SCHOOL OF EDUCATION

The Perceptions of Botswana Agricultural Science Teachers towards their In-service Professional Development: An Exploratory Study of the Central Region

By

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ABSTRACT

This study relates to the reforms by the Education Ministry in Botswana of decentralising the coordination of teachers' In-service Professional Development (IPD) to the Regional Offices with the overall aim of improving students' academic performance (Republic of Botswana, 2006). In the absence of other research data, the study aims to understand how secondary school teachers of agriculture in Botswana perceive their IPD. The study endeavours to identify gaps in current IPD provision and make recommendations to guide IPD policy reforms at regional level.

Based on a review of the literature and the overarching research purpose, a set of research questions was devised. Considering the research questions, a Realist perspective to the research that endorses a flexible pragmatic stance was adopted. The research employed a mixed methods design. A questionnaire was developed and administered to all the Agriculture teachers in the Central Region (n=247). A purposive sample of teachers (n=36) and every Agriculture Education Officer (n=8) were interviewed. The quantitative data was analysed using SPSS software, with descriptive and inferential statistics reported. A coding guide was developed to analyse the interview transcripts which was done with the assistance of NVivo software (Bazeley, 2007).

The findings show that the main source of motivation for teachers to attend IPD is to update their knowledge and skills in the subject. The study revealed workshops and meetings to be the most popular IPD opportunities of all IPD opportunities found to be relevant by teachers. The study also identified satisfactory

and unsatisfactory characteristics of IPD; the contextual factors that adversely influence IPD in the region; and a wide range of IPD needs.

The findings have implications for future IPD policy reforms; most important of these include the need to:

- adequately resource IPD and create time for it as an integral part of the education programme;
- remove restrictions associated with funding teachers' enrolment in part time courses;
- revise teachers' workload policy to help them find time for IPD; and
- have IPD emphasise acquisition of agriculture skills by teachers.

Beyond policy, the findings also suggest improvement of the design and organisation of IPD, which include strategies for making IPD interesting, meaningful, sustainable and accessible to all teachers in the region.

Keywords: In-service Professional Development Botswana, Agricultural Education, In-service needs, and Professional Knowledge base.

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LIST OF ACRONYMS

ACRONYM	STANDS FOR:
BATA ……..	Botswana Agriculture Teachers Association
BCA ……..	Botswana College of Agriculture
BEC …….	Botswana Examination Council
BFTU ……..	Botswana Federation of Trade Unions
BOCODOL ……..	Botswana College of Distance and Open Learning
CDD&E ……..	Curriculum Design Development & Evaluation
CICE ……..	Centre for In-service Continuing Education
DFEE ……..	Department for Education and Employment (UK)
DSE ……..	Department of Secondary Education (Botswana)
EFA ……..	Education for All
IPD ……..	In-service Professional Development
ITE ……..	Initial Teacher Education
KRTC ……...	Kweneng Rural Training Centre
LCA ……..	Learner-Centered Approaches
LCP ……..	Learner-Centered Pedagogy
MDGs ……..	Millennium Development Goals
MFDP ……..	Ministry of Finance and Development Planning (Bots)
NDP ……..	National Development Plan
PD ……..	Professional Development
RNPE ……..	Revised National Policy on Education (Botswana)
TCE ……..	Tonota College of Education
TT& D……..	Teacher Training and Development
UB ……..	University of Botswana
USAID ……	United States Agency for International Development

DEFINITION OF TERMS

The general adoption and use of specialized jargon (which is common in education circles of any country) made it necessary to include a definition of terms used in this study. These are:

Batswana: Citizens of Botswana.

Cluster of schools: Are groups of six/seven schools in the same vicinity which meet, usually for subject specific issues (McDevitt, 1998).

IPD Framework: Means the broad structure of teachers' IPD devised to reach out to all teachers. Kennedy (2005) described these broad structures as CPD Models.

Junior secondary agriculture teacher: An individual given responsibility to impart agricultural knowledge, skills and attitudes to students from Form One to Form Three levels (Grades seven to nine) of secondary education in Botswana.

Reform- Type Professional Development Activities: Activities that take place during the regular school days, during the process of classroom instruction, or during the regular scheduled teacher planning time. This may include any other activity developed in response to the felt needs of teachers or principals.

Resource person: Any individual with particular expertise who leads or gives instructions during any IPD session.

Senior secondary agriculture teacher: An individual given responsibility to impart agricultural knowledge, skills and attitudes to students at Form Four and Form Five levels of secondary education in Botswana.

Teacher trainer: A teacher who is trained so that he/ she can, in turn, relay the information to the rest of the teachers at either school, cluster or regional level.

CHAPTER 1: INTRODUCTION

1.1. Background Setting

1.1.1. Preamble

This thesis shares the views of Botswana Agricultural Science Teachers towards their In-service Professional Development (IPD). The thesis intents to contribute approaches that could enhance effective IPD provisions in the context of the reforms, by the Education Ministry in Botswana, of decentralising the coordination of teachers' IPD to the Regional Offices with the overall aim of improving students' academic performance (Republic of Botswana, 2006).

The notion of Continuous Professional Development (CPD) as espoused by Richard Gardner in the mid 1970's (Gray, 2005) is embraced in Botswana, for efforts are made to ensure that teachers continuously learn while on the job. However, CPD is defined differently in other contexts, for instance in England and Wales, it excludes activities undertaken at the early stages of assuming employment, which are taken to constitute 'Early Professional Development' (EPD) (Training and Development Agency for Schools, 2007). In this study CPD is referred to as In-service Professional Development (IPD) which includes any form of teacher learning undertaken from the first day of service up to retirement as implied by the Botswana's Revised National Policy on Education (Republic of Botswana, 1994b). I understand it to embrace EPD and CPD and to supplement Initial Teacher Education (ITE).

1.1.2. Botswana: Contextual framework of the study

As a geographical context of the study, Botswana is a developing landlocked country situated in Southern Africa (see Figure 1.1 below). It enjoys long borders with South Africa, Namibia and Zimbabwe, and a 700-metre border with the Republic of Zambia. The political and economic capital, Gaborone, is located in the South East, close to the border with South Africa.

Figure 1.1: Map of Botswana (Source: www.mapsofworld.com/ Botswana-political-map-html (Accessed: 10th April, 2011)

Botswana has an area of about 570000 square kilometres and the country is sparsely populated, with only 3 people per square kilometre (Republic of Botswana,

2001). Most of the country's landmass is taken up by the Kalahari Desert, and most of the towns and villages are along the eastern part of the country where soils are comparatively fertile for tillage. The climate in Botswana is semi-arid, with an average rainfall of 475 mm per year. The rainfall is unreliable and unevenly distributed.

Botswana is divided into geographical regions. The region of interest for this study is the Central Region for it was the region where data for this study was collected. This region can be seen in Figure 1.1 above. The choice of this region for this study is discussed later in Chapter 3.

Botswana has a democratic government, which has ensured political stability since independence. The country gained independence in 1966, after having been a British Protectorate from 1885. Since independence, it has become renowned for good governance, intolerance for corruption (World Factbook, 2010) and solid respect for legal processes. The country is characterised by an impressive economic growth, mainly due to gemstone diamond mining and the beef industry. Diamond exports contribute the largest share of the country's GDP. (Botswana Export Development Authority – BEDIA, 2011).

Although the agricultural sector is not performing so impressively (Ministry of Finance and Development Planning, 2009), the government still recognises the role it plays to the wellbeing of Batswana. The majority of Batswana undertake farming at subsistence level to earn a living. Even public officers practice agriculture on part time basis to augment their income at household level. Agriculture is further recognised for

its potential to help the country achieve economic diversification and employment creation especially in rural areas. The government has established programmes like the Integrated Support Programme for Arable Agricultural Development (ISPAAD), the National Agricultural Master Plan for Arable Agriculture and Dairy Development (NAMPAADD) and the Young Farmers' Fund (YFF) through which it endeavours to promote food security at household and national level and boost the contribution of the agricultural sector to the economy. The efforts by the government to promote agriculture include ensuring the introduction of agricultural skills to all young Batswana by having the subject 'Agricultural Science' taught in schools: an aspect to be expanded under Section 1.1.4 below.

1.1.3. Education in Botswana

Formal education comprises of primary, secondary and higher education programmes and is offered in both government and non-government schools. The government is committed to provide education to all its citizens. This is evidenced by its provision for vocational education and the out of school education programmes. There is also a continued expansion of formal education system with the aim of achieving universal access to 10 years of basic education to all Batswana (Ministry of Education, 2004). Furthermore, Botswana is a signatory to conventions such as Education For All (EFA) (MFDP, 2009), which recommend that education should be accessible by all.

However the government faces challenges posed by big class sizes (Ministry of Education, 2004), which increase costs especially at this period of economic recession (Ministry of Education, 2006). Already the government has started devising

cost sharing and saving means, because the levels of investment in education can no longer be sustained by the government on its own (MFDP, 2009). For instance, distance education courses, through Botswana College of Distance and Open Learning (BOCODOL), are now paid for by learners.

The government commitment to invest in education could be evidenced by the relatively larger share of the public expenditure it allocated the sector over the years. In 2009/2010, the education sector accounted for 19.6% of the total budget (Matambo, 2015). The sector accounted for about 25% of the public expenditure in 2014/15 (Matambo, 2015). The education sector continued to receive the largest share (28.1%) of the total recurrent budget for the 2015/16 financial year (Matambo, 2015). It is clear from the figures that the investment in education has been increasing over the years. This could be an indication of the government's commitment to support human capital development.

Whereas the government's investment in education focussed mainly on expanding access in the past, investment in quality could be said to be intensifying in recent years. For instance, pre-primary education is being introduced in public schools and the programme is currently at its pilot stage (Republic of Botswana, 2015b). Introducing children to education at an early stage would enhance their readiness to learning thus increase their chance of understanding concepts better when they start primary education. Strategies are under formulation to lower student teacher ratios (Republic of Botswana, 2015b): the move that I find likely to enhance student- teacher interaction and better understanding on the part of learners. Furthermore, curriculum development and assessment frameworks adopt competency or outcome based

approaches (Republic of Botswana, 2013a: 2015b) which, if properly implemented, could make education relevant and meaningful to the learners and the society at large. The challenge is not about the curriculum design itself but is on how it is taught. This stride suggests a need for continued teacher support to help them effectively implement the outcome based approaches. Also visible in the education system is the infusion of Information Communication Technologies (ICT) to teaching to enhance learning (Republic of Botswana, 2015b). In a wider picture I find ICT, if properly integrated into the education system, become a vehicle through which government could achieve its social, economic, cultural and political transformation targets enshrined in the country's vision 2016 (Republic of Botswana, 1997). For this reason, the need for teacher support in the use of ICT becomes vital.

Some of the positive developments that could be said to mark change in the focus from that of just expanding access to emphasising quality education by the government would be visited later in the sections below. These include attempts by government to provide for the teachers' in-service support (Republic of Botswana, 2013b) and the restructuring of operations to enhance effectiveness and efficiency in service delivery (Republic of Botswana, 2006: 2015b)

The government is also committed to respond to issues of the empowerment of women in the education sector. This is evident from its commitment to ensure gender neutral curricula at all levels of education (Ministry of Education, 2004: Republic of Botswana, 2013a). Gender equity is ensured to teacher recruitment level where qualification is a determinant to joining the teaching field. Any disparity in the number of female and male teachers may not be blamed on biased recruitment.

Education structure

Ever since Botswana gained independence in 1966, the education structure had been seven years primary, three years junior secondary (equivalent to UK year 7-9 level), and two years senior secondary (equivalent to UK high school level) or 7- 3- 2. The 1976 National Commission on Education recommended a change from the 7- 3- 2 structure to 6- 3- 3, that was, involving six years primary, three years junior secondary, and three years senior secondary (Republic of Botswana; 1977). The recommendations of the 1976 National Commission on Education, which are enshrined in its policy document entitled 'Education for Kagisano' directed and guided the development of education until 1996.

The National Commission on Education observed that the target of the 6 - 3- 3 structure was nine years of basic education for every Botswana child, unlike the former 7 – 3 - 2 structure where a child was allowed only seven years of basic formal education. The nine years basic education was to include 6 years of primary and 3 years of junior secondary. According to the National Development Plan 7 (MFDP, 1985), restructuring the education programme from 7- 3- 2 to 6- 3- 3 was not as simple as it was stated. It was realised that shortening the primary phase to six years could deprive many children of a year of schooling. The change was also made difficult by the fact that places in junior secondary schools were, then, insufficient to accommodate all primary completers in order to attain their nine year basic education (Ministry of Finance and Development Planning, 1985).

Accordingly, the 1976 National Commission on Education had recommended a transitional phase of 7- 2- 3 (Republic of Botswana, 1977). This phase was

envisaged to allow a longer senior secondary course and nine years of basic education without curtailing primary education. Consequently, the 7- 2- 3 structure was in operation from 1987 to 1997 when the government embarked on the 7- 3- 2, structure, which is currently in operation, following the recommendation of the 1993 National Commission on Education (Republic of Botswana, 1994a). Upon successful completion of the 7 years primary, 3 years junior secondary and 2 years senior secondary schooling, candidates sit and awarded certificate for Primary School Leaving Examination (PSLE), Junior Certificate Examination (JCE), and the Botswana General Certificate of Secondary Education (BGCSE) respectively.

1.1.4. Why and how Agriculture as a subject sits in the Botswana education system

It is intended by literature in this section to deepen understanding on the work demands expected of agriculture teachers in the context of the Botswana education system. The literature in the process signals associated potential IPD demands.

Agriculture is taught, as a subject, in the Botswana education system as an effort by the government to ensure that the culture of raising crops and animals [a way of life I alluded to earlier (under Section 1.1.2)], is transmitted to young Batswana. Transmitting culture is one educational purpose emphasized by Bottery (1990). Equipping young Batswana with skills to raise crops and animals could also be regarded as the government's long term strategy for reducing unemployment and poverty amongst the citizens, as well as bolstering economic diversification in the long run.

I believe the use of agriculture to diversify the economy would be a platform for teaching agriculture in a way that would encourage students to view it as a way of making life even during this modern time. I find the move likely to instil seriousness in both teachers and students. They would go beyond looking at agriculture as a subject, but as a means to earn a living in the long run.

As a subject in the education system in Botswana, agriculture is taught to children from primary, through junior secondary (equivalent to UK year 7-9 level) up to senior secondary level (equivalent to UK high school level). At primary school level, Agriculture is offered together with Mathematics, Science, English, Setswana, Religious and Moral Education, Creative and performance and Social Studies. At junior secondary level Agriculture is offered together with Mathematics, Science, English, Setswana, Social studies and optional subjects like Design and Technology, Art, Music, Physical Education, Religious Education, Business and Accounting, and Home Economics. Other subjects offered at senior secondary level include Mathematics, Sciences (Physics, chemistry, and Biology), English, Setswana, Geography, History, English literature and optional subjects like Art, Design and Technology, Music, Business and Accounting, and Home Economic amongst others.

Agriculture is offered as an examinable core subject to all students in primary and junior secondary schools. At senior secondary level, it is offered as an examinable optional subject and is a popular choice for many students. As a result, more often, facilities become overstretched by larger class sizes as observed by the Botswana Agriculture Teachers' Association (BATA, 2007). Consequently this may pose a real need for agriculture teachers' IPD support.

The need for IPD may also be intensified by the fact that both Junior and Senior Secondary Agriculture syllabi (Ministry of Education, 2000: Ministry of Education, 2010) reflect a broad range of subject matter that has to be taught, which include agriculture concepts (usually referred to as a 'theory' aspect in Botswana) coupled with farm skills (popularly known as practical or hand-on skills). Therefore, the students' performance in both theory and practical work contribute to the overall agriculture score for every student computed at the end of the programmes (Junior Certificate Level - JCE or Botswana General Certificate of Secondary Education-BGCSE level). At Junior certificate the theory and practical components contribute at a ratio of 70% (theory) to 30% (practical) (Ministry of Education, 2010), whereas at BGCSE they contribute at a ratio of 80% (theory) and 20% (practical) (Botswana Examination Council- BEC, 2011). Only the theory score is considered for computing the candidates' Primary School Leaving Examination (PSLE) score for agriculture. This is mainly because at primary school level the facilities required to house the agriculture enterprises for teaching and learning purposes are inadequate or non-existent (BEC, 2011).

The other point which suggests the need for improved agriculture teachers' in-service support stems from a seemingly declining students' academic performance in agriculture as revealed by Table 1.1 below.

It can be learnt from the table that the agriculture quality performance (i.e. grades A-C) of candidates at primary level was relatively high, recording 75.62% and 70.95% in 2007 and 2008 respectively. In 2009 a drastic decline (about 31% fall) in

Table 1.1: Overview of the Students' Academic Performance in Agriculture at PSLE, JCE and BGCSE from 2007 to 2014: National Results

YEAR	PSLE		JCE		BGCSE	
	% GRADE A- C	DIFERENCE	% GRADE A - C	DIFERENCE	% GRADE A- C	DIFERENCE
2007	75.62	-	27.9	-	60.18	-
2008	70.95	-4.67	25.6	-2.3	55.82	-4.36
2009	40.17	-30.78	27.1	+1.5	50.95	-4.87
2010	39.41	-0.76	28.2	+1.1	47.36	-3.59
2011	24.13	-15.28	26.3	-1.9	40.52	-6.84
2012	24.00	-0.13	29.3	+3.0	36.32	-4.20
2013	39.39	+15.39	29.9	+0.6	36.98	+0.66
2014	42.35	+2.96	30.7	+0.80	35.77	-1.21
Range Of Decline	51.62		5.1		24.38	

Source: Compiled from Botswana Examination Council Internal Review Records

the agriculture quality performance of candidates was recorded: falling from about 71% to 40%. The low quality performance increasingly worsened to about 24% in two executive years (i.e. 2011 and 2012) after which it rose by 15.39% in 2013 to become 39.39%. In 2014 the performance slightly improved by about 3%. The improvement, in recent years, could be due to the effect of in-service support programmes which are part of the overall reforms by the Education Ministry to improve the quality of education in Botswana: starting from primary level (Republic of Botswana, 2015b).

The agriculture quality performance of candidates at junior secondary school level appears to have been generally low since 2007 to 2014 for it ranged from as low

as 25.6% in 2008 to 30.7% being the highest record in 2014. The 5.1 range of decline over the eight years suggests that there has been a minimal change in the struggling agriculture performance at junior secondary level. The continued low performance could be borne by the lack of effective in-service support rendered to improve the teaching and learning of agriculture in schools.

According to the table above the quality performance (i.e. grades A-C) of candidates in agriculture at senior secondary level (i.e. BGCSE) has been increasingly declining over the last 8 years. The performance fell from 60.18% in 2007 to 35.77% in 2014: recording a decline range of about 24%. Like at junior secondary level, this continued decline could also be explained by the lack of effective in-service support offered to teachers of agriculture amongst other potential factors.

The demanding nature of the teaching of agricultural science, compared to that of other subjects in general may further intensify the teachers' need for IPD support. Reflecting on the teaching demands of agriculture, Harper, et al. (1990) who wrote from the American context argued that:

> ..Agriculture teachers generally instruct not only in the classrooms and laboratories but also on-site in school farms, ranches, and cooperative learning sites. The scope of such instruction directly involves students' parents, other members of the community, and usually involves time, effort, and travel beyond the normal school day (p.22).

The excerpt above suggests that the work load experienced by the teachers of agriculture could be relatively high compared to that of other subjects. Its teaching calls for more time and energy to be expended by teachers of agriculture to achieve objectives set for its teaching.

On a different note, the unpredictable climatic condition which, more often, vary from one location to the other (Ministry of Finance and Development Planning, 2003), hampers the success of agriculture in the country. This condition poses a challenge to teachers who have to continuously make adjustments in pedagogy and subject matter in order to address the unexpected changes (BATA, 2007).

It is worth noting at this juncture that, in spite of the challenges; the government seems committed to support the teaching of agriculture in schools. The government provides, at every secondary school, basic agriculture teaching resources. These include a school farm with structures to house equipment and livestock. Basic garden tools and some consumable materials like fertilizers, seeds and chemicals are provided for by the government, although they are never adequate (BATA, 2007). In the next two pages, I placed photos to let readers see and appreciate the agricultural enterprises in a typical school farm as well as the associated structures.

The government also endeavours to ensure that the programme is implemented by qualified teachers trained locally and in the neighbouring countries like Swaziland and South Africa. In-service training opportunities are also arranged for teachers and they have been since coordinated centrally from the Ministry of Education headquarters in Gaborone (Ministry of Education, 1998). Sections 1.1.5 and 1.1.6 below expands discussion on how the government endeavours to provide initial teacher training and in-service support to teachers respectively.

School agriculture enterprises in pictures

Photo 1: Livestock structure, store-room and layout of vegetable plots

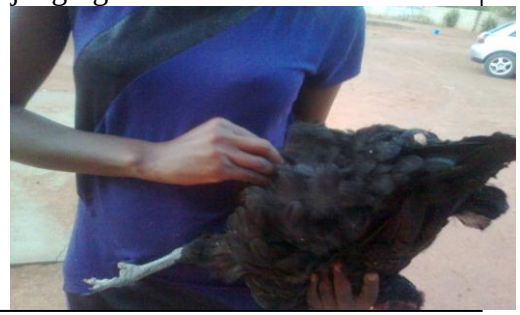
Photo 2: Goats enterprise

Photo 3: Project on Setswana chickens

Photo 4: Bee enterprise

Photo 5: Rabbit enterprise

Photo 6: Demonstrating Poultry judging exercise



Source: All nine photos were taken by the researcher for purposes of this study

School agriculture enterprises in pictures (continues)

Photo 7: Poultry enterprise (Layers in cages)

Photo 8: Vegetables enterprise (Each student growing a leaf, legume and root crop)

Photo 9: Garden Tools

Source: All nine photos were taken by the researcher for purposes of this study

1.1.5. Pre-service Teacher Preparation Programme for Agriculture teachers in Botswana

This section deepens understanding on the structure and content of the initial teacher training programme for agriculture teachers in Botswana. The information was found important here given that the quality and amount (coverage) of knowledge student teachers acquire during initial teacher training may have implications for their IPD (Guskey and Huberman, 1995).

Initial teacher preparation has an impact on the quality of instruction and so determines the level of learning achievement at school level (Musset, 2010). Its primary purpose is to acquaint prospective teachers with a repertoire of good practices to render them competent and remain motivated as they meet varied challenges associated with their career.

Currently, most agriculture teachers implementing the agriculture curriculum at the secondary schools of Botswana are locally trained at the Botswana College of Agriculture (BCA) and Tonota College of Education (TCE). Some few Batswana train at the University of Swaziland (UNISWA) and some South African institutions to become agriculture teachers. Although the scope of this study does not include the teaching of agriculture at primary schools, I find it worthy to highlight that the Primary Colleges of Education in Botswana also offer agriculture training to primary school teachers who are expected to teach the subject together with other subjects. In other words, primary school teachers, who upon completion of their training are

awarded Diploma in Secondary Education qualification, do not specialise: they train as generalists to teach all subjects offered at primary level.

The Botswana College of Agriculture has been, all along, offering a three year Diploma in Agricultural Education (Dip AEd.) as well as a four year Bachelor of Science Degree in Agricultural Education (BSc AEd.). The Dip AEd. and BSc AEd. programmes were designed to prepare teachers to implement agriculture curriculum at junior and senior secondary school level respectively. However, the Diploma in Agricultural Education programme has been, since 2008, abolished for it could not attract adequate number of students. Despite its stoppage, a number of its graduates are still teaching agriculture in schools: with the hope that one day they will gain an in-service support and be taken for further studies to attain degree qualifications. On the other hand, Tonota College of Education (TCE) offers a three-year programme at Diploma level and upon completion candidates are awarded a Diploma in Secondary Education qualification which qualifies them to teach at junior secondary school level.

The University of Swaziland (UNISWA), which trained most of the agriculture teachers before the inception of the teacher training programmes at both BCA at TCE, also offers both a three year Diploma in Agricultural Education and a four year Bachelor of Science Degree in Agricultural Education. UNISWA also offers a full flesh Master of Science Degree in Agricultural Education which benefited a sizeable number of Batswana. The purpose and structure of the agriculture teacher training (Diploma and Degree) programmes at UNISWA are equivalent to those at BCA in terms of structure and course content.

Table 1.2 below provides an overview of the professional knowledge base of agriculture teachers (courses covered) as enshrined in the initial teacher training programmes of BCA and TCE where the majority of agriculture teachers in Botswana receive training. To save space, the table mainly entails what tends to differentiate between the programmes for junior and senior secondary agricultural science teachers as well as between courses offered at the two institutions.

The table shows that, the BCA diploma and degree programmes differed in duration of study, course coverage and content depth: and this may lead to a difference in the extent to which the graduates from the two programmes need IPD support. Nonetheless, both programmes meet Agricultural Education programme's stature for they have both agriculture and education courses taken concurrently (Harper, et al., 1990).

In addition, Table 1.2 shows that TCE prospective agriculture teachers take agriculture as their major and pair it with any other subject of their choice as minor to constitute the subject matter component. This means the candidates' time is shared between two subject matter areas (major and minor) thus posing a load challenge on the part of student-teachers. Again, as a result of an additional subject (minor) as well as apparent emphasis on pedagogy, TCE might be covering not as much agriculture content as does BCA where agriculture areas make the bulk of the offered programmes. At TCE candidates are offered education foundation courses together with two prolonged teaching practice sessions, which possibly enhances their teaching capabilities more than does the single teaching practice session offered at BCA. This disparity may present a difference in the need for IPD support by the teachers from the two institutions.

Table 1.2: Distinction between the courses covered by agriculture student-teachers during their initial teacher training at BCA & TCE

Institution	**Botswana College of Agriculture (BCA)**		**Tonota College of Education (TCE)**
Programme	Diploma in Agricultural Education (3yrs)	Bachelor of Science Degree in Agricultural Education (4yrs)	Diploma in Secondary Education (3yrs)
Level intended to teach	Junior secondary schools	Senior secondary schools	Junior secondary schools
Courses taken	<u>Education course (Pedagogy)</u> i). 6 weeks teaching practice ii). No micro and peer teaching iii). Do education foundation courses <u>Agriculture courses (Subject matter)</u> i. Basic sciences including Physics I, Chemistry I, Maths I, Biology I, & Communication skills ii). Cover agriculture courses (**with reduced content except basic principle courses**) from disciplines of: Crops science, Animal science, Engineering, & Economics	<u>Education courses (Pedagogy)</u> i). 6 weeks teaching practice (exempt mature entry candidates with Diploma) ii). No micro and peer teaching iii). Do education foundation courses (with increased content) iv). Do research methods & undertake research project <u>Agriculture courses (Subject matter)</u> i. Basic sciences including Physics I&II, Chemistry I&II, Maths I&II, Biology I&II, Biometry I&II, computer skills I&II , Biodiversity, Communication and academic skills ii). Cover **full** agriculture courses from disciplines of: Crops science, Animal science, Engineering, & Economics	<u>Education courses (Pedagogy)</u> i). 8 weeks teaching practice I ii). 8 weeks teaching practice II iii). Do micro and peer teaching iv). Do education foundation courses <u>Agriculture courses (Subject matter-**major**)</u> i).No basic sciences ii). Cover agriculture related material tailored to the secondary school syllabus they are meant to implement. These include: animals, crops, engineering, and economics aspects. <u>(Subject matter-**minor**)</u> iii). Choose either Science or Mathematics.

Source: BCA undergraduate prospectus and TCE programme prospectus

In fact, the TCE programme was tailor made to produce teachers to man junior secondary schools most of which mushroomed in the late 80's (Republic of Botswana, 1994b). It could be due to this reason that the institution emphasises more on the teaching profession areas (pedagogy) and less on the agriculture subject matter areas compared to BCA.

Despite the possible differences in teachers' knowledge base that might have emanated from the differences in the initial training programmes, one would still expect to see the pass rate for Agricultural science increasing in all schools, as well as agricultural enterprises in schools flourishing with products such as vegetables and milk. In the long term, the country should realise growth in the agricultural contribution to the economy.

The government has instituted the regulating body- Botswana Qualification Authority (BQA)- through which it can ensure that international standards are met by all tertiary training institutions, thus preventing the existence of bogus institutions in the country and ensuring acquisition of quality education by the citizens (Republic of Botswana, 1994b; Republic of Botswana, 2015b). The Botswana Qualification Authority (BQA) is charged with responsibility to ensure that the developed curricula meet acceptable standards. Bench-marking is placed to determine the accepted content standards of various programmes. Being a new institution, the effect of BQA is yet to be reliably felt.

1.1.6. Teachers' In-service Training Programme at National and Regional level in Botswana (Current status reflected)

In Botswana the In-service Professional Development (IPD) of teachers has always been an important concern for the two main commissions of education (Republic of Botswana, 1977: Republic of Botswana, 1994a). In its report the 1976 commission noted that:

> 'another approach to better teacher morale is through development of a stronger sense of professional identity among teachers … (which) … is partly a matter for teachers themselves to take up through their own professional associations (Republic of Botswana, 1977, p.133).

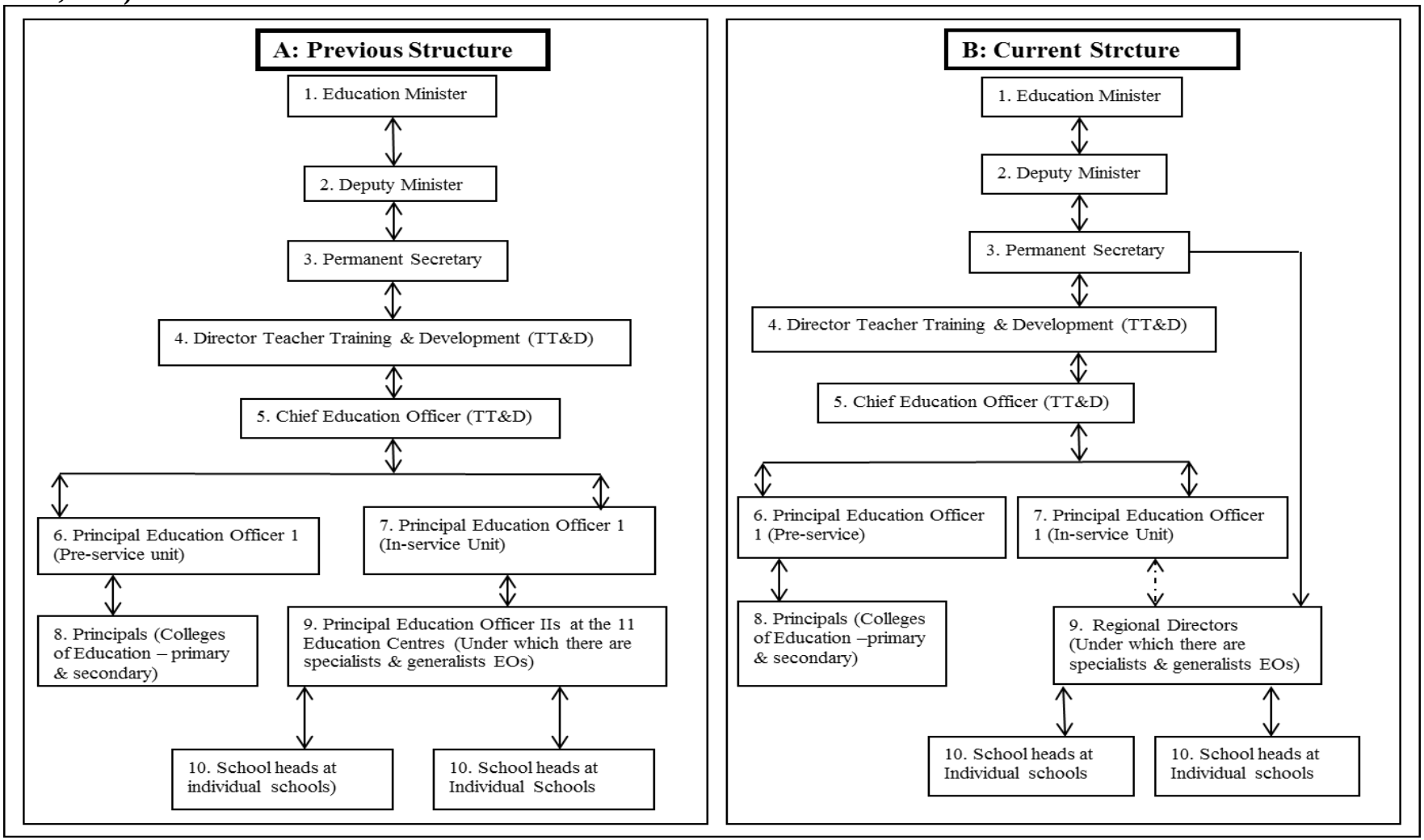
Additionally, the commission suggested to the then authorities that there should be a framework and support services for professional development. The later 1993 commission, developed the scope for professional development by recommending that efforts should be made to cater for both the professional growth of teachers and the supervisors (Republic of Botswana, 1994a). The commission further suggested a shift in viewing IPD that it:

> should not be seen as a stop-gap means of upgrading untrained teachers or those …under-qualified, but rather a continuing means of strengthening and reviewing the education system through development of teachers' competence and sense of professional commitment (Ibid. p.353).

Although efforts to improve teacher quality were made by stakeholders at various levels (i.e. teachers as individuals, schools, education regional offices, and the Ministry of Education) in response to these reports , such efforts were very minimal, especially when considering the many challenges that face education today. I will later reflect on what could be considered the major strides made and the challenges faced.

With the help of Figure 1.2 below, I will first look into the organisational structure for the teachers' in-service training

Figure 1.2: Previous and Current Organisational Structure for teachers' in-service training and development in Botswana (Rep. of Bots., 2006)



and development in Botswana. The figure helps us conceptualise the previous and current organisational structures as the structure kept on changing over the years due to some developments by the Education Ministry (Republic of Botswana, 2006).

First to note with both the previous and the current structures shown in Figure 1.2 above is that officers from numbers one up to seven were and are based at the Ministry of Education headquarters in the capital Gaborone. The officers at cells nine and ten could be said to have previously operated or are currently operating at regional level. They are the ones operating closer to the schools, classrooms, teachers and students in which we expect change through IPD to manifest itself.

From the top of the previous structure, the figure, through downward arrows shows that decisions about the professional growth of teachers went from the Minister through the Deputy Minister, the Permanent Secretary, the Director of Teacher Training and Development (TT&D), the Chief Education officers (TT&D), and the Principal Education Officer I, before they reached the Principal Education Officers II (PEO II). The PEO II would then monitor the Education Officers (In-service) as they relayed decisions to the School Heads as well as help organise and monitor the implementation of IPD interventions where possible. With the previous structure, most decisions about teachers' professional development were centrally made at TT&D as it was the department charged with the responsibility for teachers' professional development (Ministry of Education, 1998). School Heads (Cell 10) as the immediate supervisors of instructions in schools, used provisions as enshrined in the scheme of service manual (Ministry of Education, 1994) to offer clinical

supervision to the teachers as individuals or in groups. The upward arrows on the figure show reporting lines with bottom officers reporting to those above them.

Similarly, the figure shows that with the current structure, the decisions on teacher training and development flow from the top (Cell 1) following the direction of the downward arrows passing through all cells down to School Heads (Cell 10) who provide clinical supervision to teachers at school level as said earlier. As with the previous structure, upward arrows show reporting lines: with the bottom officers reporting to those above them. However, since 2010 most administrative decisions on teacher training and development have been decentralised to regions, with the Regional Education Directors, who are in charge of all education matters at regional level, leading them (Republic of Botswana, 2006).

The broken arrow between cell 7 and 9 suggests that the current structure reduced control which the department of TT&D, through PEO 1 in-service (Cell 7), used to have over the control of EOs at regions and generally, over matters pertaining to the teachers' professional development in schools. The TT&D's decision-making power here is reduced by the introduction of Regional Directors in the structure and these were not included in the previous structure, hence the difference. The figure, through double arrows between Cell 3 and 9, shows that the Regional Directors directly receive instructions from and report to the higher office of the Permanent Secretary. As a result the Regional Directors can make decisions about teachers' development in their regions, without consent from TT&D and this might be considered inappropriate.

Likewise, the Regional Directors are not bound to report directly to TT&D as shown by the broken arrow from Cell 9 to 7. I therefore find this structural clash, led by the by-passing link between Cell 3 and 9, likely to make TT&D redundant or make it difficult to hold TT&D wholly accountable for teachers' training and development at school level. There is also a possibility that instructions from Cell 7 and those of the Regional Directors, to bottom officers, may clash and this may lead to unnecessary confusion on the part of Education Officers, schools and teachers. For instance, Sticks[1], an Education Officer at one of the regions when interviewed, said

> *Due to shortage of manpower, currently we find ourselves doing mostly inspectoral functions at the expense of doing our in-service training and development mandate*

The comment indicates the adverse effects of the structural change as viewed by some observers in the system.

It can be seen from the two organisational structures (in Figure 1.2) that probably ever since the inception of the notion of teacher training and development in Botswana, the administration of IPD in the country has been centralised, with most decisions made from the Ministry under the in-service unit of the department of Teacher Training and Development (TT&D). Again, the hierarchical pattern of authority adopted by IPD organisational structures (both previous and current) has all along been concerned with maintaining control of teachers' professional growth at management level rather than with the teachers themselves. Contrary to that, professional development literature (e,g, Bishop and Denley, 2006) argues for empowering teachers to take ownership of developments geared to their professional growth.

Sticks [1] (not real name) is an In-service Education Officer (personal communications)

It is worth noting that unlike in developed countries like the UK, where the teachers' PD opportunities are offered by government and some private agencies (Day et al., 2006), in Botswana the government is the main provider of the formal teachers' IPD through the department of TT&D as mentioned earlier. Also the schools, through the school administrations or teachers themselves (as groups or individuals) undertake formal in-house IPD activities which foster either an individualised or a school wide change. Besides the University of Botswana (see Chapter 2, Section 2.11) and its associated institutions, there are currently no private external agencies in Botswana offering teachers' IPD either subject-specific or generic. I find this necessitating the need for the government to encourage support of the private sector in this regard.

Efforts by government

Nationally, ever since the recognition of the growing demand for quality education (Republic of Botswana, 1994b), the government has been working towards effective IPD for teachers to 'stay current in educational theory and practice throughout their career life' (Good and Weaver, 2003, p.439) and remain motivated and effective in their work (Ho and Yip, 2003).

The major strides made by the government that one could point to, ever since the recognition of the importance of teacher support, include the establishment of the Department of Teacher Training and Development (TT&D) to be responsible for the provision of in-service support for teachers in the country (Ministry of Education, 1998). This department was established in 1989, in response to the mass expansion of primary and junior secondary schools. The expansion put pressure on the supply of the

teaching force to such an extent that the system had to engage untrained teachers to close the gap (UNESCO, 2010/11). This created a greater need for in-service support. Specifically, it is the mandate of the In-service Unit within TT&D to oversee matters relating to the maintenance of teachers' effectiveness in the primary and secondary schools of Botswana.

The In-service Unit is intended to support improvement in the quality of teaching and school management by way of workshops on a wide range of topics: classroom demonstrations; collaboration with teachers; school and cluster-based training sessions; and special activities, such as exhibitions, fairs and other professional development initiatives (Ministry of Education, 1998; Republic of Botswana, 2010).

However, since the establishment of the In-service Department in Botswana, its growth has not kept pace with the rapid growth of secondary education. This view is supported by the Revised National Policy on Education (RNPE) which indicates that since 1984, the increase in the number of Community Junior Secondary Schools has been sky-rocketing (Republic of Botswana, 1994b). The expansion in number and capacity of secondary schools in general had implications on student enrolment, as well as recruitment of teachers, hence the increased demand for in-service training support.

The existence of the Department of TT&D then led to the establishment of 11 Education Centres throughout all the regions in the country manned by In-service Education Officers (IEOs) for both primary and secondary levels. The Central region

being the largest in the country has three of these centres at three of its major locations: Serowe, Mahalapye and Selibe Phikwe.

Ideally each centre was supposed to have an EO (specialist) for each subject offered in secondary schools as well as a reasonable number of those who are generalist to oversee IPD activities for teachers in the primary schools (Ministry of Education, 1998). Unfortunately, this arrangement has never been realised, mainly due to shortage of funds to employ more officers (Republic of Botswana, 1994a).

Besides human resource, initially each centre was adequately resourced with a library, production room, conference or seminar rooms, refectory facility, stationary and hostels with ablutions to offer accommodation to teachers who attend from afar (Ministry of Education, 1998). However, due to wear and tear, some resources at the Education Centres currently appear to be worn out and some are out-dated due to technological advancement that faces the world today.

Regarding usage, the Education Centres are meant to be used by the primary and secondary school teachers as individuals or as a group (Ministry of Education, 1998). During my interview with the In-service Education Officers (Buti[2] and Pitso[3]) I learnt that teachers could visit the centres to research in the resource centre, dialogue on subject specific issues, develop teaching aids and, attend workshops, seminars or meetings arranged by either the teachers themselves or the In-service Education Officers. One would expect teachers to use the centres as venues where they could

Buti[2] and Pitso[3] (not real names) IEOs for agriculture (personal communications)

reflect on their practice with the aim of improving it. In the absence of local research in the area, the extent to which the teachers utilise the provided facilities and acquire professional support is not yet known, let alone the impact of the IPD support rendered.

Other noteworthy strides

Efforts were made by the government to provide a conducive learning environment for teachers and students at school level in Botswana. For instance, local studies (e.g. Batane, 2004: Isaacs, 2007) revealed that the government has installed networked computers in all secondary schools in the country to support learning by teachers and students at school level. Although the computers may not be adequate to support all teachers and students, one would expect the teachers to at least make good use of them to enhance their professional growth as individuals. The computers may also help teachers incorporate technology into their practice (Srinutapong et al., 2005). Unfortunately, no research has explored the extent of usage of these computers and possibly reveal their impact in aiding the teaching and learning in schools.

In an effort to ensure proper coordination of teachers' professional development activities at school level, the Ministry of Education in Botswana established a post for a Staff Development Coordinator to chair a Staff Development Committee in a given school (Ministry of Education, 1994). The committee is charged with the responsibility to identify school-wide teachers' IPD needs and organise relevant IPD provisions to address them. The Staff Development Coordinators, who are teachers as well, were initially expected to receive support from

the In-service Education Officers, but currently the linkage seems to be non-existent (Maedza, 2010). Lack of written information on the form and quality of IPD provisions organised for teachers at school level led to this study raising questions about the forms of IPD in which agriculture teachers participated.

The Ministry of Education has also provided a manual commonly known as 'The scheme of service for teachers' (Ministry of Education, 1994) which entails, among other things, guidelines on how teachers could be helped by the instructional leaders (i.e. the school administration) to grow professionally at school level. Organisation of capacity building workshops and seminars, as well as peer coaching which could be achieved through observations and feedback, are reflected in the manual as one of the professional development activities that could benefit teachers to improve their practice. Also due to lack of research, it is not clear as to how teachers benefit from the aforementioned activities and what impact these activities have on the teachers and their practice.

The government also gives teachers study leave to attend full time training to further the qualifications in the areas that would benefit their teaching practice. While the dispensation is quite often limited by lack of sponsorship funds, the majority of the teachers who had diploma qualifications when they joined the field have now gained their degree qualifications.

IPD framework in Botswana

It has been noted by the task force that recently drafted the national in-service training policy for teachers (Republic of Botswana, 2010) that the teachers' IPD provisions have been running without a well-defined IPD framework ever since the inception of in-service unit.. This is possibly part of the problem, alongside a shortage of EOs that has led to a sub-standard in-service support rendered to teachers at grassroots level. According to the report by the aforementioned taskforce, the results of the lack of a well-defined in-service training framework were that:

> in-service training was limited hence a number of teachers would go on for too long without any training. … Obsolescence became inevitable and consequently this affected the quality of delivery in the classroom (Republic of Botswana, 2010. p.7).

This excerpt indicates how limited the IPD initiatives offered to teachers in Botswana have been without a guiding framework. There have been some exceptions, though.

For instance, a report by McDevitt (1998) reveals that the cascade framework was once adopted during an in-service project which was launched to train unqualified teachers on mixed ability teaching. However, currently on the ground it appears, after disengagement of the project, the model could not be sustained and maintained uniformly across the country.

The shortage of In-service Education Officers that I alluded to earlier had been a challenge ever since the inception of the In-service wing in Botswana. It could be due to this shortage that the government launched a special in-service project in 1996, as an interim measure, to help cope with the increased demand for in-service support

due to the increased numbers of the junior secondary schools at the time (Ministry of Education, 2004).

Probably, I should give an overview of how the then in-service project assisted in supporting the teachers. McDevitt (1998) notes that the expansion of schools came at a time when the government started introducing automatic promotion of children from primary to secondary level, which led to the existence of children with a wide range of mixed learning abilities in the junior secondary schools. At this time the supply of qualified teachers could not match schools' expansion rate, thus causing the government to employ unqualified teachers on a temporary basis. This increased demand for the teachers' IPD support further.

It was in response to this increased demand for IPD that the government launched the aforementioned in-service project. The project was named '*Botswana In-service and Pre-service Projects'* and it consisted of some consultants from the UK and some Education Officers in Botswana (McDevitt, 1998). This team worked closely with In-service Education Officers, school administrations and teachers (McDevitt, 1998). The team then identified, as top priority, the need for training teachers in mixed ability teaching. Given the limited resources (both human and material) the team adopted the use of the Cascade model to offer in-service support to the teachers (McDevitt, 1998). Figure 1.3 below depicts the Cascade model used.

Figure 1.3: The Cascade model for mixed ability teaching (McDevitt, p.426)

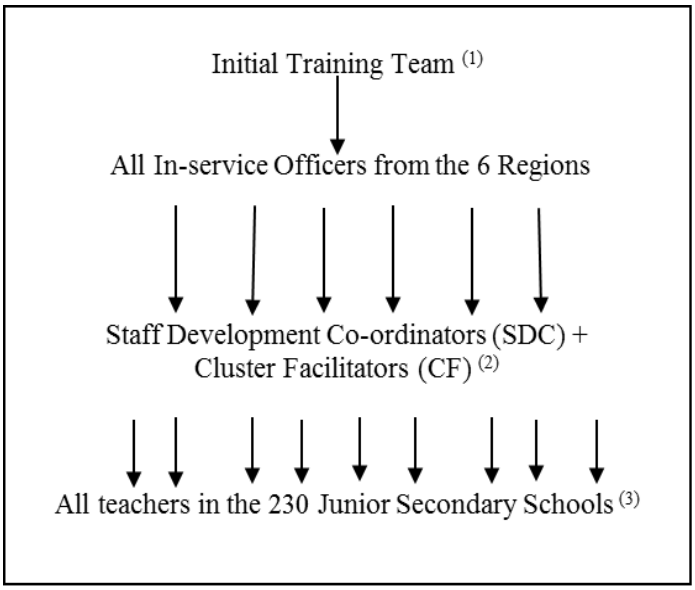


Figure 1.3 shows here that first group of teachers were trained to be used as teacher trainers (1). And through the assistance of In-service Education Officers, teacher trainers at each region mounted workshops at the established Education Centres to train SDC's and CF's (2). Thereafter, SDC's and CF's trained teachers at their respective schools and clusters (3).

NB/ According to McDevitt (1998) , Clusters are groups of six/seven schools in the same vicinity which meets usually for subject specific issues

This Cascade Model was considered effective by the project team, for it proved to be economic in terms of material and human resources (McDevitt, 1998). In fact, it was these benefits that drew my attention to the model. However, besides the possible distortion of material on its way down the levels, the assurance of maintaining attainment of identical benefits by audience at all levels remained a challenge for the design of the packages (McDevitt, 1998). The challenge was that the audience kept changing with the levels and this demanded continued re-designing to meet the needs of the audience at each level.

Some of the structural arrangements which were established then (e.g. clustering of schools) are still talked about and followed in some areas. Although there has never been a study to ascertain the model's current influence, anecdotal evidence suggests that the model has currently lost its initial influence on the system. This is likely to be due to the government withdrawing most of the support it used to offer during the time of the project.

Challenges facing teachers' IPD at national level

Notwithstanding the strides made by the Ministry of Education including that of establishment of education centres and in-service offices at strategic locations in the whole country, shortage of Education Officers (EOs) remain a major challenge (Buti, 2010)[2]. Agriculture, with only two EOs specialising in the subject area nation-wide, is one of the most hard hit subjects (Pitso, 2010)[3]. At some centres there have been efforts to mitigate the problem by engaging the help of EOs who are not specialists in the subject area, but this is far from a satisfactory state of affairs (Pitso[3]).

In addition, there is also lack of frequent replacement and refurbishment of some resources at some education centres and this make them lose their original status of providing a conducive learning environment due to either wear and tear or out-datedness.

Studies focused on any major generic national IPD interventions for teachers in Botswana are lacking. While the work of Ramatlapana (2009) points to an effort made by the University of Botswana's Department of Mathematics and Science Education In-service Training unit to offer subject-specific IPD interventions for science and mathematics teachers at national level, evidence of effort made to offer agriculture IPD interventions at national level is also absent, suggesting that national IPD interventions for agriculture teachers have been lacking. This creates a challenge for EOs and concerned stakeholders to ensure that in this era of technology, agriculture IPD provisions are rolled out nationwide.

Buti[2] and Pitso[3] (not real names) IEOs for agriculture (personal communications)

Having looked at IPD at national level, below, I now go on to consider the current organisation of teachers' IPD provisions at regional level. It is in this section where I will reflect on some specific elements of IPD that seem to characterise its organisation at Central Region. I find these elements of organisation important, drawing from the understanding that 'the way in which CPD is organised influences its potential to have an impact on children's learning' (HM Inspectorate of Education, 2009, p.7).

IPD at Regional Level

Currently, the teachers' IPD activities at the Central Region are overseen by the Central Region Education Office headed by the Director. This office is based in Serowe village. The Central Region is the largest in Botswana: constituting 38.5% (92/239) of the secondary schools in the country. It is followed by Southern region with 14.2% (34/239) of secondary schools (Republic of Botswana, 2015a).

Perhaps the most disturbing fact about this largest region is its lack of a comprehensive and encompassing IPD framework that could direct IPD provisions and hence effectively impact the teachers as individuals and their practice in the classroom to ultimately improve students' academic achievements (Maedza, 2010). Due to the massiveness of the region, the IPD activities are also highly constrained by limited resources, especially the shortage of Education Officers and transport (Maedza, 2010).

Perhaps in response to some of these problems, it appears that some IPD activities are either offered in-house normally referred to as school-based IPD activities, or organised at venues out of school such as the Education Centres, hotels and other institutions (Republic of Botswana, 2013b). I find it important to note this aspect of appropriateness of IPD venues because it has attracted the attention of several commentators who have differing opinions. Some (e.g. Roberts et al., 2006: Tennant, 1997) feel the school-based IPD activities help address contextual problems, whereas others, for example some teachers in this study (see Findings: Section 6.4.4, specifically p.349) feel the school-based opportunities fail to offer a refreshing environment and hence they would prefer externally held IPD activities.

Some IPD workshops and meetings which support teachers mainly on curriculum issues are organised at cluster level (Republic of Botswana, 2013b). The clustering of schools is an arrangement that came along with the special in-service project that was launched in 1996 (McDevitt, 1998) and it appears to be still currently evident (Republic of Botswana, 2013b). The arrangement encourages schools within close proximity to form a community, members of which could offer professional support to one another. This arrangement accords the teachers an opportunity to learn from one another and improve their practice (BATA, 2007). Following this arrangement, it has now become a norm in the education system that schools arrange cluster examinations as well as exhibitions during which teachers share ideas (Republic of Botswana, 2013b). For instance, agriculture fairs are held in phases: at cluster, regional and national level. Unfortunately, research into whether teachers benefit from this cluster arrangement is lacking. It is for this reason that this study included questions on the benefits of cluster meetings.

In the absence of written reports by the regional office about the current status of the teachers IPD in the region, it remains unclear as to what, how and when teachers undertake IPD activities at regional and school levels, be that as individuals or groups. Based on anecdotal information, it appears that teachers' professional growth is given minimal support. It also appears that the teachers mostly attend one to two days' workshops which address curriculum issues without much extension to teachers' other needs as professionals. Again, IPD is not treated as an integral part of their professional undertaking and there was still an emphasis on additional time being needed for it by teachers I interacted with. It is also clear that when classroom observations take place they appear mostly concerned with the appraisal purposes rather than to enhance teachers' professional growth. Based on such observations, the schools appear to be lacking policies to direct teachers' IPD at school and classroom levels.

On the positive side, the Director of Education at the Central Region (Maedza, 2010), pointed to his plan to propose an in-service professional development road map for teachers of the Central Region designed to guide the operation of in-service activities in the region. Through the proposed road map, the schools and teachers would be encouraged and empowered to undertake IPD activities relevant to their context (Maedza, 2010).

I was personally made to understand, through engagement with the In-service training roadmap produced by the Regional Director in late 2010 (Maedza, 2010), that the region had not then gathered data from stakeholders, especially teachers, in order to inform the design and choice of content for IPD provisions in the region. This

contrasts with literature (e.g. Guskey and Huberman, 1995: Burns, 2005), which suggests that the teachers' involvement in deciding on their own IPD opportunities serves as a motivation for engagement in IPD later on.

It is clear that the proposed IPD roadmap produced by the Director of the Central Region followed the Ministry's initiated reforms in the coordination of IPD of teachers (Republic of Botswana, 2006). With this new arrangement, regionally driven IPD initiatives were expected to address teachers' needs and improve academic achievement more effectively than the old centralised system. Following this change, regions have begun to develop strategies to best serve teachers in this regard. In the light of this, I will specifically present what triggered the undertaking of this study in the section below.

1.2. Statement of the problem and the rationale of the study

Whilst the concept of educational decentralization may lead to improvement in the quality of education, numerous studies (e.g. Brown, 1990: Sharpe, 1996) have concluded that it is still unclear whether, and under what circumstances, it makes any real differences in increasing levels of students' achievements. Measuring the direct contribution of educational decentralization in increasing levels of students' achievement is said to be made difficult by the existence of many mediating socio-economic and organisational variables which according to UNESCO (2005), and Winne and Nesbit (2010) also contribute to academic achievement.

Furthermore, some literature argues that decentralization involves the transfer of power from central office to those offices deemed junior in exercising authority. For instance, educational decentralisation according to Sharpe (1996):

> ...is merely a management device which moves the discretion, authority, responsibility and accountability for some decisions from a central agency to an individual school (p.7).

Again, serving as the premise for educational decentralization is the understanding that:

> …educational decisions made at the local level are more quick, informed, flexible and responsive to specific needs than decisions made in the capital city (Hanson, 1997, Internet).

This understanding is also shared by other analysts (Kochen and Deutsch, 1980: Brown, 1990) as the basis for decentralization. Kochen and Deutsch (1980) for instance, asserted that 'decentralization is only a means to such goals as responsiveness, service quality, and lower costs' (p.17).

It can be learnt from the excerpts above that decentralization is about transfer of power to improve efficiency in decision making and service delivery, which I view as an administrative role or structural change that may not directly impact learning in the classroom. Supporting this view is Elmore (1992) who argues that there is scant evidence to show that structural change of any educational endeavour may lead in any noticeable way to changes in teaching, content taught, or to how learners learn.

It is against this background that I perceive decentralization of IPD, in this instance, to be more of improving administrative roles which may or may not lead to improved student academic performance in the final analysis. I am of the view that it

may provide opportunity, but not the guarantee for improved academic achievements in schools. I argue here that it is not how much administrative power the regional offices have on making decisions about IPD, but the teachers' roles that may directly lead to student academic achievement.

It seems that for the IPD policy reforms to have a significant impact on improving teaching and student performance in the classroom, which is often the primary focus, first they ought to have with them focussed attention to promote the effectiveness of IPD in improving teacher quality which will, in turn, directly impact students' learning. Second, the reforms ought to have been accompanied by a series of targeted studies that would inform planning of subject-specific IPD activities, coordinated by regions.

The main problem that triggered this study is that there has not been any local study, either general or subject specific, which has attempted to inform either the decentralisation process or the strategies by the regions of what exactly is needed, in terms of design and substance, for effective localised IPD for teachers. Currently, there is no evidence in the existing literature about the Agriculture teachers' views on their practice (i.e. how they see their roles) as well as how such a practice is improved (i.e. how they see their own IPD). It was therefore necessary for a targeted research of this nature (i.e. addressing individual subject context) to be conducted to help provide such information on what would make IPD meaningful to the teachers of agriculture.

Existing studies which address the topic of professional development of teachers, do not address specific IPD issues associated with teaching a practical

subject such as Agricultural science. Mostly the studies are on hard sciences and mathematics as also was found by a research work of Cordingley and colleagues in the UK (Cordingley et al., 2003). But the teaching of agriculture is unique, as advanced earlier (Harper et al, 1990) and this uniqueness might increase the demand for in-service support on the part of teachers. This study therefore provides a platform for the Agriculture teachers to articulate their position on matters regarding IPD that is meant to help them improve their practice. In this sense the present study recognised the role teachers play in the education system and the need to take into account their views.

My concern was, in the absence of targeted research to inform the aforementioned reforms, policy makers and In-service providers will remain uninformed of what exactly is needed, in terms of design and content of IPD for teachers, thus rendering the reforms ineffective (Guskey, 2002). Their decisions may be based on generalised information which do not consider the local context and individual subject demands known best by the teachers concerned (Morant, 1981). Literature (Crossley and Watson, 2003: Crossley, 2006) has strongly cautioned against the practice of international transfer of policies and the consequences of not giving regard to culture and context in wider policy development. Day (1999, p.82) has also warned against the consequences of imposing 'structural and curriculum reform efforts' on teachers.

I therefore hold the position that IPD initiatives should meet teachers' 'felt and ascribed needs' (Knowles, 1984, p.17), and for this to be achieved, the teachers' views ought to be taken into account at the planning stage. This idea of promoting the teachers' voices is supported by Hargreaves (1997) and in this case they will be

raising their voices as learners. In fact, this idea of taking the learners' perspectives into account when developing teaching/ learning experiences is strongly represented in literature on learner-centeredness (McCombs, 1994), adult education (Mezirow, 1991) and teaching adults (Rogers, 2002: Illeris, 2003).

It is in this context that I found the need to solicit the secondary agricultural science teachers' opinions about their own IPD, in-order to help policy makers make informed decisions when planning targeted IPD activities for Agriculture teachers. My investigation was focused on how Agriculture teachers felt about their IPD with Education Officers' views also solicited to provide supporting evidence. The intention was not to evaluate the IPD for the Agriculture teachers but to discover how satisfied the teachers were that their needs and interests were met. The following purpose statement will further clarify the research agenda.

1.3. Purpose Statement with Overarching Research Question

The purpose of this study is to generate subject-specific IPD data that would help policy makers make informed decisions when planning targeted IPD activities for agriculture teachers. The study sets out to address the overarching question:

- *How do agriculture teachers in Botswana perceive their IPD?*

The overarching research question above led to a subset of questions that had implications for examining teachers' opinions of:

- their experiences of IPD;
- their IPD needs;
- the characteristics of IPD they received;

- the relevance of IPD strategies; and
- practical or logistical factors influencing teachers' involvement in IPD activities**.**

These aspects therefore became the focus for this study because they are collectively concerned with the structure and substance of IPD which I find to be in need of improvement, if IPD is to be rendered effective. The question also had implications for promoting meaningful opportunities for Agricultural science teachers' professional development throughout their careers to improve their practice. Through revelation of the gap between what teachers expected of IPD and what they experienced, the study could contribute to the strengthening of the quality of activities, thus realigning them with the teachers' expectations.

1.4. Specific Research Questions

This study addressed the following specific research questions:

1. What reasons do teachers give for participating in IPD?
2. In what forms of IPD do teachers participate?
3. What forms of IPD activities do teachers consider relevant in the context of teaching and learning agriculture?
4. What are the characteristics of IPD activities in which teachers participate?
5. What factors adversely influence teachers' participation in IPD?
6. How much attention does IPD content give to aspects that contribute to teacher quality?
7. What are the teachers' IPD content needs for the foreseeable future as defined by the teachers themselves?

8. Are there differences in teachers' perceptions of IPD according to selected demographic characteristics and school attributes (i.e. Education phase or level; School location; school performance; sex; age; teachers' experience; and academic qualification)?

The formulation of both the main and specific research questions for this study was informed by the study rationale and literature explored at initial stages. But it is important to note that the list of research questions consists of questions which could be said to be 'Contextual' (2,4,&6), 'Diagnostic' (1,5,7,&8), 'Evaluative' (7), and 'Strategic' (3&6) as indicated by Bryman and Burgess (1994, p. 174). According to Bryman and Burgess (1994), the questions addressed by applied research can be broadly divided into:

> Contextual- identifying the form and nature of what exists;
> Diagnostic- examining the reasons for, or causes of, what exists;
> Evaluative- appraising the effectiveness of what exists;
> Strategic- identifying new theories (like asking suggestions of what could be done) (p. 174)

These types of questions therefore rendered this study to be typical of applied research aimed at informing policy makers and implementers (i.e. Education Officials and Teachers) about IPD (Bryman and Burgess, 1994). Other than 'to meet specific information needs' (Ibid. p. 173), this study resembles an applied policy research in its intention to have 'actionable outcomes' (Ibid. p174) that would contribute in implementing the IPD policy process planned for the Central Region. This view is also shared by Miller and Brewer (2003) as they defined policy research to be that which often makes recommendations for action.

Using the questions to emphasise various information needs suggested a broad approach to conducting this research. This understanding realigned the assumptions that guided this study. I welcomed assumptions that had a holistic approach to research in focus, with an attempt to attain answers to as many questions as possible but within the limits of available resources, capacity and time.

1.5. Basic Philosophical Assumptions and Overview of Research Approach

When I thought of conducting this study, I already had a basic belief that both facts and meanings can play a meaningful role in social research. I have therefore always found this view point to be consistent with that of Realists who also have a dual understanding of perceiving the world (Chapter 3 further develops this perspective). With this philosophical view point, I therefore assumed that:

i. the world's complexity demands 'richness and depth' (Miller and Brewer, 2003, p. 99) and when studied 'wholeness, context, meaning and understanding' (Bryman, 2004, p.444) need to be taken into consideration (Potter, 2000). This therefore made me approach this study with the intention to learn from the teachers and officers, because they know their context better than I do. Their varied experiences, feelings and beliefs on the topic at hand were of paramount importance to making this study meaningful. This therefore suggested incorporation of data collection methods that allowed respondents to express their views easily with little restrictions imposed by the researcher.

ii. There is an existing body of knowledge which has been generally accepted as functional that I could tap to help me understand the Agriculture teachers' roles and their own IPD. This created room for probabilities, speculations, and certainty (Travers, 1969) when dealing with some information in the study. This also necessitated the incorporation of objective procedures and methods in conducting this study.

These two main assumptions imply that I approached this study from the pragmatic position which, according to Tashakkori and Teddlie (1998), puts the research questions at the forefront to dictate methods and procedures for this piece of research. For this reason, this study adopted a mixed method approach where both qualitative and quantitative approaches to research were adopted with semi-structured interviews and structured questionnaires used respectively to collect data. Chapter 3 will further develop issues of data collection, analysis, data merging and interpretation as well as ethical considerations observed. Amongst the ethical considerations I observed was that of presenting an account of myself in relation to the research area (See Chapters 3 and7), since I acknowledge that my experiences in the research area might have influenced my thinking of the study. I understand from qualitative research literature that my relations with the research area must be made explicit so that the extent of my influences can be determined (Richards, 2009; Strauss and Corbin, 1998). My personal and professional trajectory below serves to facilitate the readers' understanding of the researchers' experiences which might have influenced the choice of undertaking this study.

1.6. Personal and professional trajectory

My interest in the issues concerning the teaching and learning of agriculture in schools can be traced as far back as my early years when I was a secondary school student. I was inspired by the way my agriculture teachers used to teach us to raise crops and animals based on the underlying scientific principles guiding the husbandry practices. My teachers showed a high level competence, confidence and commitment in teaching agriculture, the calibre that created a mark of professional quality in my thoughts about my career. It then happened that after completing my senior secondary education, I trained as a teacher of agriculture after which I taught at junior secondary level and later got promotion to teach at senior secondary level. Following my acquisition of a Masters Degree in Agricultural Education I got promoted further to the supervisory post of being an In-service Education Officer. Later on I decided to leave the supervisory role and become a teacher educator at one of the teacher training institutions which offers initial teacher training programme for agriculture teachers.

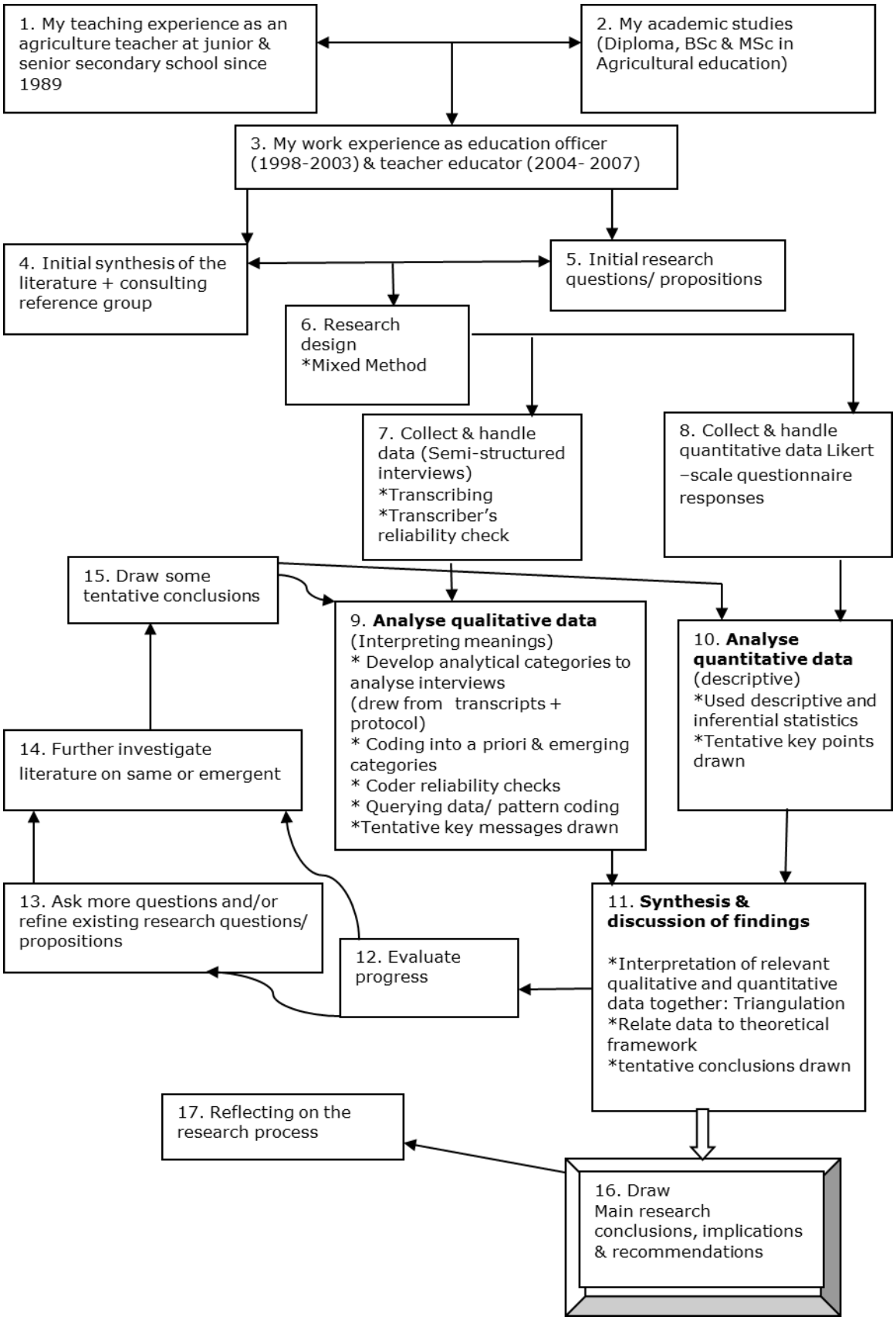
In short, my professional trajectory has been concerned with the teaching and learning of agriculture. It is for this reason that my thesis is concerned with the learning of agriculture teachers whilst serving in the field. I find this piece of PhD research to have benefited from the wealth of experience I acquired over the years in the fields of agricultural education and In-service training. Section 7.2.1 (e.g. p.402) further expands on the possible benefit enjoyed by the study from my experience.

1.7. Stages of research process at a glance

Figure 1.4 below illustrates the stages of the research process I went through in carrying out this research. The model is provided in this early chapter to help readers conceptualise the form of the entire study and to understand the thesis structure. The model in Figure 1.4 shows all the stages of research from the inception stage to the end. As Bazeley (2007) puts it, this model served as 'a record of where I started and what assumptions I brought to the research' (p.35). For instance, cells 1 to 3 show the amount of knowledge and experience I brought into the study. Literature was also consulted to inform the study (cell 4). Bazeley (2007) further indicated that a model might help in planning for data collection. In this respect, cells 7 and 8 indicate that qualitative and quantitative methods were selected to collect data for the study. This implies that my thoughts were influenced by the pragmatic stance I adopted and this is fully discussed in Chapter 3.

Cells 9 and 10 show the analysis stages of qualitative and quantitative data respectively with findings of each data set reached. Here tentative findings were reached per data set. Cell 11 marks the triangulation of outcomes, where the two different data sets were brought together as equals, jointly interpreted and discussed in relation to the conceptual framework (literature). The synthesis also takes into account tentative findings drawn at cells 9 and 10.

Figure: 1.4: Model of my Research Process (Adapted from Johnstone, 2004, p.266)



Cell 12 to 15 form the 'iterative' loop (Denzin and Lincoln, 2003, p.328) that caters for intense interrogation of texts to access hidden meanings, which I carried out more often. In most instances, I was compelled to further question the data to understand different patterns of the responses. This led me to also check supporting evidence from literature. The repeated analysis also led to the links from cell 15 to cells 9 and 10. The main research conclusions were drawn from the synthesised triangulated findings (cell 16). Finally, (Cell 17) is the stage where the study's limitations, contributions as well as the researchers' possible biases were reflected upon. The stage sets the opportunity for evaluating the research.

1.8. Scope of the study

This research confined its focus to eliciting views from all Agricultural science teachers in the Central Region of Botswana (n=247) and all Agriculture Education Officers (n=8). The region consisted of a total of 60 secondary schools, constituting about 26% of the 233 secondary schools in the country at the time of study (Republic of Botswana, 2006). Sections below briefly discuss the structure of this thesis.

1.9. Structure of the Thesis

This thesis is comprised of seven (7) chapters.

Chapter One presented the background setting for the study, with reference given about Botswana's geographical, social, political and economic statuses. Agriculture as a subject in Botswana and the specific challenges facing the teachers of agriculture were highlighted. Other aspects covered here include: statement of problem and justification, purpose statement with an overarching research question, specific

research question, and the scope of the study. In this chapter I introduce the basic assumptions that guided this study, and give a brief overview of the research process.

Chapter Two presents the conceptual and theoretical framework. It is the chapter that presents the focal theory of the study. The research questions stated earlier (See p.43) provided a framework for reviewing literature to guide the study.

Chapter Three describes the study design, population, development of data collection instruments, data collection exercise with ethical considerations, and data analysis.

Chapter Four entail the qualitative findings of the study. The findings are presented narratively with some figures used where necessary for the purpose of clarity.

Chapter Five presents tabulated quantitative results with some short comments under each table.

Chapter Six presents synthesised discussions of the joint study findings. It is in this chapter where data is grouped to answer the research questions. It is also in this chapter where I interrogate theory with practice to draw concrete conclusions and point out the implications. The chapter also presents conclusions, implications and recommendations for the study which include a proposed Integrated IPD model that could guide the IPD activities for Agriculture teachers in the Central Region of Botswana. When addressing implications I also pointed out the stakeholders who are implicated, how they are implicated and indicated actionable outcomes for improvement in the future as well.

Chapter Seven brings the thesis to close through presentation of critical self-reflective account of my possible influences, significance and contributions of the study, a brief description of my PhD research journey and focussed conclusions and recommendations for both action and further research. This chapter is then followed by the references and appendices sections.

NB/ Included also is a CD-ROM which contains extra information that might be of interest to readers e.g. complete tables of statistical tests, other correspondence, etc. It is made user friendly, since I keep sign posting readers to the stored files as they read text. However, I ensured that all relevant and important information is accessed in the text and appendix section. For that reason readers may not see the need to refer to the CD-ROM unless they are kin to see details of presented work.

1.10. Chapter Summary

This chapter introduced this study by first drawing the readers' attention to what the term IPD means in this study. The chapter pointed to the existence of challenges in education which increase the demand for teachers' IPD in general. It is suggested that there are specific subject-related challenges facing teachers of agriculture, which have the potential of increasing their IPD demand as opposed to teachers of other subjects. The complexity of the schools' agriculture programme in the context of Botswana continued to reflect increased teachers' need for IPD.

The chapter summarised the IPD policy context which formed part of the background theory of the study and revealed to the readers the problem which triggered the study. The absence of targeted research to inform the IPD reforms in the

region was cited as the problem that influenced the decision to conduct this study. This chapter identifies the gap in the current literature and research. Currently the teachers' views on the way they see their IPD are not known. As a result, this study was set to create the opportunity for agriculture teachers to contribute this information and inform plans for IPD opportunities following the IPD reforms by the Ministry.

An outline of specific research questions has been presented in the chapter to guide this study. In a brief overview, the chapter revealed that this study involved teachers as a way of recognising the role they play in the education system and the need to take into account their views. The model was used to depict the research process. A brief description of what each chapter in this thesis entailed is also given.

The following chapter provides the conceptual and theoretical frameworks of the study.

CHAPTER 2: THEORETICAL AND CONCEPTUAL FRAMEWORK

2.1. Introduction

Throughout Chapter 2, I will focus on establishing the basis for my study by presenting literature that oriented my conceptions of how In-service Professional Development (IPD) opportunities could be designed, and how agriculture teachers could be best helped to learn following the recent IPD reforms by the Ministry of Education and Skills Development in Botswana. My research argument, as reflected in Chapter 1, stems from the point that the IPD reforms appeared to focus on improving administrative roles rather than on meeting the interests of teachers. Furthermore, the reforms took effect without being informed by the teachers' views on their IPD. I argue that the focus ought to be on making IPD meaningful to the teachers through adoption of a blend of bottom and top- down approaches.

Since my intention has been to generate information that would lead to designing IPD opportunities relevant for improving Agriculture teachers' practice, my conceptualisation of this study rested on the analysis of literature on: IPD definition and rationale, forms of IPD, the notion of effective professional development and its implementation frameworks from the global perspective. Furthermore, my conceptualisation of the phenomenon of IPD benefited from various strands of literature including: professional knowledge base of teaching, some general learning theories, and adult learning theories. The development and related perspectives of IPD in Botswana as well as the IPD success stories in other African contexts are also covered in the chapter to benefit the study.

Professional knowledge base of teaching is included to deepen the understanding of the general knowledge base that teachers ought to possess to be effective in their practice. This strand of literature highlights what could be IPD content in relation to Agriculture as a subject.

I used general learning theories to enlighten the design of effective IPD instructions because in the absence of teaching theories, education research often base the designs of instruction on the information we have about learning. For instance, building on Wilson's (1996) idea of drawing parallels: if knowledge is viewed to be constructed, then IPD instructions would be perceived as the environment for engaging with, as an actor. Conversely, if knowledge is regarded as something to be transmitted, then IPD instructions could be viewed as involving concepts to be delivered to passive recipients.

I therefore hold the view that how teaching takes place is contingent on the theories we hold about learning. Although research that led to most of these general learning theories was based on children, I consider the theoretical ideas applicable to all levels. My observation here is consistent with the views of earlier scholars (Shulman, 2004: Wall, 2011) who believe that conditions that make students high achievers are also relevant for adult learners who are teachers in this case.

Theories of learning have the potential to help inform the selection of IPD content and strategies relevant to meet the teachers' 'felt' and 'ascribed' needs (Knowles, 1984, p.17). Knowles (1984) described 'felt' needs as those which the learners themselves are aware of, whereas 'ascribed' needs are those which the learners' organisation or society has for the learners. In providing IPD provisions, there is a need to take into account the teachers' personal needs and the motivation

they will need (Flores, 2005) and it is through learning theories that these can be known.

By virtue of age and teaching responsibility, teachers are adults (Knowles, 1970). Based on this consideration, I reviewed adult learning theories (andragogy and the concept of self-directed learning) and gained insights about adults as learners and the learning context that is congruent to their needs.

The research process, itself, benefited from the literature on research perspectives, designs and methods threaded through Chapter 3. I managed to identify the assumptions I held when approaching this study to those of Realists after having read about the assumptions associated with other research paradigms. Again in order for me to make relevant choices about the research design and methods I used in this study (see Chapter 3), I had to read and be informed about various potential designs and methods.

The literature, gathered in this chapter, was consulted at the initial stages to help formulate the research questions, and later the research questions further guided exploration of more literature to benefit the study.

The fact that this study was the first of its kind in Botswana, with no local studies of its kind (in terms of design and target group) providing guidance, made it necessary to draw understanding of IPD from diverse sources. I drew from local and external related research and general IPD ideas raised by various scholars to enrich my understanding of issues discussed. The following section will start by discussing the understanding of IPD and its rationale.

2.2. Structure of the Chapter

Research questions (RQs) (see p.43) are used to guide the structure of this chapter because they point to IPD issues that are of interest to this study. Instead of rewriting the RQs, I chose to adopt related headings which are numbered (from 2.3 to 2.15) as will be seen in the chapter.

I find this arrangement helpful in drawing together the discussion of IPD models as well as IPD issues and the theories that propose their solution. Each time I draw from any theory and/ or associated concept I indicate: what it meant (argument), its implications for IPD and this study and possible challenges for IPD in the context of Agriculture teachers in Botswana.

2.3. Rationales of Professional Development

To create a deeper understanding of the nature of the concept of In-service Professional Development (IPD), I discuss below the views of various experts on what could be attracting the organisation of IPD opportunities for teachers. However, as a way of introduction, I briefly reflect my understanding of IPD in this work.

My review of literature revealed to me that, first, authors use the terms professional development, continuous professional development and in-service professional development interchangeably, and this will be observed in the chapter. Secondly, authors seem to differ in the extent to which they view teachers' In-service Professional Development. Some provide comprehensive understanding of the concept (e.g. Day, 1999) whereas others do not. But generally when analysing the contributions, they highlight that IPD:

- includes any effort, planned or unplanned, meant to make a difference to the teachers' practice
- focuses on effecting change in teachers themselves, their practice and students' performance
- expands teachers' knowledge and skills as well as instils emotions necessary for their work
- is systematic
- is a process
- could be driven by teachers as individuals or group. Here, I understood Day (1999) to suggest the need for teachers to approach PD with the culture of independence. Beside Day (1999), Guskey (2002), Flores (2005), Joyce and Calhoun (2010), Evans (2010a), and Dawkins (2011) also contributed similar views.

I conceptualise IPD for Agricultural science teachers to be any form of learning opportunity undertaken by Agricultural science teachers, from the first day of their service until retirement, to benefit them as individuals or a group, either in a formal or informal setting, to bring about change in themselves and their practice which ultimately would lead to improved students' performance.

IPD Rationales

Literature (e.g. Guskey, 2002) raises a concern that many programmes for teachers' professional development fail because they do not build from what attracts teachers to participate in PD opportunities. This observation raised my interest to explore the views of other scholars on what could be understood to attract teachers to value and participate in PD opportunities. Table 2.1 below summarises the different

authors' contributions on this crucial aspect which actually surrounds the question of rationale for PD.

The contributions in Table 2.1 suggest that the rationale for teacher PD is to maintain high quality teaching staff. Most of the contributions focussed on the change in teachers and their practice. For instance, they tend to view PD opportunities to be meant for helping teachers grow in knowledge and teaching skills (Day, 1999: Wellcome Trust, 2006). They also see PD as a means to change the teachers' attitude, beliefs and behaviours in order to improve their practice (Republic of Botswana, 1994a: Day, 1999: Ho and Yip, 2003: Flores, 2005: Nash, 2008: Adey et al., 2004).

Regarding teachers, some writers viewed PD as meant to: reduce stress in teachers (Lesetedi, 2004), retain teachers (Good and Weaver, 2003), relieve classroom monotony (Day, 1999) and boost teacher morale (Mulkeen et al., 2007). However, some authors, like Guskey (1986:2002) as well as Leu and Price-Rom (2006), gave reference to the point that the changed practice of teachers will in turn give rise to improved student performance as the primary outcome.

Additionally, several other authors made the point that teachers' PD might be provided to close gaps in knowledge of teachers that might have been left by their initial training programmes (Cropley and Dave, 1978: Kirk and Glaister, 1988: Guskey and Huberman, 1995). Some recognised the fact that knowledge is

Table 2.1: The Rationales of teachers' PD as perceived by various authors

Author	**Why PD?**
Nash (2008) (Internet)	…increases [teachers'] levels of self-confidence and assertiveness …helps teachers make classroom experiences inspirational
Fullan & Miles (1992)	…observed that what teachers hope to gain through PD are specific and practical ideas that relate to their daily teaching operations
Guskey (1986:2002)	…Changes teachers attitudes and behaviours to impact their practice which would in turn lead to improved student performance …'teachers tend to be quite pragmatic' (p.382) with what they expect from PD (Guskey, 2002).
Day (1999, p.131. 148)	…*promotes accelerated growth in the individuals* … through giving new knowledge and skills (*additive*) and changing beliefs, attitudes and understanding (*transformative*) …getting away from the business of classroom life was rated by the studied teachers as the most widely appreciated benefit (p.148) [i.e. relieves monotony]
Flores (2005)	…meant to improve quality teaching [Ho and Yip (2003) concurs]
Ho and Yip (2003, p.534)	…helps teachers respond *to a wide range of economic, social, educational, political and most importantly technological demand.*
Kirk and Glaister (1988)	…closes gaps in knowledge of teachers left by the initial teacher training
Guskey and Huberman (1995, p.115)	…'p*re-service education for teachers is too short and has too many built-in limitations to accomplish the awesome task of adequately preparing new teachers'*
Cropley and Dave (1978)	…closes gaps in the knowledge of teachers whose initial training had left them inadequately prepared
Republic of Botswana (1994a)	…offers teachers technical, emotional and administrative support to make them effective in imparting knowledge, skills and attitudes to students
Coolahan (2002, p.13)	…*the knowledge base on which a teaching career is based has deepened and calls for teachers to engage with it on an on-going basis …*
Mulkeen et al. (2007, p.30)	…under increased workloads it can serve as a morale booster …*declining morale has serious implications for recruitment and retention of teachers as well as teacher performance.*
Welcome Trust (2006, p.2)	…*helps teachers learn to: understand the curriculum, keep abreast of curriculum developments and new teaching approaches to improve classroom performance ; increase their subject matter knowledge; advance professionally*
Lesetedi (2004)	… it can serve to reduce stress associated with the teachers' work
Good and Weaver (2003, p.439)	…*Professional development is an essential component of retaining high quality teachers*
Leu and Price-Rom (2006)	…effective PD translates to improved teacher practice which, in turn, gives rise to improved students' achievements
Adey et al., (2004)	Through a Venn diagram they reflect three broad intentions of teacher PD being to bring about: … *educational change, professional development of teachers and school improvement* . (p.5) Also meant to either just *introduce straightforward techniques* or focus on making *deep-seated changes* of beliefs, attitudes, cultures amongst teachers (p.5).

NB/ Italicized insertions are direct quotes, others are paraphrased

continuously deepening due to technological advancement and for that reason they find PD helping the teachers to cope with the changes in technology throughout their career (Coolahan, 2002: Ho and Yip, 2003). Schwille and Dembele (2007) recognise the existence of multiple purposes for continuous professional development of teachers, which include:

1. Learning to facilitate implementation of policy or educational reforms;
2. Preparation of educators for new functions;
3. School-based learning to meet school needs and further school development; and
4. Personal professional development chosen by individuals for their enrichment. (p.103).

My analysis of the contributions points to three main outcomes of teacher IPD which include: 1) to bring about positive change in teachers and 2) their practice, and 3) improve students' performance. Although most authors here appear to have reflected on these outcomes as individuals, others (Guskey, 1986:2002; Leu and Price-Rom, 2006) attempted to extend and show the existing relationship between them in terms of sequence of occurrence as they appear to occur together during any IPD change process. This relationship between IPD outcomes is also demonstrated in the work of Joyce and Showers (2002), who established 'the close linkage between staff development, the development of professional learning communities, changes in curriculum, instruction and climate, and the cumulative effects on student learning' (p.vii).

However, by only reflecting on two outcomes, the quote from Leu and Price-Rom (2006) limits analysis to see if they agree or disagree with Guskey (1986:2002) in terms of the order of occurrence of the outcomes. Through his 'Model of Teacher Change' Guskey (1986:2002), discussed later, illustrates his thinking about the effective order of occurrence of the said outcomes.

Thus, whilst we may have three main outcomes of teacher PD, as indicated above, the motives behind arranging and participating in IPD opportunities could be diverse and context dependent. It would therefore be inappropriate to assume that what attracts teachers to attend IPD provisions elsewhere would be applicable to the teachers of Agriculture in Botswana. The observations by Fullan and Miles (1992) and Guskey (2002) specifically, show that there could be specific, tangible and practical ideas related to the teaching of a particular subject (agriculture, in this instance). For this reason I included, in this study, a question that sought reasons for participation in IPD by Agriculture teachers to help guide the IPD provisions in future. I assumed here that the reasons could be different from those generally known.

In short, the reasons that attract teachers to professional development include their belief that it will expand their knowledge and skills, contribute to their growth and enhance their effectiveness with students. I also appreciate other specific benefits highlighted, such as reducing stress, relieving monotony etc. These benefits show how IPD can directly meet the teachers' needs. It appeared that outcomes of IPD could be diverse and context dependent. Still from the contributions above, I have been made to understand teacher PD to be the undertaking that could drive different agenda and this led me to conceive PD from different angles. For instance, we could have PD that targets enhancement of growth of individual teachers (Self-directed PD) as opposed to that which focuses at a group of teachers (covering departmental, school-wide, regional up to national PD provisions). There could also be those short-term PD provisions focused on mere introduction of straightforward packaged information, policies, techniques for teachers to implement. Opposite to this could be long-term PD

opportunities that intends to bring about what Adey et al., (2004) referred to as *deep-seated change* (p.5) on the teachers' beliefs, attitudes and culture of doing things as individuals and the entire school.

To appreciate the requirements of effective In-service Professional Development for teachers, one needs some insight not only into the aims but also into the theoretical base for teachers' professional development (PD). Adey et al., (2004) reflected in their work that the pedagogies of PD (organisational frameworks and models) arise from the theoretical base of PD. Below I will discuss the main features of that theory base and point to some features of PD which are implied by the theory.

2.4. Theoretical framework for Teachers' Professional Development

As reflected by Joyce and Calhoun (2010), professional development models do not exist without underpinning assumptions and theories. Below I discuss some theoretical underpinnings that inform my understanding of various designs and processes of teachers' professional development. Basically, my conception of In-service Professional Development (IPD) in this study was informed by the theories reflected in here.

Client-centred therapy

To start with, Rogers' (1969) client-centred therapy is based on the premise that human beings seek growth given the appropriate conditions. The therapy argues that 'the only learning which significantly influences behaviour is self-discovered … self-appropriated learning' (Ibid, p.153). This has the implications for IPD for it suggests

the importance of recognising individuals' needs to make learning meaningful. The theory supports models guiding learning by individuals such as those I will discuss later espoused by Sparks and Loucks-Horseley (1989) (i.e. the individually-guided staff development) and Joyce and Calhoun (2010) (i.e. family of models supporting individuals).

I find this theory recognising the importance of IPD provisions which allow opportunity for learners, as individuals, to identify their own professional needs, set out objectives and plan their preferred ways of learning to find answers to such self-selected professional problems. Sparks and Loucks-Horseley (1989) pointed out that these phases might be undertaken informally or formally. They further indicated that the involved PD activities might be single session (e.g. attending a workshop) or occur overtime (e,g. involved in a research project). The proposed individualised IPD could benefit agriculture teachers given that the problems associated with the teaching of agriculture are quite often varied: thus call for teachers to keep realigning their teaching in their own contexts.

Self-directed learning

The argument by Rogers' (1969) client-centred therapy is consistent with that of the notion of self-directed learning espoused by Knowles (1970) which I view to be also informing IPD that enhances growth of individuals. Knowles (1973) defined self-directed learning as:

> A process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes (Knowles, 1973, p.18).

This perspective is also shared by Brookfield (1986) as well as Tough (1967) who chose to term it as self-teaching. The theory suggests that an individual is both the learner as well as the facilitator of learning at the same time. It claims that individuals have control over their own learning (Smith, 1982). It implies characteristics of learners who are autonomous in their learning. Here I refer to people who are old enough to exercise their own rights to learn independently, but be responsible for themselves, for their deeds, decisions and development. This understanding is also shared by Rogers and Horrocks (2010).

The self-directed learning theory has implication for teachers' IPD. Like the client-centred therapy self-directed learning suggests that IPD providers need to consider that teachers as adult learners prefer to take control of their own learning. For that reason, where possible, they ought to be allowed to make decisions for their learning. But this does not suggest that criticism should be absent from educational encounters (Brookfield, 1986). Of course, they (teachers) may not enjoy complete autonomy due to restrictions imposed by regulations governing their practice. For instance they may not have authority over funds and also might face time constraints in arranging for activities. In fact, this may not be a surprise because scholars such as Rogers and Horrocks (2010) caution that the degree of autonomy adult learners may enjoy would be dependent on the underpinning cultures: environment in which they find themselves. They pointed out that some cultures may enforce compliance as a feature in the workplace.

Self-directed learning includes engagement in activities that individuals may choose to take up in order to pursue a special interest. This could be through reading

journals, magazines and books. Other forms include web-based and distance learning modes (Rogers and Horrocks, 2010). The Self-directed model allows, to some degree, learning that occurs in an informal atmosphere which is favoured most by adult learners (Knowles, 1970). These considerations have implication for teachers' IPD. The former idea suggests that teachers ought to be encouraged to be initiative and make use of available resources within their context to enhance their professional growth. The latter idea suggests that teachers need to be encouraged to exploit informal learning opportunities that might benefit them. Given that information is lacking regarding the extent to which agriculture teachers in Botswana are supported to make good use of the ideas raised, a gap exists in knowledge. This study responded by raising questions which addressed the issue of reading widely and making use of informal learning.

Although in some quarters the contribution of informal knowledge to effective teaching may be questionable, Turner (2006) holds the view that 'it leads to tacit knowledge about the role of the classroom teacher' (p.308). There is also incidental learning which 'takes place in everyday experience and occurs without intention, from doing and from both successes and mistakes' (Guskey and Huberman, 1995, p.100). This information has implications for in-service providers who are to ensure that participating teachers are motivated enough to learn and take advantage of different forms of learning. They are to select instructional approaches that promote proactivity, critical reflection and creativity. These could also be targeted as the learning outcomes of IPD.

Although I appreciate the ideas raised by self-directed learning, they may face a challenge of implementation in the context of Botswana especially at the remote

areas due to shortage of resources. For instance, where internet facilities and some library services are limiting, there is nothing that teachers could do. Self-directed learning is criticised for isolating (Joyce and Showers, 1995) thus failing to recognise the benefits of social interaction in learning. I find this shortcoming likely to breed boredom and lack of motivation on the part of teacher learners: It could be for this reason that Chisholm et al. (2009) observe that 'self-directed learning requires not only metacognitive skills but motivational skills as well' (p.21).

I further argue that the theory seems to assume that every adult would have self-motivation to learn independently. But motivation, which Rogers (2002) perceives to be a drive that '… keeps [people] in a learning situation and encourages them to learn' (p.95), is dependent on either intrinsic or extrinsic factors. This therefore, implies that it may not always hold true that people would be motivated to learn on their own as this would depend on circumstances. This suggests the need for In-service providers to provide teachers with continuous support as well as devise ways of arousing teachers' interests to learn on continuous basis: adopting life-long learning.

Rogers' (1969) client-centred therapy, I alluded to earlier, also recognises human differences: that the circumstances most suitable for one person's professional development may be different from those that promote another individual's growth. On their part, stage theorists (e.g. Levine, 1989) hold that individuals at different stages of development have different personal and professional needs. These arguments suggest that IPD for young and inexperienced teachers may be inappropriate for veterans hence the need to foster relevance. The differences in

people and their needs are well presented in the literature on adult learning theories I will discuss in the last part of this section.

Concerns-Based Adoption Model

Adding some insight into the learning by individuals is the Concerns –Based Adoption Model espoused by Hall and Loucks (1978). The model holds that as individuals learn new behaviour and change their classroom practice, they experience different types of concerns that require different responses from PD providers. In other words if a new teaching approach is learnt, some teachers with personal concerns may remain worried that they might be immediately evaluated on the use of the strategy and for that reason they might need reassurance that they will not be evaluated. Conversely, teachers with management concerns might want to know how the approach could be used in the classroom. This has implications for IPD providers for they may need to identify individuals' concerns and offer appropriate responses to address them to enhance effective learning by individual teachers.

Possible challenges with theories encouraging individually directed IPD

Although I applaud the consideration for encouraging IPD programmes that focus on the growth of individuals, the therapy may face a challenge, for it may not appropriately inform arrangements for either school-wide, regional or national IPD interventions intended to economically, uniformly and timely relay policy-related information to (or effect change in practice by) a wider group of teachers. Furthermore, a developing country like Botswana may lack capacity and resources to adequately cater for IPD that could address individual teachers' interests. However, there are existing provisions that teachers could take advantage of and learn as

individuals. Besides library books, internet facilities, conferences and seminars that teachers could access as individuals, the government avails opportunity, although limited by funds, for teachers to go on study leave and upgrade their qualifications (Republic of Botswana, 2010). Currently, the information on the extent to which teachers of Agriculture make use of these is lacking and it is for this reason that this study raised questions about their participation on these PD activities.

Situated learning and Legitimate Peripheral Participation

The other theories that I found relevant to broaden my conceptions of agriculture teachers' IPD include notions of Situated Learning and its associated idea of Legitimate Periferial Participation (LPP). Situated Learning is a general theory of knowledge acquisition espoused by Lave and Wenger in the mid 80s. It argues that 'learning is a function of the activity, context and culture in which it occurs (i.e. it is situated)' (Smith, 2009, p.1). Sharing a similar view are Brown et al. (1989) and Lave and Wenger (1991). The theory offers an alternative to conventional cognitive theories of knowledge and learning (Lave and Wenger, 1991). Furthermore, Lave and Wenger (1991) describe situated learning as characterised by a process called Legitimate Peripheral Participation (LPP). This concept claims that learning is meaningful if it is fully participatory and continuously involving learners in real and tangible life situations (Lave and Wenger, 1991). By bringing in the element of participation, the LPP concept injects a shift from just talking of the need to contextualise knowledge to 'learning through doing'.

The theory contrasts with most formal or classroom learning activities which involve knowledge that is abstract and out of context. It suggests that learning occurs

when learners work on authentic tasks that take place in the real world (Herrington and Oliver, 1995) and that meaningful learning would only occur if it is embedded in the social and physical context in which it will be used (Brown, et al., 1989). The theory implies that learning does not occur in isolation and draws attention to the need to understand knowledge and learning in context. It suggests the need to focus on tangible and specific knowledge and to render meaningful and effective instructions.

As a result of additional contributions from literature, the list of what the Situated Learning theory argues for became comprehensive. Below I summarise suggestions by Herrington and Oliver (1995) on what the learning environments couched within the notion of situated learning could provide. They indicate the need for authentic context and activities, access to expert performance and modelling, collaborative construction of knowledge, coaching and scaffolding at critical times, time for reflection to enable formation of abstractions, adequate articulation of the vocabulary to make tacit knowledge explicit, and provision for integral assessment of learning within the task. I find this list providing a basis for appraising the learning instructions at all levels with the aim of making them offer meaningful learning. The ideas raised have implications for IPD organisation, venues, methods, resource persons, and learning paraphernalia that could render meaningful learning to teachers. Lack of information on the status of these aspects with respect to IPD for agriculture teachers in Botswana, presented a gap which this study chose to address by raising questions about the aforementioned aspects with the aim of improving them.

Furthermore, the idea of Legitimate Peripheral Participation (LPP) makes the concept of situated learning relevant to inform this study. Being concerned with

sharpening of their agriculture skills, agriculture teachers could therefore best learn the husbandry practices in an atmosphere that allows them, especially the newly appointed teachers, to gain mastery of manipulating real objects through the LPP process. Agriculture involves plants and animals which are living objects. As such, their management could effectively be learnt through manipulating the real objects in situ with an expert demonstrating the skills. However, it is not known whether or not opportunity is availed for Agriculture teachers in Botswana to perform and master skills. It is therefore through this study that such information would be made available.

Although this theory has been instrumental in guiding teaching learning in the field, it does not exist without criticisms, some of which I present below.

1. Lave and Wenger (1991) are criticised for claiming that participation and social engagements develop individuals' identity and practices whereas there is not much research which convincingly supports the outcome (Handley et al., 2007). However, I find the claim enlightening learning in Agriculture. I understood Lave and Wenger (1991) from their expression that learning is an 'inseparable aspect of social practice' (p.53) to imply that learners may draw from the cultures they are identified with (i.e. of practising agriculture at home) to enrich their understanding.

2. Other critics (Wineburg, 1989) argue against the idea that situated learning theory requires learners to be exposed to masters or experts: pointing out that it is not appropriate for classroom learning. However, from the perspective of teachers' IPD, I find the idea relevant because teachers, as adult learners, would want to learn to solve their problems right away (Knowles, 1970). So, the presence of 'knowledgeable others' guiding them would instil their learning confidence.

Experiential learning

Given that Agriculture as a subject in schools involves active participation by both teachers and students, I found the experiential learning and social constructivism theories relevant to broaden my understanding of active learning for they appear to view it from different angles.

Experiential learning is viewed by Kolb (1984) to be 'a holistic integrative perspective to learning that combines experience, perception, cognition, and behaviour' (p.21). He therefore does not regard the theory to be the alternative to either behavioural or cognitive learning theories. Kolb's (1984) position here benefited from the divergent perspectives of the earlier proponents of this theory (Lewin, Piaget, Dewey) which he analysed. Rogers (2002) cautioned though, that the meaning of Experiential Learning is perceived differently by different people, thus creating a problem to reach consensus on its definition. But amongst the possible meanings he indicated in his book, he pointed out that 'it [Experiential Learning] can mean … learning by doing' (p.94). For Keeton and Associates (1976) experiential learning proceeds through acting or seeing another person act, to observation of the effects of the act, and understanding the effects. 'If exactly the same set of circumstances reappeared, one could anticipate what would follow from the action' (p.51) and one would be said to have learnt from consequences at this stage.

Whilst I appreciate the encompassing nature of this theory and its varied meanings as suggested by Kolb (1984) and Rogers (2002), I found the theory relevant to this study when understood from the perspective of emphasising 'learning by doing' held by Keeton and Associates (1976) and Rogers (2002) as I indicated above.

It is for this reason that I find it having implications for learning by agriculture teachers whose subject is practically oriented. I assume that IPD activities would be authentic if teachers are involved in 'hands-on learning' (Leu and Price-rom, 2006, p.15).

This theory has implications for both IPD of Agriculture teachers and for this study. It suggests that Agriculture skills need to be demonstrated to teachers and thereafter the teachers be given opportunity to try out skills, in situ, with real objects. At the end they would be said to have learnt through experience. Again teachers of agriculture could draw from their experiences as part time farmers, to reinforce their learning, since learning from experience seems to be a core emphasis of Experiential Learning theory. The theory also suggests that venues where IPD opportunities are held ought to be relevant for the topic at hand. Responding to the lack of information on the relevance of the venues used during agriculture teachers IPD sessions, and prevalence of demonstration methods, this study raised questions about the aspects.

Experiential Learning theory does not exist without critics, though. For instance Michelson (1996) argues against the idea of emphasising learning by reflecting on experiences. He argues that the learning process of "reflection" presumes that knowledge is extracted from experience by the processing mind, which ignores the possibility that all knowledge is constructed within power-laden social processes and that knowledge and experience are mutually determined. He maintains that experience is knowledge driven and cannot be attained outside socially available meanings. But contributing from the agriculture perspective, I hold that learning by drawing only from experience may restrict learners from learning new ideas especially

during this era of increased technological advancement. This therefore suggests learning instructions that emphasise experiences and social engagements to cross fertilize learning. The treatment of reflections and experience as if they exist in isolation could limit the scope of learning. Supporting this position is Seaman (2007) who argues that the constructivist perspective of Experiential Learning renders experience to be a static abstraction existing in isolation.

However despite the arguments raised, I still find the theory relevant to guide teaching and learning in agriculture. In this instance, it may effectively guide learning during IPD by agriculture teachers, who in most instances, need to learn through demonstrations. Teachers as adults could be more careful when learning through manipulating the agriculture implements, tools, fertilizers and the pests controlling chemicals which sometimes prove to be hazardous to children. There might be implementation challenges associated with lack of time and inadequate material resources that might be required to adequately expose all the teachers in a given setting to hands-on learning experiences- but with measures put in place, the idea of 'learning by doing' could benefit agriculture teachers to attain skills they need for their practice.

Social Constructivism

I find social constructivism, although 'primarily a theory of learning rather than a theory of teaching' (Brophy, 2002, p.ix), to be relevant to the notion of teachers' PD which involves teacher learning. Specifically, social constructivist theorists argue that 'learning is most likely to be meaningful and accessible for use when it is socially negotiated through classroom discourse' (Brophy, 2002, p.ix). The

theory emphasises the role of 'social others' (p.6) in the development of the cognitive structures of learners and these could be a teacher, any more capable peer, or parent (Vygotsky, 1978). From Vygotskian perspective this theory regards authentic learning to be the product of 'a great deal of on-task discussions and constructive argument by learners 'in small groups and between groups' (Adey et al., 2004, p.21). Specifically, Vygotsky (1978) who is the main proponent of learning through social interaction holds that learning could result from what he termed collaborative dialogue between the learner and tutor. He believes that in the process of dialogue individuals internalise information and use it to direct their performance. Although Vygotsky was referring to learning by children here, I find the idea informing learning across all levels including learning by adults as it is also observed by other scholars. For instance, Leu and Price-rom (2006) hold that teachers' PD activities would be authentic if teachers engage with others and involved in 'emphasising higher-order thinking skills' (p.15).

So then, it could be understood from the argument of social constructivism that being active in learning is to engage in discourse as opposed to doing things. This theory therefore has implications for both the learning of teachers and the design of IPD opportunities, especially on the selection of approaches of instruction. It suggests that teacher-learners ought to be given the opportunity to discuss and engage one another in a way that promotes critical thinking. The theory suggests approaches to teaching during IPD that encourages dialogue by learners who share common goals. It emphasises the concepts that inform learning and teaching such as situated cognition, scaffolding, cognitive apprenticeship, and cooperative learning as indicated by Brophy (2002). It suggests the role of the IPD instructor to be that of structuring and guiding deliberation. However, information on the extent to which these ideas are applied to

benefit learning by agriculture teachers in Botswana is not known. This therefore necessitated this study to identify the instructional approaches used during IPD with the aim of suggesting improvements to benefit teacher learning during the new IPD reforms.

Given that the theory emphasises construction of knowledge by teachers through interactions, it suggests the use of Learner Centred Approaches (LCAs) that would allow teachers to explore, think critically, discover and solve problems on their own (Vavrus et al., 2011). Gallagher (2003) also found learner-centred instructions to be capable of developing in learners the capacity for 'cognitive flexibility, self-direction, cooperation, resourcefulness [and] perspective-taking' (p.96). All these are gained through Piaget's process of 'Disequilibrium' (Phillips, 1969) rather than passively acquiring facts.

LCAs could transform learners into people who can handle issues of trade and production, for instance (Vavrus et al., 2011) and it is for this reason that these LCAs could be relevant for the learning of agricultural science teachers, whose discipline is in line with food production and security. The approaches could also contribute to learners' political socialisation and engagement in democratic processes because they offer learners an opportunity to debate and express their views (Antal and Easton, 2009). So, the methods could empower agriculture teachers who are also the managers of the agriculture department's resources in their respective schools. They need to be convincing advocates for their department.

Challenges associated with LCAs: Brophy (2002) observed that the techniques and strategies suggested by constructivists are difficult to implement effectively in practice, as they demand more knowledge from the teacher or instructor. Furthermore, they lack focus for learning; careful planning; structure for learning; assume too much that learning will automatically occur as long as individuals are involved in discussions; and do not recognise the input of the teachers or providers of whatever form of instruction (Brophy, 2002).

These shortcomings have implications for in-service providers, who may need to put measures in place in order to reap the benefits of the LCAs. Like all innovations, the LCAs should not be presented as though one could master them with ease in any context. There is a need to continuously reflect on their viability in different situations and provide for any necessary modification, so maintains Vavrus et al. (2011). Bartlett (2009) cautions that putting learners at the centre of the learning process does not mean that all that they say or think should be accepted. This is very true when we compare cultures. In Botswana for instance, drawing from my experience as a former Education Officer, I saw agriculture teachers to have had a culture of dependency when it came to learning.

So, for LCAs to work in IPD sessions in Botswana, a certain degree of monitoring ought to be ensured by the resource persons or Education Officers responsible to ensure that quality learning takes place. Instructor-centered approaches could also be embraced to guide instructions depending on the content, learners' characteristics, instructional objectives (Shulman, 2004) or in summary, the prevailing context.

Notions of Cognitive conflict and Metacognition

Together with the theory of *social constructivism* I have just discussed above, the notions of *cognitive conflict, and metacognition* (p. 21) are the basis of PD for what Adey et al., (2004) termed Cognitive Acceleration (i.e. PD that alters cultures of doing things and ensures deep change of attitudes and beliefs rather than just focusing on introduction of new technology to teachers)

The notion of cognitive conflict comes from Piaget principle of equilibrium: which point out that 'when the mind encounters a problem which requires sophisticated mental structure than is currently available, it attempts to grow to meet the challenge, to accommodate to the new demand' Adey et al., (2004, p. 21). The notion further suggests that in order for the mind to make sense, the level of conflict must be reasonable: not too little nor excessive. Saying the same thing from Vygotsky perspective of the Zone of Proximal Development (ZPD) the notion of Cognitive Acceleration requires that the learner ought to be working within ZPD- seen to be the range of tasks that are just beyond the learners' unaided capability but could be learned with guidance of more skilled person (Adey et al., 2004: Santrock, 2011). This is a zone where learners struggle a bit and therefore need appropriate scaffolding support: that which is reduced as the learner masters the task.

This notion of Cognitive Acceleration couched within the principle of cognitive conflict has implications for IPD for agriculture teachers. It suggests that IPD activities ought to be designed to maximise chances for cognitive conflict. It also suggests that IPD providers ought to strive to maintain adequate level of cognitive

conflict and give teacher-learners an opportunity to engage their minds to enhance effective learning. Given that learning is an individualised activity, the cognitive conflict suggests that teachers who are the beneficiaries of IPD ought to be ready to engage their minds as they interact with instructions. I find the teachers likely to engage their minds more when learning as a group for they may engage in some form of a discourse. However, possible challenges may exist where the work place limits time for teachers to engage one another in discourses or is not structured to facilitate collective study (Joyce and Showers, 1995)

The notion of metacognitions: 'becoming conscious of one's own thinking' (Adey et al., 2004, p.22) is considered to be a useful strategy for learning by literature (Santrock, 2011). The notion argues that leaners have the potential to reflect on their own thoughts and fairly weigh (after considering other factors) the appropriateness of the decisions they may want to take (Adey et al., 2004). Like with Social learning theory espoused by Bandura (1977), that I will discuss shortly, metacognitions have to do with the self-regulatory process of thinking about the outcome and other factors that come into play. This notion therefore suggests the importance of according the teachers an opportunity to reflect on the outcomes of IPD interventions they might be involved in.

On its part, Social learning theory (Bandura, 1977) illuminates how experience, behaviour and thought relate. Unlike the understanding that human behaviour is influenced by direct experience with the world or learned material, the social learning theory postulates that learning is a product of the interaction between direct experience, observations and human thought (Bandura, 1977). The belief, here,

is that after experiencing, an individual acts or puts into practice and observes the effects which might be either desired or undesired. But the decision to adopt or abandon the action would come as a result of a self-regulatory process of thinking about the outcome and other associated factors. The theory here recognises people's self-regulatory capacities which may even lead to adjustment of their behaviours (Bandura, 1977). It is in this sense that thoughts are said to be regulators of behaviour which I will discuss shortly.

Social learning theory suggests that IPD opportunities ought to provide ample time for teachers to interact with learning experiences, try out things, observe outcomes and reflect to make informed decisions as they have capacity to self-regulate. By recognising the people's self-regulatory capacities, the theory suggests that teacher-learners may not accept new ideas just because they produced desired outcomes. There is also a need for individuals to be happy with all other factors associated with the occurrence of desired effects. For instance, should they be in doubt as to whether their context may not lead to the same desired effects, they may not accept the new ideas brought to them through IPD. So, this idea of self-regulation contributed to stimulating the interest for this study to investigate if adequate time is provided for agriculture teachers to reflect on their learning. Currently, this information is lacking.

Another notion which emerges in social learning theory is that of associating learning with interaction and socialisation which I have discussed under social constructivism.

Self- Efficacy beliefs

Self-efficacy beliefs are discussed here as part of Bandura's social cognitive theory. Self-efficacy beliefs are the thoughts or ideas people hold about their abilities to perform the task necessary to achieve the desired outcome (Bandura, 1986;1997). Its relevance here stems from the point that IPD is self-directed. As a result, for teachers to benefit more from it they ought to have high aspirations and be ambitious to achieve set learning targets. And this can be achieved by fostering positive self-efficacy beliefs.

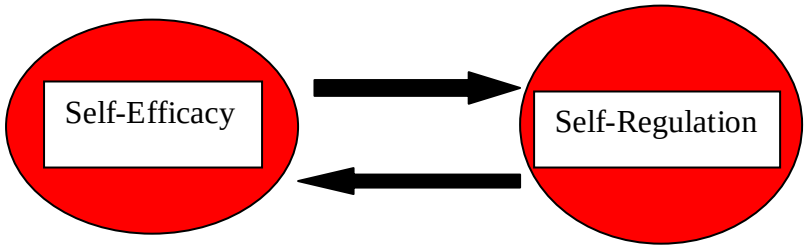
Bandura perceived self-efficacy to be capable of influencing people's behaviour both positively and negatively depending on their beliefs about their abilities to perform a given task. The theory postulates that unless people believe they can bring desired outcomes, they will have little incentive to act (Bandura, 1986) as it is their positive expectation of a desired outcome that motivates them to act. This has implications of whether or not teachers think of themselves as capable of making a difference through their further learning of agricultural concepts and skills as well as professional aspects. If the teachers feel they are not capable, then chances of them putting more effort into learning through IPD are very low as opposed to a case where they have positive self-efficacy beliefs.

Consequently, IPD providers ought to encourage teacher-learners and allow them an opportunity to master content learnt, all of which could foster positive self-efficacy beliefs (Bandura, 1986) amongst teachers. Bandura (1997) acknowledged that 'the stronger the sense of personal efficacy ... the greater the perseverance and the

higher the likelihood that the chosen activity will be performed successfully' (p.43). This suggests the need to make teachers gain confidence and strongly believe that they could succeed in higher achievements in their practice. But it is not known whether the teachers of agriculture receive support for mastery of skills up to the level where they could feel confident of themselves. It is for this reason that this study investigated if teachers felt adequately supported to master skills.

In extension, Bandura (1986) imagined a reciprocal relationship between self-efficacy and self-regulation, both of which are driven by an individual's self-reflection. Research (e.g. Usher, 2009) continues to document this reciprocity, which is illustrated in Figure 2.1 below.

Figure: 2.1: Relationship between Self-efficacy and Self-regulation (Hypothetical)



By this relationship Bandura postulates that when individuals believe that they are capable of bringing desired outcomes (i.e. self-efficacy), they set themselves high performance targets and become focussed, which now falls into the self-regulatory process. Self-regulatory process here refers to 'the self-directive process by which learners transform their mental abilities into academic skills' (Zimmerman, 2002, p.65). In reverse, when learners have set their goals and organised everything that they would need for learning, they will have their self-efficacy beliefs strengthened and will tend to work hard towards those set goals.

This relationship has implications for this study. It suggests that for agriculture teachers to remain motivated to learn, they should have developed positive self-efficacy beliefs that they will achieve their learning targets. As a result teachers will set for themselves learning targets which may make them proactive and so recommend to IPD providers the content they need and the level at which they would like it to be addressed. Again, because classroom structure is capable of altering self-efficacy of learners (Usher, 2009), emphasis should be given to designing IPD instructions that can strengthen the teachers' self-efficacies as well as self-regulatory processes.

It has to be remembered here that self-regulatory processes enable people to improve their performance (Bandura, 1997). But Day (1999), writing from the context of the UK, cautioned that more often the workplace conditions leave teachers having reduced self-efficacies, which become counterproductive. Many teachers are left 'feeling deskilled, bewildered, angry, and demoralized' (Day, 1999, p.70). I consider the demoralising workplace conditions likely to be experienced by teachers elsewhere including agriculture teachers, although the degree of impact may vary from one context to the other. However, the need exists under any context to have conditions that would strengthen the teachers' self-efficacies.

Bandura's (1986) social cognitive theory further postulates that individuals develop their self-efficacy beliefs by interpreting information from four sources namely: mastery experience, vicarious experience of seeing and observing actions of others (that is why role models are good for developing self-efficacy beliefs), social persuasions and physiological or affective states (emotional, cognitive or motivational

processes). These four concepts are explained and their relevance to IPD is set out below:

- Mastery experience: Since positive outcomes would raise confidence and strengthen efficacy beliefs, the opposite would remain true with negative outcomes. In relation to IPD, content ought to be sequenced such that the easier aspects come first and gradually progress to more challenging components. This might be important with technology-related topics because teachers may find them difficult to learn, and so choose to avoid them.
- Vicarious experiences: learning through observing actions of others is a way of learning that teachers can take advantage of for their IPD, especially with agriculture teachers who learn concepts to translate to practice in the field. IPD instructions could make use of role models (i.e. other successful teachers) to motivate the rest of the teachers to accept new ideas. Whereas visiting successful teachers in other schools may be expensive, learning through observing colleagues teach, within the same school, is something that could be encouraged.
- Social persuasions: These are appraisals and words of encouragement that are received from others. They strengthen efficacy beliefs as well. This suggests that for teachers to learn best IPD providers could use positive reinforcement to give teachers assurance for success. This is especially important with female agriculture teachers who seem to have crossed the stereotype boundary posed by the Setswana culture, which associates agricultural roles with men (Makgeng 2000: Johannesson and Thamuku, 2009). Generally, agriculture teaching is male dominated with few exceptions in Sub-Saharan Africa (Mulkeen et al., 2007).

- Physiological or affective states: Efficacy beliefs can be affected by states 'such as anxiety, stress, fatigue, or other emotions' (Hutchison, et al., 2006, p.40). This suggests the need to ensure that the teachers' conditions of work are less stressful to allow teachers to save some strength for continued learning, probably engaging in part-time courses. Keeping them less stressed and fatigued would strengthen their beliefs that the energy they have could lead them to success. But this might be a challenge with the teaching of agriculture which is said to be hectic (Harper et al., 1990). It remains to be seen how the teachers cope with learning given the demanding teaching roles associated with implementing the schools' agriculture programme.

Hutchison and colleagues note that women have stronger reactions to efficacy beliefs than men (Hutchison et al., 2006). The idea of gender influence in self-efficacy is supported by research. For instance, the Maths-related study by Hackett (1985) revealed that males had higher self-efficacy perceptions than their female counterparts. Perhaps, female teachers need to be supported more closely than their male counterparts in order to strengthen their self-efficacy beliefs.

Having given reference to adult learning theories in the discussion above, below I expand on them and show their contribution to my conceptualisation of teachers as adult learners.

Adult learning theories

According to Knowles (1970) an adult is an individual who:

> ...begins to see his normal role in society no longer as being a full-time learner. He sees himself as a producer or doer, a worker, a spouse, a parent, a citizen.

> He expects this status in his own eyes and also experiences a deep need to be perceived by others as being self-directing (p.40).

As a result of this feeling, adult learners tend to 'avoid, resist and resent situations in which they feel they are treated like children- being talked down to, embarrassed, punished, and judged' (Ibid, p.40). This suggests that adults, who are in this case teachers, should not be taught like children. They ought to be treated with caution, for they may simply disappear from learning experiences that dissatisfy them, since they are, most of the time, voluntary learners.

On their part Rogers and Horrocks (2010) identified characteristics of adult learners which may affect the way adult instructions might be designed. They found adult learners to be people who:

- Bring with them a package of experience, knowledge and values;
- Come to education with aspirations and intentions;
- Bring expectations about the learning process;
- Have competing interests; and
- Already have their own patterns of learning (p.79).

These characteristics suggest that In-service providers would need to consider the teachers' motives for attending IPD and base the design of IPD and selection of its content on what teachers would have indicated. The points also suggest a need to provide for dialogue in order to allow teachers to learn from each other.

Andragogy

In the wake of realisation of the difference in learning needs between children and adult learners, a new theory for the education of adults evolved which was named

"Andragogy". The practices of andragogy were therefore seen as a departure from the traditional practices of "Pedagogy". According to Knowles (1970):

> Pedagogy is the art and science of teaching children – based on the definition of education as a process of transmitting the culture [....] whereas Andragogy is the art and science of helping adults learn – based on defining education as a lifelong process of discovering what is not known (pp.37-38).

Although andragogy evolved to cater for adult learners, I consider it to be also suitable for learners who are children or youths. My argument is centred on exercising justice and fairness here; the view also maintained by scholars such as Freire (1997).

However, for this study, I find andragogy to be made more relevant by the implications it has for the learning by agriculture teachers. For instance, Andragogy assumes that, as a person matures,

1. his [/her] self-concept moves from one of being a dependent personality toward one of being a self-directing human being;
2. he [/she] accumulates a growing reservoir of experience that becomes an increasing resource for learning;
3. his [/her] readiness to learn becomes oriented increasingly to the developmental tasks of his social roles; and
4. his [/her] time perspective changes from one of postponed application of knowledge to immediacy of application, and accordingly his orientation towards learning shifts from one of subject-centeredness to one of problem-centeredness. (Knowles, 1970, p.39)

Based on the above assumptions regarding andragogy, I develop here that:

1. Agriculture teachers in Botswana ought to be consulted and involved when dealing with their IPD, so that they develop a sense of ownership. This is important since they resent situations in which others impose their will on them. The need to respect and trust adults, is supported by Bishop and Denley (2006) who argue for teachers' autonomy in their learning. In fact, the need to consult learners when

developing teaching/ learning experiences is strongly advocated for by a wider body of literature. The captured quotes indicated in Table 2.2 below serve as evidence of this advocacy.

2. While adult learners are responsive to some external motivators (e.g. better conditions of service, higher salaries, pressure from competition (Illeris, 2003) the most important motivators for their learning are internal inducements such as the desire for increased job satisfaction, self-esteem, and quality of life. They are more encouraged to learn if they see utility value in the education (Illeris, 2003). This therefore implies that intrinsic motivation plays a crucial role in adult learning. So, In-service providers ought to strive to make the rewards of attending IPD greater than the pain of learning (Knowles, 1970). But this does not rule out the use of extrinsic motivation if need arises.

Table 2.2: Contributions by different authors on the need to consult adult learners

From view point of:	**Author**	**Suggests that in dealing with adult learners there is need …**
Teaching Adults	Rogers and Horrocks (2010)	…to promote personal growth … full exploitation of talents. …to encourage a greater sense of perspective …to foster confidence, the power of choice and action to increase autonomy rather than to deny it (p.48)
	Brookfield (1986)	[to ensure collaboration] …collaboration is seen in the diagnosis of needs in the setting of objectives, in curriculum development, in generating evaluation criteria and indexes (p.10)
	Illeris (2003)	[to ensure that each] …learner has understood and accepted that the arrangement [of the programme is in his or her own interest (p.13)
Adult Education	Tough (1967)	…for individual learner to assume the primary responsibility for planning (p.3)

3. The teachers have a sense of ‘the need to know’ – which means that they need to know why they need to learn something before undertaking it. Thus, one of the first

roles of an IPD facilitator is to help teacher-learners become aware of why they need to know (Jarvis, 1995) by being explicit when outlining the instructional objectives. The information on whether or not IPD providers in Botswana observe the need to make teachers aware of why they need to know does not exist. This led to this study to raise a question associated with objective stating during IPD sessions.

4. Agriculture teachers, being adults, have accumulated a considerable amount of knowledge over the years they have been teaching (concurs with Rogers and Horrocks, 2010) and that knowledge has to be respected and tapped to serve as a base for shaping current learning practices as well as answering current problems. This also suggests that any group of agriculture teachers is likely to be more heterogeneous in terms of background, learning style, motivation needs, interests, and goals than a group of youths. Furthermore, the varied experiences are likely to help the teachers learn from each other and solve problems of a varying nature. However, this diversity of experiences may prove problematic where resources cannot cater for the varying needs. This poses a challenge in working out a programme that, with given resources, would attempt to accommodate varying needs of teachers.

The teaching techniques that can best tap varying experiences of adult learners are the more participatory experiential ones including:

> … group discussion, case study, simulation exercise, role play, skill-practice exercises, field projects, action projects, laboratory methods, consultative supervision, demonstration, seminars, workshop, work conferences, counselling, group therapy, and community development (Knowles, 1970, p.45)

The dialogue among learners that is achieved through these methods of learning and teaching is said to be enhancing construction of knowledge by learners (Phillips,

1969). The works of Dewey (1938) and Freire (1997) also appeared to advocate for these democratic methods where the providers of instructions are regarded as facilitators.

5. The teachers, being adults, believe in learning that is result-oriented. This suggests that they engage in learning that helps them solve their current life problems. This problem-orientation of adult learners therefore implies that: (i). facilitators of adult learning must be familiar with the concerns of their learners and be able to 'develop learning experiences that will be articulated with these concerns' (Knowles, 1970. p.48); (ii). The program of adult education must be sequenced or organised according to problem areas not subjects; and (iii). The facilitators of adult learning must start by asking learners what they (learners) hope to achieve out of the course thus making, in this instance, the IPD programme to be negotiated.

My conclusion here is that in the absence of information on the views of agriculture teachers in Botswana regarding the ideas raised by Andragogy which could facilitate their leaning, the views above further created interest for this study to raise questions relating to the treatment they received, and the extent of involvement they are allowed for instance.

Having looked at why IPD could be necessary as well as its theoretical underpinnings, the section below is set to continue drawing from some theorists and researchers to broaden the readers' conception of the notion of effective IPD as described universally. The aspects of design (encompassing the forms, characteristics of effective IPD as well as models) and implementation frameworks of IPD will be discussed in the section.

2.5. Forms of IPD activities

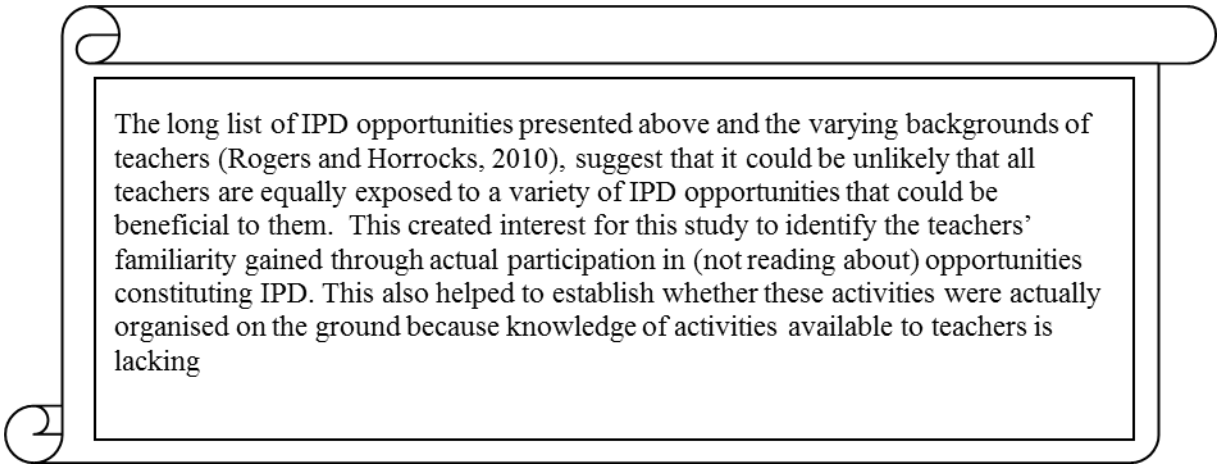
As part of the rationale for this study, information on the teachers' views regarding the IPD activities they currently participate in is lacking. But I am of the view that knowledge of such information will help plans for improving IPD to start with improvement of activities that are already in place. This view is held from the background that there are various examples of PD activities in existence today as revealed by literature. In some cases authors or researchers provided a list of the activities whereas some attempted to generate groups. I define forms of IPD here to mean the kinds of initiatives teachers engage in. Table 2.3 below compiles IPD activities as outlined by different authors.

Table 2.3: Forms of IPD activities

Author	Types or Forms of IPD activities
Findlay (1992)	College courses; home study; and on-the-job experiences e.g. workshops, seminars, liaison with colleagues at work, and meetings
Anderson (2002)	Teacher-centred and school-based workshops; in class coaching by consultants, supervisors , or peers; team planning and problem solving by collegial work groups; action research; teacher inter-visitation; and professional study groups
Mulkeen et al. (2007)	Distance Education (found less costly) On-line technologies (…offer alternatives for dialogue at a distance p.29)
Day (2001)	Learning alone and from others; reflecting upon one's own practices, upon the values underlying them and upon the context in which one works; and engaging in a sustained process of enquiry with others. Identified networks as powerful sites of teacher learning (Day, 1999)

The lists of professional development provisions depict a wide range of the existing activities from which in-service providers can choose to develop the teachers' competencies. The lists include school-based opportunities that teachers can take

advantage of without spending much in terms of time and money, such as those reflected by Day (1999) and Anderson (2002).



It must be appreciated by planners of IPD opportunities that not all forms of PD would be effective under every context. An appropriate choice would have to be made. This therefore makes the understanding of their criticisms necessary. Below I present a critique of some conventional forms of PD raised in the literature.

2.5.1. Critiques of traditional forms of IPD activities

Several researchers used the term 'traditional forms' of professional development to describe opportunities which are more conventional such as: one-shot workshop (Karagiorgi and Symeou, 2006: Kennedy, 2005), college courses (Srinutapong et al., 2005), 'conferences and INSET days' (Hustler et al., 2003, p.viii). Garet et al. (2001) and Desimone et al. (2002) also categorised the more conventional PD opportunities as 'traditional forms'. These activities have been largely criticised for not providing teachers with sufficient time, relevant activities and opportunity to have increased knowledge and skill that would foster meaningful change in the teachers' practice (Garet et al., 2001). It is for this reason that scholars such as Fullan (1991) found workshops ineffective. This therefore aroused interest to understand

what the case is with IPD opportunities for agriculture teachers in Botswana in terms of relevance and providing adequate learning time.

Furthermore, workshops also fail to involve teachers in either deciding topics or designing their programme of growth (Kennedy, 2005). My argument here is that for IPD experiences to effectively change the teachers' attitudes and practice, teachers ought to have an input in planning them. This argument gains support of Guskey (2002).

Again, the lack of involvement of teachers in planning the traditional forms of PD suggests that in this form of PD teachers may not have enough time to go through the process of change. Guskey (2002) argues that most PD programmes fail because of failure to provide for the change process expected of teachers among other reasons. Through his 'Model of Teacher Change' (Section 2.6.3) Guskey (1986) suggests the importance of allowing for a change process, which might be of benefit to the learning of new agriculture skills by teachers.

Specifically, 'one–shot' workshops have been criticised for addressing topics in general terms without providing for follow up (Kennedy, 2005: Srinutapong et al., 2005). But content focus has been identified by several scholars as one of the features of effective PD (Garet, et al. 2001: Guskey and Sparks, 2004). In my view, content has to be specific to benefit the targeted group, and this could be achieved if the programme is well researched and considers other aspects, including how it could be learnt by students. Several researchers have identified follow up to be an essential feature for effective PD (Guskey, 2002: Flores, 2005: Mulkeen et al., 2007). This

serves as evidence to suggest that effective IPD activities are those which provide for follow ups in their design, and to achieve this, the amount of time allocated for IPD needs to be increased. The issues of content focus by IPD provisions and follow up raised here aroused my interest to investigate their status in the context of Botswana.

So, the cited shortcomings of a 'one-shot' workshop calls for shifting to the consensus view of broadened PD which is linked to the realities of classroom needs. The broadened PD involves teachers in: practical tasks, collaborative learning, action research, exploration of relevant subject matter and continued feedback. This move gains support of other scholars like Karagiorgi and Symeou (2006). The broadened PD I allude to here seems to endorse the idea of situated learning I discussed earlier (see p. 68). The theory clearly deepens the understanding of how context and participation are useful in learning.

Key points in Section 2.4.1:

Traditional forms of teacher PD (e.g. 'one shot' workshop -Kennedy, 2005), are criticised for decontextualizing learning.

Concept of Situated Learning, proposes ideas that could improve the learning environment and make learning meaningful. The ideas stimulate questions to ask pertaining to IPD learning environment for agriculture teachers in Botswana.

Having discussed what I may term 'ineffective' versions of PD with insights of improvement suggested by Situated Learning theory (see p. 68), our minds are now challenged to think about effective IPD, the characteristics or features of which I discuss below.

2.6. Features of Effective IPD activities

Several small and large scale studies, reviews, and writings old (Gall and Strenchler (1985); Sparks and Loucks-Horsley (1989); Guskey and Huberman (1995); Garet et al.(2001); Desimone et al. (2002); and relatively current (Guskey and Sparks , 2004: Adey et al., 2004: Loucks-Horsley et al., 2010) contribute to our understanding of the characteristics of effective staff development focussing on the practices. Effective staff development according to Loucks-Horsley et al. (2010):

- Is directly aligned with student learning needs
- Is intensive
- Is on-going
- Is connected to practice
- focuses on the teaching and learning specific academic content
- Is connected to other school initiatives
- Provides time and opportunities for teachers to collaborate and build strong working relations
- Is continuously monitored and evaluated (p.5).

There is also an organisational context highlighted in literature which is required to support successful IPD efforts. According to Sparks and Loucks-Horsley (1989) such a context embraces:

- Programmes conducted in school settings and linked to school-wide efforts
- Teachers participating as helpers to each other and as planners, with administrators of in-service activities
- Emphasis on self-instruction, with differential training opportunities
- Teachers in active roles, choosing goals and activities for themselves
- Emphasis on demonstrations, supervised trials and feedback: training that is concrete and ongoing overtime
- On-going assistance and support available on request (p.35)

Regarding the features of effective PD, Guskey and Huberman (1995) posit:

> successful professional development efforts are those that help teachers to acquire and develop new ways of thinking about learning, learners, and subject

matter, thus constructing a professional knowledge base that will enable them to teach students in a more powerful and meaningful way (p.60).

Since there is a long list of different PD activities that teachers could experience, (Section 2.4), their description is difficult. And what makes it even more complex is that the nature of these experiences can be described 'on many dimensions' (Desimone et al. 2002, p.85).

Still in my search for what makes effective IPD, I was encouraged by Garet et al. (2001), who in their maths and science study devised a model for use in examining the quality of PD activities. Garet and his colleagues drew from research and best practice and identified structural and substance or core features of professional development to examine the activities. Figure 2.2 below depicts this model.

Figure 2.2: Model of examining quality of professional development activities (Garet et al., 2001)

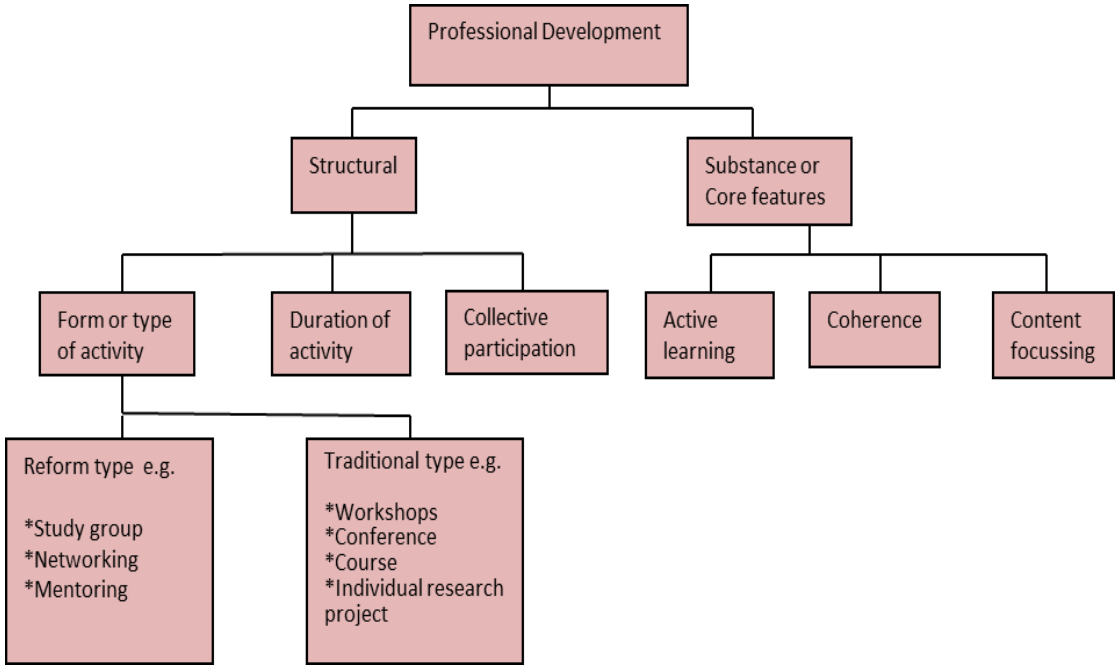


Figure 2.2 shows that when Garet et al. (2001) examined the characteristics of PD activities, they focussed on the structural features (i.e. characteristics of the structure of a PD activity) which included: 1) the form or organisation of the activity which could be reform type (i.e. affording extended time for learners to master skills) versus traditional forms; 2) the duration of the activity (contact hours spent in an activity and span of time over which the activity was spread); and 3) degree of collective participation of a group of teachers from the same school, department or grade level versus participation of individual teachers from different schools.

Furthermore, core features or characteristics of the substance of the activity included: 4. extent of offering active learning; 5. extent of promoting coherence in teachers' professional development; 6. degree to which activity has content focus (i.e. focus on content to be known by teachers and students as well as its level) (Garet et al., 2001). This framework was later on adopted by Desimone et al. (2002) in their study which focussed on the effects of professional development in changing classroom teaching practice.

Later on Desimone (2009) proposed a framework which she called the 'path model' (p.185). Through this model she continued to emphasise that PD provisions will become effective if they incorporate the five features of effective professional development (content focus; active learning; coherence; duration; and collective participation).

On their part, Guskey and Sparks (2004) proposed a theoretical model of the relationship between PD activities and improvement in student learning. In a way,

their model expanded that of Garet et al. (2001) as they included 'context characteristics'. The model by Garet et al. (2001) only described what they termed 'structural' and 'core' features as shown by the figure above. The model by Guskey and Sparks (2004) indicates content characteristics, process variables, and context characteristics as factors affecting quality of PD. And they suggest through this model that these are the aspects to be examined to determine the effectiveness of PD.

For content characteristics they consider the currency of knowledge as well as aspects of its scope, credibility and how practicable is the change required to implement the new knowledge.

For the process variables, they ask the question "how", hence are concerned with: types and forms of PD as well as the way they are planned, organised, carried out and followed up.

In the case of context characteristics they consider 'the "who", "when", "where", and "why" of the professional development' (p.14). This means they consider those involved (teachers), the environment (school), and those served (students) as well as the organisation, system and the prevailing cultures underpinning PD.

In this study I found these frameworks by Garet, et al. (2001) and Guskey and Sparks (2004) to be useful criteria for judging the effectiveness of any IPD provision. The models also contributed issues I asked teachers about when studying their views regarding the characteristics of their own IPD in Botswana. Issues of content, process, and context were covered by this study (see questionnaire Appendix 6). I also relied on these models to interpret the teachers' accounts regarding the characteristics of IPD in their context.

The two frameworks by Garet et al. (2001) and Guskey and Sparks (2004) together identify effective PD to be that which focuses on specific content (content characteristics), as well as promotes active learning, coherence, collective participation (process variables), and receives support from stakeholders and prevailing cultures (context characteristics).

Challenges: Considering that the models by Garet et al. (2001) and Guskey and Sparks (2004) were developed from the western context, they may not fit readily in other contexts without having to be adjusted to cater for the situational and contextual differences. I find the main challenges with these models to lie with whoever will be using them to evaluate PD opportunity, and these individuals would be mainly In-service providers, school administrators or teachers themselves depending on the scope of the activity. The challenge will be on whether they would examine aspects determining PD effectiveness at the same level of emphasis as would the originators of the models. I find differences in context likely to impact the model's effectiveness to help examine IPD as this would depend on the skills of individuals using them, the purpose of evaluation and the prevailing circumstance in a given context. But generally, I find the models here to have stimulated my thinking about characteristics of IPD to be explored by this study.

Nevertheless, there is yet another challenge arising from Evans' (2010a) observation that there is lack of precision of our existing definitions of effective professional development. I also see this shortcoming to remain a challenge for in-service providers in Botswana as they will find it difficult to measure in precise terms what and how much change IPD effects, especially in teachers themselves. There is

therefore a need to specify the properties or components we want impacted and also have precise measuring instruments for effectiveness. Other factors that may be of challenge to effective IPD are discussed later on.

Apart from using the frameworks of Garet, et al. (2001) and Guskey and Sparks (2004) to inform my interpretation of the teachers' accounts about the characteristics of IPD they experienced, I drew from them, here, to analyse and summarise the different authors' views about effective PD.

By applying Guskey and Sparks' (2004) model in analysing the authors' views, I found the authors to have described effective PD under the content it emphasises, organisational process it follows, and context under which it takes place as shown in Table 2.4 below.

Although not all authors in Table 2.4 have identified content characteristics, the aim for developing knowledge and understanding of teachers seem to be the highly desired learning outcome for effective PD. Authors seem to have put little emphasis on student performance as a learning outcome: besides assuming that it is implied. But of particular importance is that some authors specified skills and emotions (Day, 1999), attitudes and beliefs (Guskey, 2002) and intellect or reasoning (Evans, 2010a) as components to be changed. Expressing in precise terms what needs changing would help evaluate the impact of PD provisions.

Some authors, e.g. Gray (2005), also pointed to the need to ensure that the content is suitable for the needs of the target audience. I find this crucial because any

Table 2.4: Characteristics of effective Professional Development as perceived by various authors

SOURCE	CONTENT CHARACTERISTICS	PROCESS VARIABLES	CONTEXT CHARACTERISTICS
	PD is effective if...	**PD is effective if...**	**PD is effective if...**
Garet et al. (2001)	...focus on content to be known by either teachers or students	...encourages collaborative participation and active learning ...is of reform type ... takes long time (Van Driel et al. 2001 support)	...it smoothly joins those existing- coherence (Leu and Price-Rom, 2006 support)
Desimone et al. (2002)	...focused on specific instructional practices	...encourages active learning	
Mulkeen et al. (2007)		encourages learning communities for discussions and mentoring	...classroom environment is well resourced with books & material ... systems fosters mentorship
Hustler et al. (2003 p.91)	*... tailored to needs .* *...increasing knowledge*	*...consultation... well organized and planned...enjoyable* ...doing rather than listening	*...treating teachers like professionals*
Karagiorgi & Symeou (2006, p.48)	*...exploring relevant subject matter*	*...continuous...highlights collaborative learning context,* teacher research, practical *involvement, and consistent feedback*	
Srinutapong et al. (2005, p.23.1)	*to integrate dynamic technology into their curriculum.*	...emphasises continuous support	
Guskey (2000: 2002)	… brings permanent change in teachers' attitudes & beliefs …intentional	...emphasises sequence in change of learning outcomes ...fostering gradual change, feedback & follow ups …on-going & systematic	
Dawkins (2011, p.129)		...it is a process of analysis, reflection, feedback and follow up	...addresses various aspects of organisation ...context provides structural support
Day (1999)	...focussed on making change ...develop skills knowledge & emotions essential for good practice	...naturally occurring or planned ... process carried through each phase of teaching period	...teachers involved extended their commitment as change agents, hence self-directed
Evans (2010a, p.9)	...involves the enhancement *of* [behaviour, attitude and intellect] or [competence, motivation and reasoning]	*...moves individuals along Hoyle's professionality continuum from 'restricted' to 'extended' personality* [Hence a process]	
Flores (2005, p.487)	*...focus on personal & professional needs*	*...support and guide throughout careers*	*...Considering personal, contextual and political factors affecting teacher PD*
Gray (2005, p.20)	*...carefully researched in terms of teacher needs* *...likely to have impact on teaching* *...improves subject matter knowledge*	*...well presented by experts* *...offering scope for later follow up, support and networking* *...offers scope for feedback during session & later*	*...economical in terms of time & monev* ...there is adequate support

NB Direct quotes are italicized and other insertions are paraphrased

mismatch may demotivate teachers to learn. Burns (2005) regards meeting teachers' needs as a way of motivating them. Key findings of the studies by Edmonds and Lee (2002), Hustler et al. (2003), and DFES, (2003) recognised the importance of teachers' needs. They argued against a tendency for school development and national priorities to take precedence over the teachers' needs in influencing professional development activities**.**

It also appears that process variables have been identified by all authors. This could imply that aspects associated with organisation, planning, implementing and giving feedback are essential for effective IPD. Again, cutting across most of the authors above is the element of seeing effective PD to be that which is continuous and involving learners in doing things other than listening. Finally, the context characteristics seem to have not been given as much attention as the content and process variables. Process variables for effective PD pose a challenge for in-service providers who are to work hard to meet the stated organizational expectations. The challenge for teachers here is that of ensuring effective implementation of the new ideas.

In summary, for IPD to be effective, it has to provide for: proper planning, organisation, implementation and feedback; respect for teachers as professionals; meeting teachers' needs; support and follow up; coherence of activities; active learning; specified learning outcomes; encouraging teachers to be self-directed; as well as being on-going, systematic and intentional. However, although these features of effective PD are known, information has been lacking about them with respect to

IPD for agriculture teachers in Botswana. This created a gap in knowledge that this study had to fill through examining the characteristics of IPD for the teachers.

The idea of active learning or involvement of learners suggested by the models espoused by Garet et al. (2001), Desimone (2009), and Guskey and Sparks (2004) as well as the authors in Table 2.4 was understood from different angles in this study. From the context of experiential learning theory (Lewin, 1951: Kolb, 1984) discussed earlier (see p.71), active learning could be understood to mean learning by doing: hands-on, whereas from the view point of the social constructivists (Vygotsky, 1978: Brophy, 2002) (see p.73) it could be viewed as learning through engaging in discourses with others. The latter view is concerned with the engagement of cognitions not muscles as does the former. The implications of both view points for the agriculture teachers' IPD have already been presented under Section 2.4.

2.6.3. IPD and Teacher Change

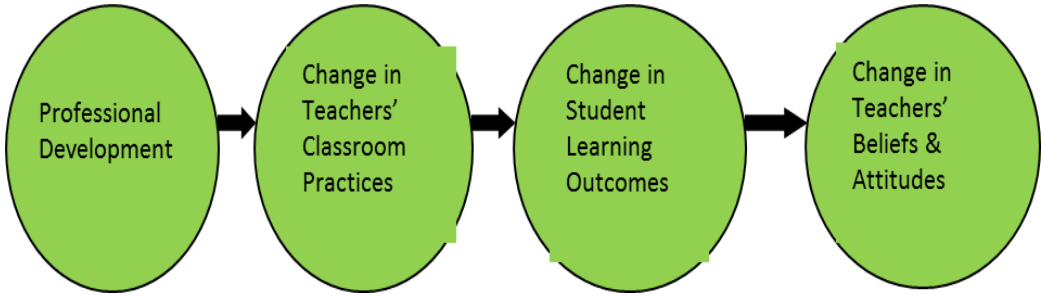
In analysing the literature in Sections 2.3 and 2.6 it appears that the element of change is inherent in the process of teacher professional development. This implies that the effectiveness of IPD provision would also depend on how the change process is managed during IPD sessions. Models exist in literature that propose how the change process in education in general (Fullan, 1991:1993), and the involvement of teachers' ideas concerning their practice (Guskey, 1986:2002), could be harnessed.

Michel Fullan (Fullan and Stiegelbauer, 1991) has been writing about the concept of change in education for many years. For instance Fullan (1999) offers the three tier model which involves steps of initiation, implementation and

institutionalisation of change in a school setting. However, I find this model illustrating general change unlike the 'Model of Teacher Change' espoused by Guskey (1986:2002).

The Teacher Change Model by Guskey (1986) is shown by Figure 2.3 below. In this model Guskey emphasised the sequence in which these PD outcomes occur as he considered it to be crucial for determining permanent change in teachers' attitude and beliefs upon successful completion of IPD initiatives. Whilst the model appears linear in the figure, in reality the occurrence of these stages (outcomes) is complex and it is mediated by many other factors that may, in the process, disrupt the change process (Guskey, 2002).

Figure 2.3: Guskey's Model of Teacher Change (Adapted from Guskey, 2002, p.383)



According to the figure, first the teachers are exposed to an IPD activity and thereafter they put to practise what they learn. That will be followed by observing whether or not the changed practice had a desirable effect on student performance. And lastly, the teachers' beliefs and attitudes would be changed by seeing the improved performance, or else they would abandon the new practice that results in poor results (Guskey, 1986: 2002).

The observation by Guskey (1986:2002) that teachers only retain and repeat what they found to be workable supports reports by previous researchers. For instance, Bolster (1983) reported that the new ideas and principles about teaching were believed to be true by teachers after giving rise to actions that worked. On the other hand, following the study that intended to develop teachers' commitment to the new practices, Crandall (1983) reported having found teachers becoming committed to the new practices only after they had actively engaged in applying them. It is from this background that I hold the view that teacher change needs to be provided for in IPD.

This model sees teacher change as a process, not an event. It was designed on the premise that 'change is primarily an experientially based learning process for teachers' (Guskey, 2002, p.384). The model disagrees with the general understanding that teachers change immediately after being exposed to IPD opportunities.

The early change theorists such as Lewin (1935) believed that mere exposure to PD would lead to expected change. But research on teacher change found the assumptions of the early models to be inaccurate when considering PD for teachers (Huberman and Miles, 1984: Guskey and Huberman, 1995). Guskey (2002) considered this model to be 'An Alternative Model' to the models developed by early change theorists who drew more ideas from psychotherapeutic models.

This illustrates three outcomes that are linked and occur together during any IPD change process and, as such, they deserve to be given joint and equal attention during any IPD change process. It would be unwise to assume that exposing teachers to IPD activities would translate into improvement of student performance without

considering change in the teachers and their practice. I find student performance dependent upon how effectively the practice of teaching is changed by IPD experiences. Also sustainment of new ideas is reinforced by success in improving student performance.

However, the primary PD outcome seems accepted to be that of making learners achieve high academic performance. This could be that the majority of the teachers use their students' performance to gauge their success. A previous study of the teachers' perceptions of success by Harootunian and Yargar (1980) found that 'most teachers define their success in terms of their pupils' behaviours and activities rather than in terms of themselves and other criteria' (p.4). Other researchers since report similar findings (e.g. Fullan and Hargreaves, 1996: Fullan, 1999). In his article, Guskey (2002) also reflects on a similar trend.

I find the discussed model of Guskey appropriate for use in IPD in Botswana. It shows a scenario of a single activity, take a workshop for instance: where teachers are first exposed to learning material and are then given time to put to practice with students, get feedback and return for evaluation. The length of time would depend on the topic at hand. I find the model relevant for imparting skills necessary for managing agricultural enterprises. The teachers' competence to effectively manage livestock and grow crops in a school setting is built over time after several field trials of trying out things.

Guskey's model has **implications** for teacher-learners, in-service providers and IPD programme structure. Teachers ought to be prepared to go through the change process,

to try out new things and to intentionally evaluate outcomes. Teachers' resistance to change has been mentioned amongst the barriers to their professional development by Fullan and Stiegelbauer (1991) and Fullan (1993). On their part, In-service providers need to give teachers more time as they might be finding it difficult to de-construct what they are used to (Bolster, 1983). Illeris (2003) also pointed out the difficulty involved in de-constructing knowledge or identities as compared to gaining new ones. The IPD programme could be structured such that ample time is made available for teachers to implement the ideas during IPD and later return to the group process to engage with the ideas. This could be done repetitively more so that the model sees IPD as a process not an event. The arrangement would benefit teachers of agriculture who need to observe changes during time-consuming learning projects involving plants and animals.

Furthermore, various situational and contextual factors which influence teaching and learning (Huberman and Miles, 1984) need also to be taken into account as they may affect the outcome. Secondly, teachers need to be regularly given both formative and summative feedback on student performance to help them see the outcomes of the new practices. I assume that good outcomes motivate teachers to repeat new practices or ideas. Third, attempts by In-service providers to patiently take every teacher on board and encourage them to keep pace with the group, would see them succeeding in letting teachers change their practice as a team that implements a national curriculum.

2.7. IPD Models and Implementation Frameworks

The literature included in this section deepens understanding on the nature of Professional Development (PD) and how effective PD provisions can be designed. Specifically, the section presents various IPD models and organisational frameworks for designing effective IPD.

2.7.1. Models of teachers' IPD and associated theoretical frameworks

By 'models' here I mean the overarching frameworks of IPD meant to guide the provisions offered to teachers in a given setting. According to Joyce and Calhoun (2010), 'a model is a prototype, a pattern that, in education, can be used to create an environment for learning' (p.3). They guide deliberate actions (either by education authorities, schools or teachers) to generate learning (Joyce and Calhoun, 2010) by teachers in this case.

A large body of literature (including the works of Sparks and Loucks-Horsley, 1989; Adey et al., 2004; Gaible and Burns, 2005; Joyce and Calhoun, 2010; Loucks-Horsley et al., 2010) organizes what is known about staff development into models which currently guide professional development (PD) opportunities. Different groupings of PD models have been observed in literature. Table 2.5 presents this variation.

The earlier presentations of PD models by Sparks and Loucks-Horsley (1989), which also appears in the work edited by Guyton and Rainer Dangel (2004), broadened my understanding of the models of teachers' professional development.

Table 2.5: Various Groupings of Professional Development Models

Authors	**Sparks and Loucks-Horseley (1989)**	**Adey et al. (2004)**	**Gaible and Burns (2005:25**	**Joyce and Calhoun (2010)**
Models	1.Individually guided model 2.Observer/Assessment model 3.Development/ Improvement model 4.Training model 5. Inquiry model.	1.PD for Cognitive Acceleration	1.Standardized 2.Site-based 3.Self-directed teachers' PD	1.those supporting individuals 2.those involving personal/ professional direct service by peers or supervisors 3. those encouraging social construction of knowledge and action 4. those focused at curricular or instructional initiatives 5. the infamous menus of brief workshops

The presentation summarised five PD models each having different assumptions, processes, and outcomes. These models are: the individually-guided model, observer/ assessment model, development/ improvement model, training model, and the inquiry model.

The individually-guided model emphasises self-directed PD activities and therefore tends to be disconnected from the larger and school-wide PD initiatives. Mushayikwa and Lubben (2009) consider this model as 'the professional development arising from the teachers' own initiatives' (p.376). It exemplifies the teachers' own will to learn as they select activities and 'their preferred modes of learning' (Sparks and Loucks-Horsley, 1989, p.42.

In Zimbabwe, this model was found to have benefited A level Science and Maths teachers especially those working in deprived environments: 'characterised by high teachers' stress, anxiety, and frustration' due to lack of support (Mushayikwa and Lubben, 2009, p.376). So, given that the conditions in the rural areas of the Central Region of Botswana might be similarly depriving, the model is likely to succeed as well in Botswana if appropriately implemented.

However, the model's focus on an individual rather than a group of teachers has implication for its enforcement. It poses an implementation challenge for it may not uniformly benefit all the teachers in the entire school or region since teachers differ in their quest to learn and grow professionally: 'state of growth' as described by Joyce and Calhoun (2010). Some teachers may not adequately apply themselves to achieve a considerable professional growth on their own. As a result, reliance on this

model may lead to failure to achieve the uniform implementation of the intended interventions by all teachers in schools or the entire region. It may also be difficult and costly to monitor and evaluate learning by individual teachers as opposed to a group.

The Observer/ Assessment model encourages teachers to observe one another and receive feedback on issues affecting their practice. The model is based on the premise that 'teaching could be effectively observed and analysed and that improvement can result from feedback' (Sparks and Loucks-Horsley, 1989, p.39).

As a success story, it is reported in the work of Joyce and Showers (1988) that improvements to students learning were observed when the training of teachers was followed by observations and coaching in their classrooms. The study which explored the effectiveness of active teaching and learning approaches in Zambia has found that the teachers who received constant observations paired with feedback and coaching support, significantly improved in the areas of: planning, stating objectives, praising students, setting up group work, classroom organisation, and creating more interactive classes (International Reading Association, 2009). Coaching in the Malawian context was found to have had a positive effect on teacher attitudes, motivation and classroom practice (Sailors et al., 2012). Moreover, the findings of recent work in Kenya by Piper and Mugenda (2013) has supported the importance of coaching in improving students' reading outcomes. Although the latter study explored coaching from literacy angle, I find its findings still relevant for this study given that reading and writing form the modes of communication in Agricultural Education. These findings provide reason to believe that teachers' believes and practice could be influenced positively by observations and feedback coupled with coaching even within our African context.

I find the challenge associated with this model likely to be the tendency to associate it with the evaluation or appraisal procedures which in most instances are linked with fault finding by some education authorities. In support of this, a recent study which explored the instructional supervision in the secondary schools of Botswana found that the instructional supervision in schools is hostile and intimidating to teachers. The study also found such supervisions constrained by the heavy load of supervisors. This therefore points to the need for raising awareness about the usefulness of observations and associated coaching and clinical supervision in enhancing the teachers' professional growth.

The other challenge pointed out by McGreal (1982) concerns the reliability of observation, for they (observations) are prone to subjectivity. However, to enhance objectivity of the observations, Sparks and Loucks-Horsley (1989) suggested the need to have joint planning (by both the observer and the observed) and narrowing what to be observed. There might also be a need to alternate focussed and unfocussed observation to enhance objectivity (Glatthorn, 1984).

The Development/ Improvement model argues for the need by teachers to gain professional growth through engagement in some development improvement processes which in most cases are initiated to solve a particular problem. It involves collective participation of teachers from the same department who might be engaged in study groups, a case study or in a development or improvement process of some kind e.g. designing or choosing a curriculum while learning at the same time (Caena, 2011).

Encouraging success stories have been identified where this model was put to use. For instance, the model was used to improve not only the knowledge, skills and attitudes of Scottish teachers, but also the school climate (HM Inspectorate of Education, 2009). The strategies that have been found to be generally effective in promoting development of teachers with this model include: teachers' observation of similar projects in other schools, attendance of regular project meetings, participation in project decision making as well as local development of project material (Hopkins et al., 1994).

The demand for special skills to carry out some school improvement process (e.g. curriculum design) may constrain agriculture teachers to take advantage of this model, for most of the teachers lack such skills. To help overcome this challenge teachers would have to be given opportunity to gather such necessary knowledge and skills (through either reading, discussions, observations or training) to ultimately rendering the model successful.

The Training model on its part encourages trainers or administrators to decide for teachers or participants, what, how and where to learn (Wood et al., 1982). The idea counters the notion of developing teachers through involving them in the school improvement processes. However, Sparks and Loucks-Horsley (1989) observed that:

> Under the appropriate conditions, training has the potential for significantly changing teachers' beliefs, knowledge, behaviour, and the performance of their students (p. 49).

In addition, when discussing the components of the 'Training model' Joyce and Showers (2002) argued that 'for specific training outcomes certain training components or combinations of components provide optimal conditions for learning' (p.75). This suggests that the best results of this training model could be achieved

through combining it with other strategies (e.g. discussions, demonstrations, modelling, observations, feedback and coaching) to constitute a multidimensional approach to teachers' development.

My further search of literature revealed some pieces of research on 'Training' which provide some insights into its efficacy and the efficacy of various training components and their combinations. For instance, the work of Good and Grouws (1987) found that as a result of training where teachers learnt about maths content as well as management and instructional issues, teachers effectively changed their practice and improved mathematics presentations.

In seeking to scale-up PD, the Cascade model of teachers' PD is seen by Schwelle and Dembele (2007) to be a 'form of teacher training used when efforts and donor agencies call for reaching many participants in a short time' (p.104). This approach to training is seen by Kennedy (2005) to emphasise adherence to standards by all teachers who are monitored centrally and are allowed very little flexibility. In a way it emphasises the institutional needs rather than the needs of the teachers, whom it treats as recipients. While the training could occur within school, more often it is carried outside school, and this makes participants lose connection with the school context (Day, 1999).

On the other hand the Cascade framework is attractive for it requires only a few teachers being trained and then used to disseminate the information to the rest of their co-workers (Kennedy, 2005). In practice, success stories have been reported. For example, McDevitt (1998) noted it had worked well during the in-service project which was launched to address mixed ability teaching. The framework was also

found to have been successful in letting teachers share information (Day, 1999). In the study by Newton (2012) the Cascade framework was described to have been successful by the participants in providing the structure for the '2Learn.ca/TLC teacher-leader model' in Alberta. It also proved to be economic in terms of material and human resources (McDevitt, 1998).

The setbacks identified with the cascade framework include that of neglecting the context under which learning occurs (Kennedy, 2005) and the issue of failure to disseminate value laden information (Nieto, 2003). Again, besides the possible distortion of content as it is passed down the levels of recipients (McCarney, 2004), the assurance of maintaining attainment of identical benefits by the audience at all levels remained a challenge for the design of the package (McDevitt, 1998). The challenge here is that the audience kept changing with levels, hence the need for re-designing packages for each level while ensuring that the message was not altered.

Whilst each framework has its own strengths and weaknesses, several reasons make the Cascade model suitable for adoption for agriculture teachers' IPD in Botswana. First, is that the Botswana education system is run centrally with the main regional office held accountable for the smooth running of the IPD activities. So the notion of 'central control' which seems to be a fundamental part of the model, makes it match the set up in Botswana.

Secondly, the Training framework seems suitable for the Central Region since it may ensure that the skills learnt, which are dictated by the national agriculture syllabi (junior and senior schools), are implemented uniformly by all teachers in the

region. The Training model is said to be cost efficient because of the high participant-to-trainer ratio it is associated with (Sparks and Loucks-Horsley, 1989). This suggests that if training is done through Cascading it would further reduce costs. Through its nature of relaying information from one group to the other, training through cascading may help the current situation where the department of in-service training lacks capacity to reach out to all the teachers (Buti[2] and Pitso[3]).

But having once proven to be effective in this context (McDevitt, 1998), and with some of its structures still existing, e.g. cluster arrangement, perhaps cascading might be easily revived. The Cascade framework might be favoured for allowing participation of learners. However, there might be challenges associated with these frameworks (i.e. Cascade and Training). Being centrally controlled, the two models may need a well worked out communication network to enable the regional office to monitor the implementation of the learnt skills. This, of course, has cost implications as both human and material resources might be required.

In the case of the Cascade framework, measures ought to be put in place to avoid distortion of information when relayed from teacher trainers to the rest of the teachers in schools. This could be achieved through continued re-designing of training packages to suit the audience at each level. Time ought to be availed for the change process at each level. Teacher trainers need to be trained in presentation skills and be closely supported. Finally, visiting schools ought to be incorporated as part of the programme.

Buti[2] and Pitso[3] (not real names) EOs for agriculture (personal communications)

In their work, Adey et al. (2004) presented a professional development model which they termed 'Conceptual Acceleration'. The model advocates the need to enhance learning by letting the mind experience 'cognitive conflict' (Ibid. p.21) which builds from Piaget's disequilibrium principle (Piaget, 1932: McLeod, 2009). The model also advocates the need to provide scaffolding support which draws from Vygotsky's principle of the Zone of Proximal Development (Vygotsky, 1978). With this model teachers are supported to implement the curriculum in their context.

Adey et al. (2004) presented a case where through this model teachers were able to successfully change the teaching and learning strategies. This was because PD was more than just showing the materials; changes were not forced; teachers were treated as partners in the process, and were consulted and listened to. More importantly the school leadership plays a role in supporting the PD initiatives.

Although the model has features that could promote effective learning by agriculture teachers, its employment at the Central Region where the operational approaches seem to cherish centralisation and compliance to save on time and costs, may encounter challenges. The model seems to have been underpinned by a contrasting philosophy that advocates democratic and constructivists' learning ideas which emphasise the need to accord the teachers extended support and time to allow for cognitive conflict.

Although they classify PD models from the Information Communication and Technology background, Gaible and Burns (2005:25) divide the models into three broad categories: standardized, site-based and self-directed teachers professional

development. This classification appears, to some degree, similar to that espoused by Sparks and Loucks-Horsley (1989). They both recognise that teachers could learn as individuals or as a group and that IPD could be organised outside or within the teachers' context. They also recognise that support might be needed for the success of the IPD interventions to be realised.

Interestingly, the work of Joyce and Calhoun (2010) provides a collapsed presentation of the various models of professional development for teachers. The collapsed presentation puts the IPD models in clusters termed 'families of models' (Ibid. p.12). These models include:

1. those supporting individuals;
2. those involving personal/ professional direct service by peers or supervisors;
3. those encouraging social construction of knowledge and action;
4. those focused at curricular or instructional initiatives; and
5. the infamous menus of brief workshops

Models supporting individuals are those that focus on an individual as a person: provide opportunity for people to grow at their own pace. Joyce and Calhoun (2010) describe them to be 'methods of direct support for personal inquiry' (p.19). Examples here embrace dispensations including:

a. Offering stipends for teachers to make good use any professional development opportunity of their choice.
b. Offering short-term leaves for teachers to pursue individual professional development.
c. Providing support in the classroom as new knowledge and skills are implemented in class or school.
d. Building an energising and positive culture in the region or school
e. Using systems for studying teaching to help teachers analyse teaching and make decisions about enhancing their repertoire (Ibid. p.20).

Models providing personal or professional service are those which involve some knowledgeable individuals (e.g. experienced teachers or supervisors) designated to provide help to others. Mentoring, coaching and clinical supervision (Goldhammer, Anderson, & Krajewski, 1980: Malawi Institute of Education, 1987) are the examples under this category.

Models encouraging social construction of knowledge and action involve those that focus on developing a group of teachers which could range from those in a department, to an entire school or a region. Examples or types of collaborative models could include:

a. Open-ended local learning community activity – study groups (Could be by independent groups within the school, school wide activity, or regional undertaking)
b. Action research (could be specified to be undertaken by individuals, groups, entire staff in a school)

The purpose of this category of models is to allow opportunity for a group of teachers to reflect together on the education they render and to find ways of making it better. This brings the idea of teaching in a social context as well as research-based school improvement programs (Joyce and Showers, 2002, p.40-1)

As teachers' work is perceived 'to be autonomous for the most part' (Joyce and Calhoun, 2010, p. 61) getting them to work as a team is difficult. Factors contributing to the difficulty in bringing them together include: limited time, individual differences in terms of their quest for learning, which Joyce and Calhoun

(2010) termed ‘states of growth’ (p.21) and varying organisational cultures or climates (Ibid. p.18).

This therefore suggests that effective collaborative models ought to acknowledge similarities and differences amongst teachers and exploit chances of benefiting from the differences. Drawing from the theory of andragogy (Knowles, 1970) adult learners are characterised by accumulated knowledge and skills. The onus therefore is with the designers of PD to incorporate ways of tapping such knowledge and skills to benefit the groups in their mission of bringing about change in education.

Curricular or instructional initiatives focus on dissemination of curriculums through workshops and courses. Although highly criticised (Guskey and Huberman, 1995: Day, 1999), Joyce and Calhoun (2010) perceive this form to be the ‘most common way of organizing people for study’ (p. 13).

The Standardised Model: Which entails a centralised approach to PD where the trainer is trained in order to train the rest of the teachers. It is used when rapid dissemination of specific skills is required but faced with a large population. However it has limitations of excluding site based contextual issues which may latter serve as barriers to its implementation. It also fails to address the long term development nature of learning, there is diminishing content reaching the teachers and some distortions may occur. It also does not leave room for follow up and support, outcomes are often difficult to measure and facilities at training venue may not match the ones in the schools.

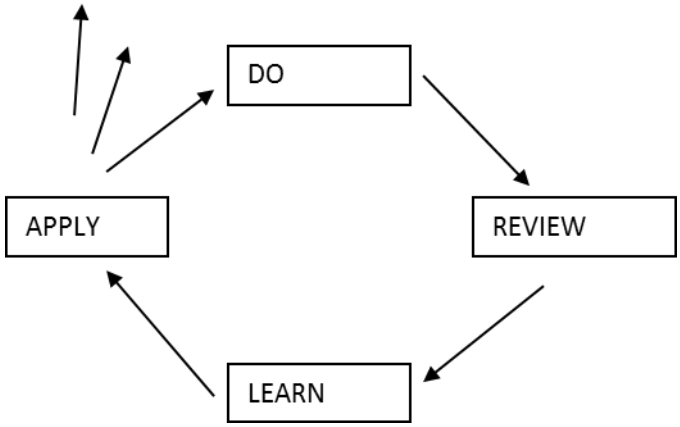
The Site Based Model of IPD is school or region based and focuses on providing solutions relevant to the local environment. As a result, the method supports long term changes in the methods of instruction and its outcomes are easy to establish over time. Through its flexibility and adoption of collaboration approaches, the model could facilitate both individual and group's initiatives (Gaible and Burns, 2005).

With the Self-Directed Model, IPD is achieved at an individual's discretion, with an individual consulting available resources and ICT to enhance methods of delivery. Depending on the motivation of the individual this method can yield positive results as observed by Gaible and Burns (2005). Although I applaud the existence of IPD models to enhance learning by teachers (as individuals or in support of knowledgeable others), they may not be adequate if not accompanied by teachers' ability to manage their own learning.

The work by Frost and Youen (2005) points to the importance of letting teachers take responsibility for their own learning as individuals who are also 'aware of the need to do so' (p.9). This contribution suggests a need to guide teachers on how best they could manage their own IPD, and make good use of the available learning opportunities and settings. Frost and Youen (2005) suggest 'a model of active learning' (p.10) to guide teachers to manage their own professional development from experiences. Figure 2.4 below shows the model.

The model is described as the 'do-review-learn-apply' cycle. According to Frost and Youen 'this cycle involves trying something out (i.e. the doing phase),

Figure 2.4: A Model of Active Learning



reviewing it, learning from the review and then applying the learning in a new situation' (p.10). The doing here may involve teaching, observing, working with mentor etc. 'Reviewing involves describing the event …, analysing it from a particular perspective, comparing it with other situations and evaluating its significance' (Ibid. p.10). In the process you learn how events link with theory (Learning phase) as theory provides a framework against which events are evaluated. The last phase is where one asks him/herself about the changes he/she could put in place to improve the situation next time, thus setting new goals and actions for the next cycle.

I find the ideas raised by this model likely to be beneficial for agriculture teachers, if they could adopt it, because whatever change required in a larger picture, it should have been first embraced by teachers at individual level.

For each of these models to thrive and be practised, there is an organisational process that has to be engaged in which involves creation of action plan, assembling resources, implementing, formative evaluation and revision of procedures, and summative evaluation including measuring the effects on student learning (Joyce and

Calhoun, 2010). This understanding therefore leads us to the discussion of the organisational process for designing PD.

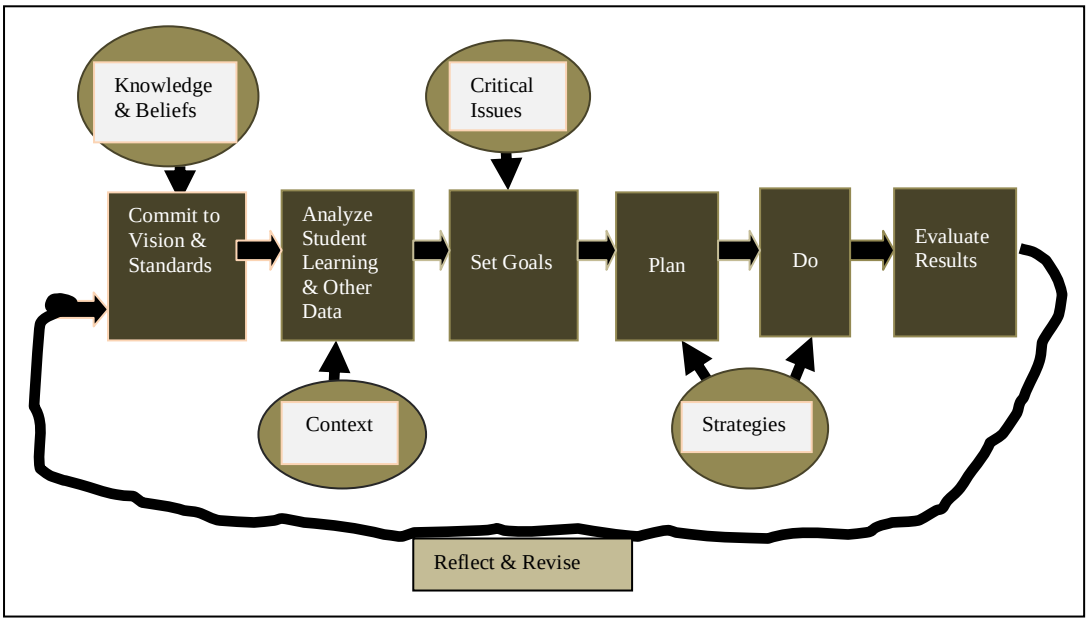
2.7.2. Organisational frameworks for designing teachers' IPD

Loucks-Horsley et al., (2010) and Joyce and Calhoun (2010) give insights into organisational processes that have to be engaged in, if an idea of designing effective PD opportunities or programmes is to be implemented or become an active practice.

Loucks-Horsley et al. (2010), who drew from research, the literature, and the wisdom of their own experience of designing complex PD programmes for teachers at various unique settings (mainly in America), suggest an organisational framework that could guide the process of designing both small- and large- scale professional learning programmes. According to Loucks-Horsley et al. (2010), 'the framework emerged originally from collaborative reflection with outstanding professional developers about their programs of mathematics and science teachers' (p.17). Having been drawn from the science perspective, which is the foundation of agriculture (Ngugi et al., 1978), I find the framework relevant for guiding organisational processes of agricultural science teachers IPD opportunities. 'This design framework is illustrated by Figure 2.5 below.

In the Figure below, the boxes which are connected with horizontal arrows illustrate the professional development design and the implementation process that consist of the following actions: commit to vision and standards, analyse student learning and other data, set goals, plan, do, and evaluate. Below and above the boxes,

Figure 2.5: Professional Development Design Framework (Source: Loucks-Horsley et al., 2010, p.18)



there are circles representing inputs into the design process that help professional developers make informed decisions. The inputs to consider here include: knowledge and beliefs and how they align with research; uniqueness of the local context; critical issues that may influence the success and impact of PD; a wide range of PD strategies and their combination that may enhance teachers' learning and practice. The arrows from the circles indicate when, in the design process, the inputs are to be considered. For instance, existing knowledge and beliefs inform 'commit to vision and standards' and all subsequent steps in the process including how the plan is designed, implemented and evaluated.

Local context is considered when analysing student learning and other data which helps to identify the needs of students, teachers and organisation to be addressed by PD. This would make IPD relevant and favourably impact practice (Williams, 2005). According to Loucks-Horsley et al., (2010), contextual factors to consider here include availability of time, resources, leadership, and school culture all

of which impact the design process. Next to be considered by planners, at the stage of setting goals, are the seven critical issues which involve:

> building capacity for sustainability, making time for professional development, developing leadership, ensuring equity, building a professional learning culture, garnering public support, and scaling up (Ibid. p.26).

According to the framework, the planners would continue to attend and think of ways of addressing these critical issues as they implement and evaluate the program. The two arrows from the strategies input, connect it to 'plan' and 'do' steps of designing the PD programme. At the first step of the 'plan' the strategies or strategies' combination would best address the set goals based on all prior inputs are considered. At the 'do' step the chosen strategies are implemented based on the plan and the designers continue monitoring the implementation and make refinements of the strategies and critical issues accordingly. At the 'plan' and 'do' steps designers also develop plans to evaluate the effectiveness and impact of PD and seek to anticipate the data to be gathered to serve as indicators for effectiveness and impact.

Loucks-Horsley et al., (2010) emphasise the need to have a repertoire of strategies from which to choose to design IPD programmes that could address different goals as well as encourage lifelong professional learning by teachers. For instance, if the goals are to impart planting skills and help agriculture teachers understand how students think and progress in learning, the IPD provider might choose to take advantage of combining different strategies: for example, a demonstration course or workshop combined with sessions of teachers reflecting on students' work and thinking. It is important to note that the chosen strategies could be used in different context for varying purposes (see Section 2.3) and could be implemented simultaneously or in succession depending on the purpose (Loucks-Horsley et al., 2010).

This framework could guide designs of IPD programmes ranging from those in an individual school to those for the entire nation. Already the framework is said to have demonstrated effectiveness in guiding the design of PD programmes in the United States. For instance, Loucks-Horsley et al. (2010) posit:

> We have seen the design framework used to guide the development of programs of many grain sizes, from single institutes to complex multiyear programs. (p.4).

Additionally, I find the framework likely to stimulate reflection and refinement for IPD programmes that could be already underway. The framework could be useful to the designers of IPD for it clearly: summarises the features of effective PD, discusses the issues that cut across PD provisions and ways of addressing them. It also discusses various PD strategies that go beyond the commonly used workshops, hence broadening the knowledge of the strategies. However, having been drawn from the western context, the framework may not fit readily in the Botswana context without having to be aligned with the situational and contextual demands. In fact, Loucks-Horsley et al. (2010) posit:

> Given limited resources, especially time, professional developers may not always have the luxury of giving their full attention to every one of the four inputs and the six design and implementation process steps in the model. (p.21)

This comment, acknowledges possible differences in contexts where the framework could be applied.

In further analysis of the organisational process of PD, Joyce and Calhoun (2010) suggest layers of organisational process and illustrate how they apply when an individual generates a personal programme, a groups' programme, or even a nationwide PD programme. In any case, they first emphasise the need to create an

action plan: steps to getting things done. Assembling adequate human, monitory and physical resources suggested by the plan follows as the second layer. The third layer is the implementation of the plan which could involve the employment of various strategies of different lengths and complexity. These could be meetings, conferences or workshops accompanied by follow-up sessions. The choice of these strategies could be determined by the purpose and scale of the PD programme. Fourth is the formative evaluation and revision of procedures.

The fifth layer entails periodic summative evaluation of the PD programme. Here PD providers verify whether the set level of implementation has been achieved. This fifth layer suggests the need to establish, from the beginning, the expected level of implementation (standard) to serve as a control measure at a later stage. Sixth, which is the last step, would be to estimate the effect of the intervention on the student learning. Here, Joyce and Calhoun (2010) emphasises the need to strategically estimate the time when effects could be reasonably expected, since evaluating too soon may not be useful. I understand the presentation of the processes above to be a guideline which could be altered to meet the needs of the local context.

I find the processes likely to apply in any context, though not necessarily following a linear pattern and the order presented above. Providers for agricultural science teachers IPD programmes may also take advantage of the processes above to enhance the effectiveness of the programmes they organise for teachers.

2.8. IPD needs

Given that the views of agriculture teachers regarding their IPD content needs are not known, I found it necessary for this study to also solicit the teachers' views on the content areas they would like to be assisted in. The idea of soliciting the views of teachers in the study that seeks to address their concerns is supported by Taylor (1997) who views teachers as the agents not the objects of development intentions. I also share the contention that IPD can be relevant and meaningful to the teachers if it addresses their felt needs. So in deepening my understanding of needs and their assessment, I came to understand that a need is a discrepancy between "what is" and "what ought to be" (Isaac and Michael, 1995). This implies a gap that ought to be filled to meet desired standards. Various methods have been employed to conduct needs assessments including: questionnaires (Millar, 1988); interviews (Robinson and Thompson, 1987); and checklists (Fresco and Ben-Chaim, 1986). Borich (1980) also emphasised the value of a model that ranks identified needs to establish priorities for training teachers.

However, Witkin (1984) noted that there is no single model or conceptual framework for needs assessment and there is little empirical evidence of the superiority of one approach over another. He further shared that the educational needs of a group could be better identified by using a variety of needs assessment tools. So, it was in the interest of this study to allow the teachers to express areas of need in their own words, thus adopting a subjective (qualitative) oriented approach to identifying IPD needs.

Needs assessment is crucial in making IPD meaningful to the teachers. A backward planning Model which enlightens how professional development initiatives could be best designed to improve teacher quality (Steiner, 2004, p.1), proposes a comprehensive needs assessment strategy which I find likely to benefit the organisational exercise of IPD. Proponents of this model (Guskey, 2000: Steiner, 2004) argue that needs assessment ought to target all stakeholders involved in the education of children to provide a sound basis for professional development opportunities. Guskey (2000) observes that the successful PD planners use backward planning, which approaches designs of IPD programme from gathering needs. The model denounces the idea of first thinking about experiences to employ. It argues that one needs to know first what is intended to be achieved before thinking about experiences to employ.

A backward planning model has implications for IPD in Botswana. It suggests that first In-service providers are to verify what exactly it is that students are expected to know (i.e. outcome). This may even include identifying the level at which the knowledge has to be provided. And by so doing the providers will be focussing the IPD initiative they are thinking of on content as summarised by Garet et al. (2001). In identifying the outcome, they will have to systematically consult students, teachers, and parents, administrators to understand and ascertain the kind, breadth and depth of the outcome desired. Thereafter, as the second step, the providers would think of IPD experiences that could best prepare the teachers to possess the competencies necessary to implement the programme to achieve the set goals.

The importance of needs assessment in IPD highlighted by literature created interest for this study to gather IPD needs for agriculture teachers to guide the proposed IPD reforms for agriculture teachers.

2.9. Professional knowledge base of teaching as possible content for IPD

Given that the purpose of IPD is to maintain and extend teachers' professional knowledge expected and to increase levels of academic performance in schools, it became important for me to be enlightened more on this teachers' professional knowledge base which goes beyond knowledge of content areas. Eraut is quoted by Day (1999) to have defined professional knowledge as 'the knowledge possessed by professionals which enables them to perform professional tasks, roles and duties with quality' (p.53).

Shulman and his colleagues (Shulman and Grossman, 1988: Grossman et al., 1989) who appeared to have intensively studied teachers' professional knowledge base addressed it under seven groups. These include: general pedagogical knowledge; knowledge of students; knowledge of subject matter; pedagogical content knowledge; knowledge of other content; knowledge of the curriculum; and knowledge of educational aims. However, other sources (e.g. Guskey and Huberman, 1995: Day, 1999) adopted different groupings when addressing this knowledge base. But my analysis reveals that in principle, all authors share the understanding that teachers ought to have: 1) general pedagogical knowledge, 2) subject matter knowledge, and 3) pedagogical content knowledge.

Although this teachers' knowledge base might be presented in categories or as discrete entities here, in reality the categories are interrelated.

General pedagogical knowledge (GPK)

This category as presented in the work by Guskey and Huberman (1995) and Shulman (2004) encompasses knowledge and beliefs about teaching, learning, and learners. Below I present the contributions on general pedagogical knowledge base of teaching.

Teachers need to understand theories which shape their own values and beliefs about education as well as learning theories which found their practice. Guskey and Huberman (1995) find these theories useful as they serve as bases for planning instructions. Preparing for instructions (Ball and Knobloch, 2005) is yet another role that teachers need to be knowledgeable of. I also find knowledge of learners and learning (Winne and Nesbit, 2010) as well as the environmental factors that could be manipulated (Guskey and Huberman, 1995) to be required of teachers or instructional leaders at all levels. Teachers also ought to be knowledgeable about adapting instructions to individual differences. These form areas that IPD could address.

Teachers also need to ensure order in the classroom and research (e.g. Veenman, 1984) reports class control to be a concern to inexperienced teachers. I view adherence to rules and procedures critical in the teaching of the practical components of agriculture. Livestock and crops enterprises used for teaching husbandry practices need to be attended to on regular intervals failing which may lead to the death of such crops and animals. This is emphasised by several scholars, including Ngugi et al.

(1978), Owen (1984) and Elliot et al. (1985). So devising monitoring strategies to ensure that learners honour their management turns is a task that faces each agriculture teacher.

Evaluating learning and providing learners with feedback is yet another general requirement of teachers according to Brophy (2002). This evaluation task becomes very important in the Botswana secondary agriculture curriculum (Ministry of Education, 2000 and Ministry of Education, 2010) because various ways of assessment are undertaken. For instance, agriculture teachers are expected to grade students' practical activities in which students have to: demonstrate skills in situ with teachers observing; sit for written and oral tests prepared and graded by teachers; and present research reports undertaken through the guidance of teachers.

Most important to note here is that the assessment is designed for students to demonstrate ability to recall, apply, and synthesise concepts as well as demonstrate skills (Ministry of Education, 2000 and Ministry of Education, 2010). This makes it necessary for teachers to be capable of teaching and testing at all cognitive levels of understanding proposed by Bloom (Anderson et al., 2001), using valid and reliable instruments. This implies that improvement of teachers' performance in assessing students at all levels of cognitive processes is one potential area on which IPD could focus.

Subject Matter Knowledge (SMK)

Subject matter knowledge is defined in literature to include knowledge of the content of the discipline (i.e. specific syllabus topics, procedures and ability to manage

agricultural enterprises) as well as the substantive and syntactic structures of the discipline (Grossman et al., 1989) that help relate ideas within and across the discipline . This implies that agriculture teachers, in this case, ought to master subject matter in agriculture at a level where they could explain why they teach it and relate its nature with the instructional practices. Inculcating the mastery of subject matter i.e. facts and concepts, and substantive structures by the teachers, may be an area on which IPD provisions may concentrate.

Pedagogical Content Knowledge (PCK)

The notion of PCK portrays the level of knowledge that forms part of the unique identity of the discipline thus claiming its importance in the entire knowledge base of teachers. This view gains support of Ball and Knobloch (2005) who specifically viewed pedagogical content knowledge in agricultural education programme to be an important factor in the teachers' professional knowledge base.

Closer examination of the agriculture syllabi for both junior and senior secondary level (Ministry of Education, 2000 and Ministry of Education, 2010) and other related material, coupled with information gathered from the reference group, showed that PCK of agriculture teachers would involve the understanding of all the aspects discussed under GPK and SMK above and how they relate in a broader picture. The list may extend for teachers to have deeper understanding of the systems politics and regulations underpinning their practice (Day, 1999). The long list implies a greater demand for IPD if at all the intention is to revitalise teachers in most of these areas.

Possible challenges and implication for IPD

Following the discussion of the teachers' knowledge base of teaching above, I identified the following challenges and implications for teacher learning and IPD design.

Some teachers may not find it necessary to be reminded of the basic knowledge of teaching: assuming to be proficient. But it might be that teachers missed some information during initial teacher training or the information might have become obsolete due to technological advancement, hence needing updating (Kirk and Glaister, 1988:). This has implications for Education Officers who may strive to identify the gaps existing in the teachers' knowledge base in the bid to convince the reluctant teachers to see the need for IPD support.

Due to the diverse nature of the teachers' knowledge base, teachers are likely to give some strands of it more attention than others. For instance, research (e.g. Marland and Osborne, 1990) has found that teachers concentrate more on students and ways to act than on the content. This suggests that IPD content ought to ensure balance of the different strands of the professional knowledge base of teaching. This created an interest for this study to explore the extent to which various strands of professional knowledge base, in the context of agriculture teachers, are given attention by IPD offered to them.

Again, given that the initial teacher training programmes may be constrained by limited time to adequately cover all aspects of the professional knowledge base of

teaching, the increase in demand for IPD to close the knowledge gap ought to be expected.

Literature, so far, enlightened us on the professional knowledge base of teachers which could serve as the content for teachers' IPD. However, literature further points out that IPD opportunities may not translate directly into best practice and improved student learning due to mediating factors (Leu and Price-Rom, 2006). Below, I review literature about the factors influencing teacher IPD.

2.10. Factors influencing IPD

This section sheds light on the factors influencing PD contributed by literature from elsewhere.

USAID/EQUIP1/AED (2004) identified personal characteristics of the teacher, policy related factors, and conditions at the local level as influencing the way effective PD activities impact teaching practice and student performance. This influence of mediating factors, in translating learning opportunities into practice, is also echoed by Leu and Price-Rom (2006) who elaborated further that:

> ...The nature of professional development, continuous or not, must connect with the whole school improvement programme, while the personal characteristics of the teacher provide a critical mediating factor as do a wide variety of conditions at school level (p.16).

Still emphasising personal characteristics, Flores (2005) maintains that 'it is not only necessary to consider what to offer as PD activity but also need to take into account what motivates teachers to learn' (p.487). Teacher motivation to learn was also identified by Steiner (2004) to be important in determining teacher learning.

In fact, Steiner (2004) emphasised the need to consider the entire context when making choices for IPD provisions. According to Stainer (2004):

> Planners need to consider variables such as available resources, other initiatives already underway, current practices and organisational culture as they determine what type of activity is best suited to a particular school or faculty (p.1).

Similarly, Flores (2005) in her work also pronounced the importance of considering 'the personal, contextual and political factors affecting teacher professional development' (p.487). This sentiment is shared by other scholars such as Day (1999) and Adey et al. (2004). Of importance, among the contextual factors, is the philosophical standpoint which is said to be 'frequently invisible or ignored' (p.37) despite its importance in education (UNESCO, 2005). Related to the philosophical viewpoint is the notion of 'value congruence' (p.142) raised by Day (1999). Value congruence has to do with:

> ...the fit between the underlying educational values promoted through INSET and that of the participating teachers. Where there is 'fit' or where existing beliefs are altered then ... there is an increased likelihood of impact on thinking and practice (Day, 1999, p.142).

Orientations, values and cultures add to teacher motivations that need to be considered when arranging IPD opportunities. School cultures that can facilitate professional development are highlighted in literature. For instance, it became clear in Day's (1999) work that teachers would learn better where: individualism is reduced; sharing of resources is encouraged; collaborative cultures are promoted; and there is reduced need for compliance. It therefore follows that the reverse of these cultures would constrain teacher learning.

Time is yet one other factor worth remembering here, because it is needed by teachers to participate in IPD activities. Unfortunately time is one commodity that is very scarce. According to Day (1999):

> when teachers in England were asked about professional learning preferences ... their responses, too, pointed to: the need for time to meet with colleagues from their own and other schools to discuss current issues and concerns; engage in curriculum development and [as well as] learn from outside speakers (p.146).

Practice shows that shortage of time is always a constraint as various school events compete for it. The shortage of time even led to some commentators querying the use of teaching time for IPD. According to Cook and Fine (1997) those against the use of teaching time for PD feel such time is solely for educating students, not teachers. But Ho and Yip (2003) observe that those against might have not seen the benefits of IPD. On the other hand I argue here that if the IPD provisions are to improve the practice that teachers are employed for, it should not be an issue to use the work hours to develop competencies to improve performance in their teaching. I find this time issue contentious. But whatever the argument, the need for time remains crucial as teachers need more time 'to reflect, work things out and think things through' (Steadman et al. 1995: cited in Day, 1999, p.141).

Given that in the Botswana education system there are no formal statutory days set aside for teachers' IPD, one wonders how teachers, especially those teaching agriculture, find time and gain stamina to learn. The schools' agriculture programme has so many practical projects that are exposed to students as part of field work, such as the management of goats, chickens, pigs, rabbits, vegetables etc. Apart from the field work, there are agriculture concepts that need to be taught to students in the classroom (Ministry of Education, 2000 and Ministry of Education, 2010). Like all

teachers, they are also expected to carry out all roles expected of any other teacher, including extra-curricular activities. While shortage of time is a common constraint in teaching, I share a strong concern here that agriculture teachers might be more affected than the rest of the teachers, given this background.

The absence of formal statutory days for IPD makes it even difficult to measure and help monitor the extent to which teachers in Botswana engage in professional development activities. There is also no guarantee that teachers have the opportunity to engage in informal means of PD. In the UK, for instance, a formal recognition that professional updating is part of a teacher's working life was shown by infusing five statutory in-service training (INSET) days in the schools' programme (Wellcome Trust, 2006). With this arrangement I learnt that, 'teachers would spend some of the time on implementing new government initiatives, some on trying out new teaching methods, some updating their own subject knowledge and on subject-specific professionalism' (Wellcome Trust, 2006, p.2) .

With regard to costs, research indicates increased expenditure associated with teachers' professional development (Day, 1999: Wellcome Trust, 2006). Ho and Yip (2003) also acknowledge the cost implications of CPD in terms of time and money: and they raised a concern that financial constraints may deny some teachers the chance to receive PD. They further recommended schemes like the unconditional no pay leave and partial pay leave that can afford all teachers the opportunity to be developed without heavy costs incurred by either the government or teachers (Ho and Yip, 2003). Some countries do try also to help teachers attain training without being curtailed by lack of funds. For instance, Israel is cited by Ho and Yip (2003) as

'offering probably the best condition for allowing teachers a sabbatical year at two thirds of their salary every seven years' (p.535) to attend PD provisions. Regardless of the costs, some observers find it necessary to invest in teacher training because teachers are the agents of quality education (Day, 1999: Tabulawa, 2009).

The contributions above have implication for agriculture teachers' IPD in Botswana and this study. The contributions suggest that IPD could be influenced by: teachers' personal characteristics, policy related factors, conditions at local level, political factors, organisational culture, relationship between the new and the existing initiatives (coherence), time availability as well as the knowledge and skills of those involved. This long range of situational and contextual factors could vary from one place to the other, thus making it necessary for policy makers to be familiar with the local context in which they are arranging IPD for teachers. They need to identify how best to synchronise orientations, values and cultures of the teachers and their surroundings with what is promoted through IPD.

The highlighted possible variability of the factors across different context, created interest for this study to study the factors influencing IPD for agriculture teachers in Botswana from the perspective of the teachers themselves.

Literature in this section points out that teacher learning, of whatever kind, is always embedded within context (Stainer, 2004) which has with it complex mediating factors (Leu and Price-Rom, 2006).

It is against this background that this study explores the factors influencing IPD in the context of agriculture teachers.

2.11. IPD contributions from locally generated research & commentators

Concerns have been raised by several local researchers and commentators about the inadequate in-service support received by the teachers in Botswana. For instance, Hulela and Oladele (2009) conducted a study to determine the level of job satisfaction of junior secondary agriculture teachers in the Gaborone region of Botswana. This was a census descriptive survey (N=49) which covered all 49 junior secondary agriculture teachers with data collected through questionnaires (r=0.72). Overall the study concluded that the agriculture teachers were moderately satisfied with factors related to satisfaction. Specifically, the study found that teachers were satisfied with interaction patterns among stakeholders and job environment. The teachers were dissatisfied with opportunities for their professional growth, job characteristics and available resource which I find crucial for professional growth. Even the proponents of teachers' IPD (e.g. Loucks-Horsely et al., 2010) point to these issues of time, resources, leadership and school culture to be critical contextual factors that determine the level of motivation by teachers to learn and grow professionally.

Although the findings may not be true for IPD provisions in the other regions of Botswana due to sample limitation, they have implications for this study. They help provide an insight into the contextual factors that are worth studying in this research. Exploring the status of these factors in other regions will help provide a nation-wide picture of their status which might possibly trigger a quick response from those implicated. The findings suggest that school heads, In-service Education Officers and the Regional Education Office should ensure that time and resources are availed to enhance professional growth of agriculture teachers in the Central Region of

Botswana. The findings also point at the importance of promoting cultures that could provide enabling environment for teachers to grow professionally. Implicated here are school heads and the In-service Education Officers who frequently interact with teachers.

In addition, Ramatlapana (2009) conducted a study investigating the perceptions of Mathematics and Science teachers in Botswana towards in-service provision rendered by the University of Botswana's Department of Mathematics and Science Education In-service Training unit (DMSE-INSET). Data were collected from a sample of 42 senior secondary maths and science teachers using questionnaires with open ended questions. This study identified the teachers' concerns regarding in-service training offered by DMSE-INSET to include lack of impact on the education system, no regular follow up to support the one-off workshops, and insufficient skills acquired to implement the strategies solicited by the workshops. These findings point to areas needing improvement to enhance effective teachers' in-service support in general, not only that which is offered by DMSE-INSET.

A further general study on the professional development of teachers, which employed questionnaire and interviews to study a small sample of selected teachers across all subjects and school heads, was conducted by Moswela (2006). Whereas I commend the researcher for the effort, the study did not address issues specific to the nature of any subject. I considered this a limitation "since experience has proven that the nature of the subject has a bearing on teachers' time and the stamina to learn" (Leu and Price-rom, 2006, p.16). However, the study concluded that for teachers' development programmes to be successful in their mission, they should be based on

what teachers encounter in the classroom. I find the conclusion validating the need for targeted research like this study, to enable IPD to address issues that matter for teachers of specific subjects.

On the aspect of IPD needs, the study by Mokgatle and Acker (2002) contributes information on what beginning agriculture teachers in the junior secondary schools of Botswana considered as their induction support needs. The study found the beginning teachers to have perceived a mentor teacher, opportunity to observe other teachers teach, feedback from the school head/ senior teacher, and provision of induction support as important to them. Although the study contributes valuable information, it would have been best if the views of teachers in the senior secondary schools could have been incorporated. As a way of bridging the gap therefore, I chose to include senior secondary school teachers as part of the population for this study so that their views, with respect to what they consider to be their IPD needs could also be identified.

Interestingly, the study by Mokgatle and Acker (2002) also revealed a mismatch in what the teachers needed versus the forms of induction assistance offered most frequently. The forms that teachers considered critical to them either did not either occur at all or occurred infrequently. This, according to the study, weakened the induction programme. This provides an example of an in-service programme which fell into the trap that professional development literature (e.g. Day, 1999: Guskey,2002: Crossley, 2006) strongly cautions against: i.e. the trap of failing to consider context when designing and choosing professional development content. The finding implies that in order to render agriculture teachers' IPD activities relevant, authentic and effective, the agriculture teachers themselves ought to be actively

involved in designing them and choosing their content. In other words the IPD planning should adopt a bottom-up approach to ensure that the teachers' interests are met.

In his presentation on the effects of IPD activities, Lesetedi (2004) saw IPD as not only updating, revitalising or empowering teachers, but also ensuring that teachers enjoy their teaching by reducing stress associated with their work. This implies that the need to engage in IPD would, therefore, become more apparent with Agricultural Science Teachers whose teaching, according to Harper et al. (1990), is considered stressful due to its labour intensiveness compared to other subjects in secondary schools. This stressful condition is also reflected by the study entitled 'Teacher Burnout in Agricultural Education' (Croom, 2003), which found more than 50% of the agriculture teachers who participated in the study to have experienced, at least, moderate emotional exhaustion from teaching the subject. Deduced from the literature in this paragraph were issues relating to time and energy associated with teachers' learning whilst working. This literature suggests the need for this study to raise questions on how agriculture teachers perceive the influence by the nature of agriculture as a subject on their learning while at the workplace.

2.12. IPD contributions from related external research & commentators

Some closely related studies which contribute to PD issues that are of interest to this study have been conducted in other countries in the context of teachers of other subjects. This research literature contains a mix of large and small scale studies including case studies, evaluation of specific approaches to improving teaching and

learning, surveys of teachers about their in-service professional development experiences. Below I briefly present some of the studies which raised my awareness on some IPD issues that benefited this study.

Research aimed at investigating teachers' views of their professional learning and its influencing factors was conducted in Portugal by Flores (2005). In this study data were gathered by means of questionnaire (n=627) and semi-structured interviews with teachers and head teachers in 18 schools. This study found that teachers undervalued more formal contexts of professional learning (i.e. Initial Teacher Training, Teaching Practice, and In-service Education) and valued a context specific and on-the-job form of learning, including classroom-centred processes of learning. This implies that teachers have preferences as to what, where, how and when they learn hence the need to consider their views on matters that concern their professional growth. These findings contributed to creating an interest for this study to raise questions on venues and methods used during IPD.

Studies by Garet et al. (2001) and Desimone et al. (2002), both of which were conducted in North America, examined features of teachers' professional development and their effects on changing teaching practice in mathematics and science. These studies, which used questionnaire and interviews, found that six features of professional development were related to increases in teachers' self-reported knowledge, skills, and changes in teaching practice (See the features under section 2.5). These two pieces of research raised awareness that not every IPD activity is effective, thus creating interest in this study to among other things explore the

characteristics of IPD that agriculture teachers experienced with the intention of finding out if there are any which hinder teacher learning.

One large study on 'Teachers' Perceptions of Continuing Professional Development' was conducted in England by Hustler et al. (2003). In this study data were collected through the use of a questionnaire survey (n= over 2500) and some case studies (22 schools) using 'CPD pen-portraits' of individual teachers to provide additional information. Teachers in primary, secondary and special schools were involved. The questionnaires focussed on INSET and CPD activities undertaken during 2001 and more general CPD experiences undertaken during the previous five years. The key findings were that:

- Most teachers were satisfied with their CPD and perceived the CPD features to be relevant and applicable to their setting. However, 'one size fits all' standardised CPD provision was devalued for not considering teachers' experience and needs.
- Few teachers took part in activities such as research.
- Financial cost, distance from training opportunities, and workload hindered access to CPD.
- Most teachers felt that school development needs and national priorities had taken precedence over teachers' individual needs

Several studies discuss the challenges, opportunities and benefits associated with teachers' IPD. Some challenges are associated with differences in teachers. For instance, the Teacher Quality and Educational Leadership Taskforce (2003) cautioned that:

> ... teacher development is not a simple linear process. They [teachers] enter the profession with varying levels of prior learning, work experience and professional preparation, and work in a range of different contexts (p.9).

This difference in teachers' background results in teachers possessing different professional needs, and this makes it difficult for professional development providers to effectively package relevant professional development content designed to meet a variety of teacher needs. Nonetheless, Law and Glover (2000) noted that maintaining motivation and boosting the morale of teachers should be seen as success criteria for professional development activities. This illuminated the need for this study to explore differences in perceptions of different groups of teachers on IPD according to their background information so that ultimately, balance could be ensured to reconcile different needs with what is on offer.

On their part, from an inclusive education angle, Lewis and Bagree (2013) call for inclusive consultations when IPD provisions are planned. These observers maintain that

> 'Continuous Professional Development needs to be designed and delivered with inputs from diverse stakeholders in particular… professionals with disabilities – to give stronger sense of reality to teachers' learning experiences' (p.1).

I find the call appropriate not least because Botswana cherishes democratic principles (Ministry of Education, 2004) and is also a signatory to international conventions that respects human rights and promotes education for all (UNESCO, 2005). These conventions include the Millennium Development Goals, the Jomtien Declaration, and the Dakar Framework for Action (Ministry of Finance and Development planning, 2009). This contribution has implication for not only planning agriculture teachers' IPD in the Central Region but also planning any education

operation at all levels in Botswana. It suggests IPD interventions which strive to accommodate teachers with disabilities and those from less privileged areas given that some rural areas in the Central Region are far from centres that have better facilities.

Having looked at the current status and perspectives of IPD in Botswana, as well as having highlighted what generally entails an effective teachers' PD provision, below I go on to suggest the characteristics for effective IPD for agriculture teachers in the Central Region of Botswana in order to later guide my analysis of findings and the study recommendations.

2.13. Proposed characteristics for effective IPD for Agriculture teachers in the central region

In this section I draw together the ideas arising from the literature presented in this chapter and propose the characteristics for relevant and effective IPD for Agricultural science teachers in the Central Region of Botswana. Here I have mainly summarised the characteristics, as the justifications have been covered in the preceding sections.

The vastness of the Central Region calls for IPD that could support growth of teachers as individuals, as well as part of a group. In addition, such an IPD framework ought to support IPD activities that are generated by the teachers themselves to address their local needs, as well as those generated by the education authorities to help teachers implement policy-related innovations. An effective IPD framework is considered to have a multi-dimensional structure (i.e. complementary IPD components) that would afford it the opportunity to fit the purpose at any given time

and situation. Joyce and Showers (2002) maintain that no one model would be appropriate for all the settings all the time.

The IPD at the regional level ought to consider the importance of combining the virtues of the PD models discussed in literature: including the works of Sparks and Loucks-Horsley (1989), Gaible and Burns (2005), Kennedy (2005), Joyce and Showers (2002) and Loucks-Horsley (2010). I find many aspects of these models, and their components, to have stood the test of time with old and current examples of their success recorded, from local and international settings. These include successes, in terms of accomplishing their objectives and enhancing learning, which benefited some schools and teachers of other subjects either in Botswana and elsewhere around the globe.

Furthermore, the IPD structure would have to recognise the existence of multiple purposes or reasons for continuous professional development of teachers, which according to Schwille and Dembele (2007) include:

> 1. Learning to facilitate implementation of policy or educational reforms;
> 2. Preparation of educators for new functions;
> 3. School-based learning to meet school needs and further school development; and
> 4. Personal professional development chosen by individuals for their enrichment (p.103).

The envisaged structure would have to ensure that these short and long term objectives for teachers' PD are achieved. And it could be for this multiplicity of purpose that I

propose incorporation of diverse forms of teachers' PD by the envisaged IPD framework.

In summary I learnt from a wider body of literature in this chapter that an effective teachers' professional development could be that which:

1. is driven by identified needs of both the teachers and students (Guskey, 2000: Whitehouse, 2011). It is from the teachers', students' and schools' needs that both short and long term IPD objectives are based;
2. is collaborative and therefore could be sustained longer to ensure change of beliefs and cultures.
3. is subject specific, given that subjects vary in nature and for that reason IPD providers ought to employ relevant strategies when offering targeted IPD opportunities (Whitehouse, 2011).
4. promotes professional growth of teachers as individuals and as a group either in a department, school, region or the nation at large. Groups here may include those involving learning by two or more teachers within or out of school settings depending on the purpose.
5. couches an on-going and lifelong professional learning by teachers: thus responding to the call by the RNPE (Republic of Botswana, 1994b)
6. promotes the use of authentic contexts given that agriculture deals with actual plants and animals that might thrive differently under different locations: thus making it necessary to offer IPD within the context in which teachers work. Consequently, IPD would become meaningful to teachers.

7. promotes the use of a combination of IPD strategies for they have proven to be more successful as compared to the employment of individual activities (Cordingley et al., 2003). The characteristic encourages cohesion amongst IPD activities supplementing one another to achieve the common goal. This considers the point that new IPD interventions might find others already in place.

8. encourages activities that focus on specific academic content required of students (Garet et al., 2001).

9. embodies authentic provisions that connect to practice and link to school-wide effort.

10. promotes access to expert performance (Whitehouse, 2011) and modelling as knowledgeable veteran agriculture teachers would be expected to support the newly appointed teachers.

11. encourages classroom coaching and scaffolding at critical times, as knowledgeable agriculture teachers would need to provide support to others at departmental level. This could be achieved through observations and offering feedback.

12. promotes teamwork and collaborative construction of knowledge given that agriculture teachers (within or across schools) are expected to implement the agriculture curriculum as a team hence the ideas of common planning and testing encouraged at school, cluster or regional level (Republic of Botswana, 2010).

13. offers ample time for teachers to reflect on their practice after implementing interventions, so helping to chart ways for improvement;

14. encourages administrative support on teacher learning since they (teachers) could learn better under enabling learning environment (Sparks and Loucks-Horsley, 1989) ensured by authorities at school, regional or ministerial level. Ensuring cultures that sustain learning by both teachers and students in a school setting is one of the factors

emphasised by most prominent writers on teachers' professional development including Guskey and Huberman (1995) and Day (1999).

15. promotes cultures that enforce collegiality to ensure conducive learning environments for teachers.

16. helps teachers effectively implement policy-related innovations initiated by education authorities, or helps teachers gain 'deep-seated changes' (Adey et al., 2004, p.6) in them and their practice, through both individual and whole-school commitment to change.

17. fosters follow-ups during IPD interventions as suggested by Ramatlapana's (2009) study.

18. has with it the mechanisms for monitoring implementation of IPD interventions as well as their evaluation through making an assessment an integral part of learning within given tasks. Evaluation could be made with the aim of improving IPD impact on the teachers and their practice as well as students' academic performance.

19. has a well-defined organisational structure and is adequately funded (Whitehouse, 2011)

Over and above the list, one would expect effective IPD in the context of the teaching of Agriculture in schools in Botswana, Central Region in this case, to be able to: make teachers confident in their subject matter knowledge (needed for teaching); help teachers improve their pedagogical skills; instil in teachers attitudes, emotions, and visions that will help them handle their learners effectively; help teachers improve their interpersonal relations; and help teachers improve their life skills in general. But as to which IPD activities can effectively help teachers achieve all these remains a challenge because situations will vary. Guskey and Huberman (1995) maintain, and so

do I, that what is listed as features of effective PD are only guidelines that suggest ways leading to successful PD. They may not apply across the board even at the level of Central Region. There will be always a need to adapt the provisions to situations at hand.

In a nut shell, this long list of the characteristics suggests that an overall model of IPD for Agriculture teachers needs to embrace a combination of elements of different PD models in order to address diverse professional development needs and the situations of teachers and institutions where teachers serve. The characteristics also suggest the need for context (e.g. time, cultures, leadership and resources) that could promote learning by teachers.

2.14. Literature on research methods and ethics

As it will be seen in the next chapter, insights on procedures that guided this study were drawn from several contributors and the contributions are threaded across the chapter. Scholars such as Crotty (1998), Pring (2000), Miller and Brewer (2003) shed light on the methodologies underppining research. Teddlie and Tashakkori (2009) and Creswell and Plano Clark (2007) shed light on the mixed method design adopted by the study. Authors such as Smith (1972) highlighted the need to observe ethical considerations to ensure that this study respected the rights of subjects and adhered to the ethical standards of research. For qualitative and quantitative data analysis this study benefited from the works of several writers like Bryman and Burgess (1994) and Robson (2011) respectively.

2.15. Chapter Summary

This section shares knowledge and beliefs drawn from literature about effective professional development.

This Chapter framed my conceptions about the phenomenon under study and ended up having discussed a wide range of existing knowledge and beliefs about effective PD which enlightened a number of key aspects explored by this study. The research questions informed the framework of the chapter. The aspects discussed here included the definition and rationale, theoretical framework, characteristics, IPD models, IPD needs and factors associated with IPD, and the professional knowledge base of teaching.

The ideas raised have implications for Agriculture teachers' IPD in Botswana. Theories and contributions by various authors stimulated my thinking about issues of IPD organisation and how teachers could be helped as adult learners. Given that information about the issues raised in the context of Agriculture teachers' IPD in Botswana is lacking, the identified issues formed the basis for developing sources of data in this study. This response shows how this study worked towards claiming its contribution to knowledge.

Although the theories discussed deepened my understanding and contributed areas for research, I identified their challenges. The general challenge concerns that of their compatibility with the local context given that they originate elsewhere. However, I acknowledged that if such proposed theories are embodied in a well thought of framework: 'multi-faceted model', they could be beneficial to the IPD for Agriculture teachers in Botswana, the central region in particular. The next chapter discusses design, procedure and methods I adopted in this research.

CHAPTER 3: DESIGN, PROCEDURES AND METHODS

3.1. Introduction

This chapter describes how the study was conducted. To evidence transparency and robustness in designing instruments as well as collecting and analysing data for this study, I present a detailed description of such processes in here.

Although details will follow later, this study design was based on the use of mixed methods including a qualitative component (teachers' accounts) and a quantitative component (perceptions in numerical form) (Creswell and Plano Clark, 2007). The two datasets were combined so that they supplemented each other in informing the study. The chapter also keep reflecting, at appropriate sections, on the measures I took as ethical considerations to ensure that this study respected the rights of subjects and adhered to the ethical standards of research

3.2. Structure of the Chapter

This chapter will first reflect on the theoretical position underpinning the study as well as the design adopted for the study. Thereafter, it will present justification of selecting the Central District, study population and sampling process, development of data sources, data collection processes and associated ethical considerations, data handling, data analysis and associated ethical considerations, and a chapter summary in that order.

3.3. Philosophical Underpinnings and Research Design

I understand philosophical or theoretical underpinnings to be the ways I conceptualize social phenomena, and this has formed the background against which I carried out this study. This view is consistent with the views of Pring (2000), Miller and Brewer (2003) and Bryman (2008). In any study, choices are made with regard to the use of methodology and methods that could best help researchers answer the questions raised, and these are impacted by the assumptions of our theoretical perspectives (i.e. how we see the world). In support of this observation, Crotty (1998) claims:

> Justification of our choice and particular use of methodology and methods is something that reaches into the assumptions about reality that we bring to our work. To ask about these assumptions is to ask about our theoretical perspectives (p.2)

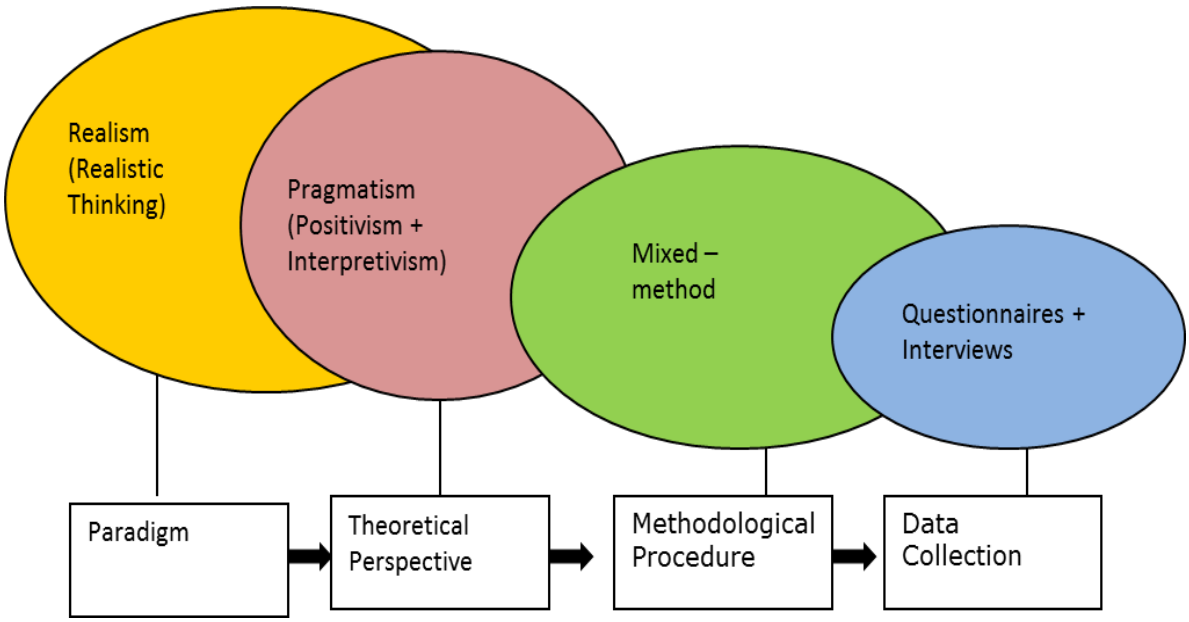
Crotty's claims also highlight the need for justifying the choices we make as researchers which is also emphasised by Bryman (2008) and Thomson and Walker (2010).

I will explain the use of key terms used in this work before I continue the discussions. A paradigm, for instance, is considered to be a basic belief about knowledge having epistemological and ontological components (i.e. P=E+O). In this equation epistemology asks a question of what knowledge is and how can it be studied (Pring, 2000: Potter, 2000: Miller and Brewer, 2003). Conversely, ontology is concerned with questions of whether or not social reality can be studied with precision (Krauss, 2005: Bryman, 2008). Again, because our values and feelings may impact the way we see knowledge, we can as well connect that the ontological considerations impact on our epistemological positions which in turn influence our thinking about the methodologies and data collection tools and Hitchcock and Hughes (1995) supports

this idea. Literature has classified positivism, realism and constructivism or constructionism as paradigms. Positivism again appears in the second level list of theoretical perspectives together with interpretivism (Crotty, 1998: Krauss, 2005).

Figure: 3.1 below illustrates the underlying theoretical perspectives that underpinned the study. It will also help see how I conceptualized the connection between the theoretical perspectives and data collection tools.

Figure 3.1: Linking theoretical perspectives and research methods (Imagined)



Realistic paradigm

When I considered ways of conducting this study, as reflected in Figure 3.1, I already had a basic belief or viewpoint about the nature of reality (i.e. epistemological view). I perceived knowledge from a flexible perspective where it could be both generated by the researcher and the researched or be found ready-made as well. In relation to my ontological view, I have always seen the possibility of studying human reality both objectively and subjectively. Therefore the way I perceive knowledge and how it

could be studied, appears to coincide with the Realists' (Realism) way of thinking about social reality.

I illustrate in Table 3.1 below that whilst realism recognises reality in the world that can be observed and measured, it also recognises the need to build theory i.e. induct theory (Healy and Perry, 2000: Krauss, 2005). Realists also recognise that reality is a product of social interaction and in this case it cannot be studied independent of the values of the researcher (Bisman, 2002).

It appears that realists occupy the central position between positivism and constructivism. Adding to this Krauss (2005) posits:

> With realism, the seeming dichotomy between quantitative and qualitative is therefore replaced by an approach that is considered appropriate given the research topic of interest and level of existing knowledge pertaining to it (p.762).

This therefore implies that researchers who associate themselves with the realistic view tend to adopt a flexible stance that gets enriched by drawing ideas from the Positivists as well as Interpretivists' views in guiding enquiry. This dual element of the Realists' perspective brought to my understanding that being pragmatic and using mixed methods in this study would better help to study IPD for agricultural science teachers.

The realistic perspective also acknowledges that knowledge is constructed through meaning making by people 'who experience a phenomenon of interest' (Krauss, 2005, p.760). They find multiple realities existing in the world as well. According to them the researcher and the researched interact to generate data. They also see knowledge as context dependent (Cousins, 2002).

Table 3.1: Realism as perceived by different authors

Source	**Called it**	**Epistemological & Ontological perspectives** (In) Realism...	**Suggested procedures and methods** (In) Realism...
Healy and Perry (2000)	Realism	...[recognises] *a reality "out there"* *...[conversely] emphasises the building of theory rather than* [testing it for generalisability] (p.124) *...assumes ... "contingent validity"* (p.125)	*...involves triangulation of several data sources* ...(p.125)
Krauss (2005)	Realism	*...has elements of both positivism and constructivism ... while positivism concerns a single, concrete reality and interpretivism a multiple realities, realism concerns multiple perceptions about a single, mind independent reality* (p.761) *...knowledge of reality...cannot be understood independently of the social actors* (p.761)	*...both qualitative and quantitative methodologies are seen as appropriate.* *...unstructured or semi-structured interviews are acceptable* (p.762)
Lincoln and Guba (1985)	Realism	...realities are constructed...	
Guba & Lincoln (1994) In:Denzin & Lincoln (Eds)	Post-positivism	…[assumes] *modified dualist/ objectivist; critical tradition/ community; findings probably true (p.109)* ...[assumes] *"real" reality but only imperfectly and probabilistically apprehendable* (p.109).	*…modified experimental/manipulative; critical multiplism; falsification of hypotheses; may include qualitative methods* (p.109)
Lincoln & Guba (1985)		Rather than being value free, as in positive research or value –laden in interpretive research realism is central)	
Bryman (2008)	Realism	...[shares] *a view that there is an external reality ...that is separate from our description of it* (p.14)	...[shares] *a belief that the natural and the social sciences can and should apply the same kinds of approach to the collection of data...* (p.14)
Dobson (2002)	Critical Realism	...recognition of a transitive and intransitive dimension to reality provides a useful basis for bridging the dualism between subjective and objective views of reality..(internet)	

NB/ compiled from: Lincoln and Guba (1985), Denzin & Lincoln (1994), Healy and Perry (2000), Dobson (2002), Krauss (2005), Bryman (2008).

The above assumptions imply that information I would gather may not be the same across the subjects of the study hence cautioning against unguided generalisations. They also imply that in order to uncover knowledge I need to interact and engage with the world. Emphasising on people who experienced the phenomena, enlightened the need to study teachers who are better placed to explain what concern them rather than depending on the judgement of outsiders (Morant, 1981).

Justification: My identification with the Realist view is justified by the concerns of the study with the development of teachers as social beings. The view allows me to consider the complexity associated with studying teachers and to realise that they were better placed to reveal what could work best for them in their context. There was also the need to consider factual information when carrying out the study.

Challenges: The Realists' assumptions emphasise context and time bound knowledge, however, time and funds for data collection were restricted to an extent that thinking of taking time with a substantial number of subjects to generate data posed a challenge. The vastness of the region of study also compounded the challenge because I had to gather views from teachers of all the schools in the region. I assumed possible differences amongst schools in terms of the way some school-based IPD activities were conducted. I therefore provided in the study ways of testing for differences. The assumption that only individuals are best placed to explain what concerns them might lead us to fail to recognise that as individuals we may not know all that impacts our felt needs. I therefore, found it necessary to create room for other people (EOs), from outside, to explain what may impact the feelings of teacher as well.

So then, having viewed social reality as complex and realised the challenge I cited above, I chose to be identified with the theoretical position that would allow me to use data collection methods that would examine IPD from different angles. Research literature (e.g. Onwueghuzie and Leech (2005), Creswell and Planoclark (2007), and Creswell (2009)) present positivism and interpretivism as two main theoretical positions which have been commonly discussed and have even caused contentious long debates among purists who kept the two perspectives separate.

Hitchcock and Hughes (1995) regard the two positions as 'predominant models of social research' (p.17). Researchers holding a positivists' position assume that the social world can be studied objectively (Arends, 2004). Conversely, interpretivist researchers assume that the researcher also plays a role in the data making process (Pring, 2000) and are interested in grasping of meanings in a given context as well (Creswell, 1998). So, in evaluating the two theoretical positions I saw value in both of them in relation to this study. For instance, I found positivists' assumptions promising to help me collect factual information from a large group of teachers in a short space of time. On the other hand, interpretivists' ideas are helpful in understanding the emotional aspects associated with teacher involvement in IPD. That way, I had to strike a balance between the two to establish my locus.

Newman and Benz (1998) and Onwuegbuzie and Leech (2005) argue that both traditions are needed to gain a more complete understanding of phenomena. This view seemed to be consistent with my own thinking because I also treated the two as occupying the opposite ends of a continuum where they can enrich each other. I then

chose to be pragmatic in approach for data collection to ensure that this study benefits from the virtues of the positivists' and interpretivists' perspectives.

Pragmatism

Pragmatism is the philosophical basis for data collection in this study. Pragmatists, according to Creswell and Plano Clark (2007, p.15) 'believe that multiple paradigms can be used to address research problems'. Onwuegbuzie and Leech (2005) saw pragmatists as advocating integration of methods 'within a single study ... in order to understand better social phenomena' (p.377). Pragmatism is regarded as the best philosophical foundation for mixed methods research. It 'allows for the use of mixed methods in social and behavioural research' (Tashakkori and Teddlie, 1998, p.13). Pragmatists ascribe to the belief that research questions should direct the method(s) used, believing that effective studying of the phenomena might be constrained by being identified with either positivism or interpretivism (Miles and Huberman, 1984: Teddlie and Tashakkori, 2009). They advocate for using the approaches that work best for the research question at hand (Robson, 2011). As a result of my pragmatic position on studying the IPD phenomenon, I adopted the Mixed Methods Design to direct the subsequent research procedures (quantitative versus qualitative) and methods (data collection tools).

Mixed Methods Design

Mixed methods design is considered to be underpinned by cross-paradigm assumptions 'that guide the direction of the collection and analysis of data and the mixture of qualitative and quantitative data in ... a single study' (Creswell and Plano-Clark, 2007, p.5). This design is based on the premise that 'the use of the quantitative

and qualitative approaches in combination provides a better understanding of research problems than either approach alone' (Ibid. p.5). Holding a similar view is Greene (2007). I consider the design to have the potential of allowing the quantitative results and qualitative findings to supplement each other, thus enabling better understanding of the phenomenon under scrutiny than would have been achieved by employing a mono-method study (Strauss and Corbin, 1998: Teddlie and Tashakkori, 2009). However, those who have studied this design carefully see it as challenging, time consuming and expensive as it involves the collection and analysis of two data sets, and may even result in conflicting findings (Robson, 2011).

In selecting the Mixed Methods approach, I considered some procedures regarding the mixing of the qualitative and quantitative datasets as suggested by Creswell and Plano-Clark (2007) as follows: First, I decided the order in which I intended to collect, analyse and interpret the data sets. I then chose the 'concurrent procedure' where 'quantitative and qualitative data are collected, analysed, and interpreted at (approximately) the same time' (Creswell and Plano Clark (2007, p.81) and at the single phase of the study.

Second, I decided to give the two data sets an equal weighting in informing this study. In taking this decision I was driven by my position that both positivism and interpretivism have strengths that could complement and enrich each other in viewing the reality of IPD (Bryman, 2008). Again the research questions did not suggest any difference in priority between the methods.

Third, I decided how the qualitative and the quantitative methods would be mixed. Here I chose to merge the two data sets at the interpretation stage. The decision was influenced by the need to avoid confusion as well as to ensure clearer processes that could be accessed with ease. With this procedure, as Creswell and Plano Clark (2007) put it, data sets are 'analysed separately in a result section and then merging ... results together during the interpretation or discussion phase' (p.83). Separate analysis here was also meant to benefit from the strengths of each paradigmatic position: 'the complementary strengths thesis' (p.98) as pronounced by Teddlie and Tashakkori (2009). The combination of these three decisions matched the choice of triangulation as data mixing procedure for this study. Further discussions on the choice of triangulation and its variant as data mixing procedure for this study is continued in this chapter under 'Procedure and Rational for Mixing data' (Section 3.7.2).

My acceptance of Pragmatism and a mixed methods approach coupled with research questions directing the procedures and methods of the study, influenced me to embrace some assumptions originating from either positivists' or interpretivists' stand points, which appeared relevant for this study. Robson (2011) supports this idea of drawing from what works.

The research questions introduced in Chapter 1 directed the procedures and methods for this study. Since the questions are 'contextual', 'diagnostic', 'evaluative', and 'strategic' in nature (Bryman and Burgess, 1994, p.174), this study has qualities of applied research which aims at informing IPD policy. As a result, its design, as well as the data collection and analysis procedures, drew a lot from some insights associated with applied policy research. These included recognising the importance of gathering

facts (thus deducting from theories) and learning from the data (inducting theories) which was applicable when attempting to 'understand complex behaviours, needs, systems and cultures' (Bryman and Burgess, 1994, p.173).

3.4. Why the Central District

This study only focussed at studying the IPD of agricultural science teachers in the Central Region of Botswana. The Central Region of Botswana was selected on grounds that:

a) as compared to other regions there was already an on-going plan at the region to develop strategies for rendering effective IPD to the teachers (Maedza, 2010), following the idea by the Ministry to decentralize the coordination of IPD in the country (Republic of Botswana, 2006). For that reason there was a need for urgent targeted studies to inform the said IPD plans.

b) it has the largest number of junior and senior secondary schools which could be studied in rural, semi-urban and urban areas, and so to allow comparison of perceptions between school locations. Differences would serve as a reflection of the inconsistencies in the way IPD is provided to teachers.

c) being the largest region, it offers the best alternative to setting up a national study which could not be undertaken because of time and financial constraints. Even though findings remained valid for the central region, to some degree, inferences could still be made regarding the perceived status of agriculture teachers' IPD in the entire country.

d) I also had an access since it is the region I once worked and lived in it.

3.5. Study Population

The population for the study consisted of Secondary School Agricultural Science Teachers and Education Officers for agriculture in Botswana. The population of teachers consisted of those at both junior and senior secondary schools in the studied region, who were in the field during the period of data collection. In order to control frame error (Osuala, 2001: Stern et al., 2004), an up-to-date list of the schools and that of agriculture teachers was obtained from the Regional Education Office in Serowe.

With Education Officers being few in number, all nine who were in the field at the time of data collection were selected to be interviewed. But with one Education Officer declining, only eight were interviewed. Education Officers were not involved in answering questionnaire items. It was believed that being the supervisors of the teachers, Education Officers might be in a better position to advise on issues pertaining to the professional development of agricultural science teachers, hence their inclusion.

3.6. Sampling (Selection of schools and subjects for interviews)

The discussion below reveals the procedure I followed in selecting schools and teachers for the interview phase of the study. It has to be noted that for the survey phase all the two hundred and forty seven (247) agriculture teachers in the region were studied.

3.6.1. Selection of schools

I selected schools by using the stratified random sampling technique (Isaac and Michael, 1995). I first grouped schools, and from the groups I randomly selected some

from which teachers were to be interviewed. The grouping of schools was according to school geographical location (i.e. rural, semi-urban, and urban), education phase (juniors and seniors) and school performance. In this case, the school performance was viewed in terms of student academic achievement monitored over a five year period (2004 to 2008). The final examination results for agriculture taken within the specified five year period, were sourced from Botswana Examination Council. After computing the average performance for each school in the region across the five years, all the schools were then rank-ordered (seniors separated from juniors) from high to the lower average. This was then followed by the establishment of the high, middle and lower quartiles where I simply divided the total number of the ranked schools by three (See 'Schools performance tables' file in CD-ROM). So, based on the average performance of the schools that was established, I considered a school to be high (H), average (A) or low (L) performing if its established performance average across the five years fell in the upper, middle or lower quartile respectively. The schools' selection therefore took place as described in the following paragraph.

Three of the eight senior secondary schools, one from each of the three performance levels, and nine of the fifty nine junior secondary schools, three from each of the three performance levels, were randomly selected, making a total sample of twelve schools (See Table: 3.2 below for clarification).

> The procedure for randomisation adopted was drawing lots (Gomez and Gomez, 1984). With this technique, the schools' numbers were written on small pieces of paper, which were then uniformly folded, thoroughly mixed and placed in a container from which one piece of paper was drawn at a time until the right population was reached.

Three junior secondary schools for each performance category were selected also ensuring a representation according to school location (i.e. rural, semi-urban, and urban). The selection of schools according to students' academic achievement in agriculture was based on the assumption that differences in performance could reflect differences in teachers' attitudes and perceptions, hence engagement in IPD across the schools. As IPD is often undertaken on the premise of improving teachers' practice and student achievement (Leu and Price-Rom, 2006), it is assumed that low performance may be related to lack of motivation and engagement in IPD activities by teachers and vice versa. Therefore, it was important for this study to establish whether or not there were differences in teachers' perceptions across schools of varying performance.

Table 3.2: Number of schools sampled across levels of school performance and education phase

School level	Schools by Performance			Total
	H	A	L	
Senior	1 (2)	1 (3)	1 (3)	3 (8)
Junior	3 (20)	3 (18)	3 (21)	9 (59)
Total	4 (22)	4 (21)	4 (24)	**12 (67)**

Key: H – High performing

A – Average performing

L – Low performing

( ) – Total number of schools in the region

The Central Region of Botswana as can be seen in the map (Figure 1.1, p.2) is large. So, care had to be taken to ensure an even geographical coverage of schools for the study if meaningful generalizations to the whole region were to be made.

3.6.2. Selection of Teachers

The selection of the twelve schools as stated above was followed by the selection of three teachers from each of the identified schools. This brought the total number of teachers interviewed to thirty six (See Table: 3.3 below for clarity). Oppenheim (2000) suggested thirty to forty detailed interviews as a 'probably typical' (p.68) number that can be conducted. But he emphasized that 'quality rather than quantity, should be the essential determinant of numbers' (Ibid. p.68) of depth interviews to be conducted, taking into account the extraneous pressures that usually compel reduction of numbers to a minimum.

Table 3.3: Number of agriculture teachers interviewed across levels of school performance and education phase

School level	Schools by Performance			Total
	H	A	L	
Senior	3	3	3	9 (53)
Junior	9	9	9	27 (194)
Total	12	12	12	**36 (247)**

Key: H – High performing

A – Average performing

L – Low performing

( ) – Total number of teachers in the region

The technique used to select the teachers, in this case, was an Extreme Case Sampling which is "a purposeful sampling procedure where the researcher selects cases that are rich in information because they are unusual or special in some way or highly enlightened" (Patton, 1990, p.169). Through this technique I purposively

selected three teachers from each identified school to ensure representativeness of teachers by gender, age, qualification, teaching position, and experience. This therefore, meant that one of the three teachers had to be a department coordinator who also was likely to be one of the experienced teachers in the department. It was planned that with the additional two teachers, the gender, age, and qualification variables would be satisfied, thus ensuring representativeness of the parameters of the target population (Silverman, 2001). This pattern of selection was adopted since it was in the interest of this study to also establish whether these variables (such as gender and age) accounted for any difference or pattern in the teachers' responses. In order to prevent sampling error, the use of an up to date 'sampling frame' (i.e. list of teachers) (Harper, 1991, p.24: Osuala, 2001, p.125) was obtained from the secondary department in the Ministry of Education in Botswana.

The other condition to note was that teachers who had participated in any of the formal IPD activities in the last 12 months were preferred. This was done since not all teachers had the opportunity to attend external IPD activities. The idea was to select teachers who were better positioned to remember their IPD experiences, which possibly enabled them to answer questions in depth. Wragg (1978) cautioned that 'when respondents are being asked to describe or evaluate events, they should be interviewed as close to those events as feasible as the human memory is frail' (p.7). I assumed that teachers who participated in the IPD activities some years back might not be as resourceful as those who had recently experienced such activities. I therefore selected teachers on the basis of how recently they participated in the IPD activities.

The use of an extreme case sampling technique helped me select teachers who supplied relatively more information, as recommended by Patton (1990). Of-course, the technique did not give every member of the teachers' population a chance to be included in the group of those interviewed, thus presenting the possibility of bias. However, it was useful in ensuring that a sample representing schools and the teachers' characteristics according to the criteria set was attained. After all, 'no sampling procedure, not even random sampling, guarantees a totally representative sample' (Ibid. p.173).

3.7. Choosing Procedures and Data Collection Methods

3.7.1. Approaches involved in the study

The approaches and methods I adopted had both a quantitative component (positivism) and qualitative component (interpretivism). This was therefore a mixed methods study. According to literature, the combining of methods could be 'within a single paradigm (quantitative or quantitative), and across methodologies' (Moran-Ellis et al., 2006, p.45).

From the quantitative perspective teachers were requested to present their views by rating on the scales provided in the questionnaire. The approach involved numbers (Leedy, 1993) and had 'an objectivist conception of social reality' (Bryman, 2004, p.62). Conversely, the qualitative approach involved sourcing of worded data from agriculture teachers and Education Officers through structured interviews. The approach enabled taking into account context, depth and meanings (Creswell, 1998) when studying the phenomenon of IPD.

3.7.2. Procedure and rationale for mixing data

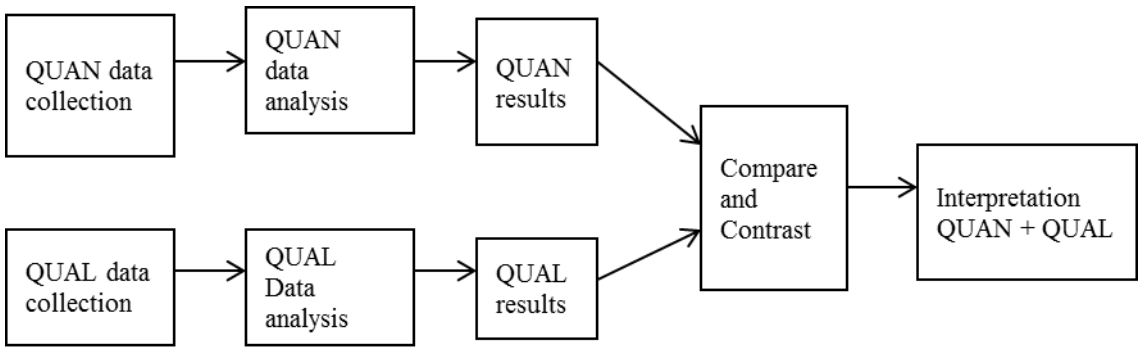
Out of the four major types of mixed methods designs being: triangulation, the embedded, the explanatory and the exploratory designs' (Creswell and Plano Clark, 2007, p.58), the triangulation procedure was adopted for mixing datasets in this study. According to Creswell and Plano Clark (2007), the triangulation variants of convergence, data transformation, validating quantitative data, and multilevel models, mix datasets differently. The convergence model was therefore adopted in this study since it matched the qualities that this study had:

> ... a single phase [both datasets were collected concurrently but separate]; b. both types of data were given equal emphasis; c. the two datasets were converged during the interpretation and the intent was to draw valid conclusions about the research problem' (Ibid. p.84).

The rest of the variants did not match these sets of expectations.

My argument is that by allowing the two datasets to inform the study on an equal footing would ensure conclusions about the phenomenon that are valid and well substantiated. So, I regarded the procedure for mixing datasets, in this study, to be the Triangulation design of convergence model and conceptualised it as shown in Figure 3.2 below.

Figure 3.2: Triangulation Design of Convergence Model (Adopted from Creswell and Plano-Clark, 2007, pp 63-64)



Although the triangulation design of a convergence model was adopted in this study, it does not mean that it is beyond reproach, for it, as with any other design, has some shortcomings, some of which I experienced in this study.

First, expertise was required to analyze qualitative and quantitative datasets and mix results in a more meaningful way to result in meaningful conclusions. In addressing this challenge, I acquainted myself with techniques for analyzing both qualitative and quantitative data. Secondly, a challenge of deciding the way forward when qualitative and quantitative data disagreement could occur. As will be seen in Chapter 6, I addressed this challenge by reporting the contradicting pair of findings in parallel as suggested by Creswell and Plano-Clark (2007).

3.7.3. Input by the reference group for developing data collection instruments

Prior to deciding on what methods to use for this study, I solicited views regarding the issues that could be addressed in a study of this nature from a group of

seven purposely picked people (reference group) that comprised four teachers of agriculture in the South Central Region and three Education officials in Botswana. This was between 23/12/2008 and 25/01/2009.

Some of the issues raised by the reference group included those relating to the: contribution of various stakeholders in IPD (e.g. teachers, school administrators and Education Officers); practical factors influencing teachers' participation in IPD; scope of understanding IPD; networking of teachers; lack of professional standards; shift in the culture of teachers' engagement in PD activities; resources constraints; and clash of instructions between departments involved, hence the need for reorganising the teachers' IPD. I was also briefed of the local IPD provisions or settings that were in existence, which the interviewees expected the teachers of agriculture to utilize in enriching their content and professional knowledge. These settings include the schools' agriculture fairs, cluster meetings, fairs organised by the Ministry, various types of workshops and self–directed reading. I then took these views into account when conceiving the study and developing the sources of data. This therefore brings me to discussing the data collection instruments used in this study.

3.7.4. Data Collection Instruments

The adoption of a mixed method approach led to the use of multiple data sources which included: (1) a structured questionnaire to collect quantitative and some qualitative data from the agricultural science teachers and (2) semi-structured face-to-face interviews to gather more in-depth experiences as well as facts, and allow for

making links to the context. Below is a detailed discussion of data sources used, including their suitability for this study.

3.7.4.1. Questionnaire

A structured questionnaire (See Appendix: 6) was used, for I deemed it to be inexpensive, self-administering and hence time saving, anonymous, and comprehensive (Bryman, 2008). The items in the questionnaire were constructed based on the: contextual literature on IPD in Botswana; general literature on the field of professional development; findings of the interviews which were conducted during the pilot phase of the study; as well as the views of the reference group (Section 3.7.3 above).

In the questionnaire, respondents were required to respond to questions by rating along a given Likert-type scale. The adoption of this scale was based on the ethical assumption that it would enable the teachers to feel free when responding, for there would be more options available for them to choose from: answers would not be forced on them.

I acknowledge that there is some controversy among scholars as to whether or not a Likert-type scale measures at interval or ordinal level. On one hand some argue for its use as an interval scale (e.g. Likert, 1932: Masters, 1974: Munshi, 1990**:** Schacht, 2005) and others against (e.g. Jaccard and Wan, 1996). Some accept it as interval scale but acknowledge its limitations (e.g. Komorita and Graham, 1965: Matell and Jacoby, 1971: Oppenheim, 2000). In this study, I have utilised the scale to measure at ordinal level for the following reasons:

- The scale ordered the degrees of both agreement and disagreement in a continuum.
- The scale collects discrete data qualifying it to be treated as ordinal (Oppenheim, 2000: Schacht, 2005).
- I tended to fail to perceive the intervalness in the underlying variables that were measured in this study, which could correspond with the intervals between points in the scale used (Jaccard and Wan, 1996). I subscribe to the notion that for the scale to be declared 'interval' such intervalness should be inherent in the underlying variable, as well, not just the uniform appearance of intervals between points in the scale. I found this expectation to be logically following the guiding principle in research that the nature of data dictates the instruments and their scales not the reverse (Rose and Sullivan, 1996: Robson, 2011).

The most serious criticism levelled against this scale, according to Oppenheim (2000), 'is its lack of reproducibility- in the technical sense' (p.200). That is, the average scores attained through it can be arrived at from different patterns of responses at different occasions. But in this study, as it will be seen later in this chapter (Section 3.7.4.4. below), I conducted pilot testing, as it was essential (Wellington, 2000) for me to check the consistency of the questionnaire: and a high Cronbach's alpha value of 0.89 for both pilot and post hoc tests was attained. However, I admit though that it might have also been proper to have cross-checked the effectiveness of the Cronbach's alpha test, by employing the Rasch model, for instance, which according to Pallant and Tennant (2007) has potential of effectively

testing the fit of scales. This could have increased confidence in relying on the high Cronbach's alpha value.

Let me now come back to discussing the sections of the questionnaire: **Section A** of the questionnaire consisted of items that gathered demographic characteristics of respondents. Considering the possibility that teachers in different types of schools or within the same school may have different characteristics and IPD experiences, and hence likely to perceive IPD differently, I included school and teacher's characteristics as control variables. The identified variables included: sex, age, highest academic qualification, experience, teaching position (teachers' characteristics), school location, school performance and phase of education in which he/she works (school characteristics). Secondly, I included them for the purposes of describing the population of the study.

Other scholars as well have seen the importance of including these control measures into the study. For instance, Oppenheim (2000) revealed that 'controlled variables, as a source of variation should be eliminated in order to fulfil the condition of "other things held equal"' (p.21). But as I could not hold them constant, I chose to build them in and tested whether the responses varied according to them. A similar control measure was employed by Garet et al. (2001) in their study, which established the effects of different characteristics of professional development on teachers' learning.

Each of the subsequent sections or domains of the questionnaire comprised of items or statements which were rated along a seven-point Likert -type scale. The

seven point scale was chosen, rather than a scale with fewer points, because several studies, including that of Komorita and Graham (1965), Masters (1974) and Munshi (1990), found that the shorter scale with fewer points tends to lump and restrict respondents to fewer alternatives. This restriction ultimately pushes the subjects to respond as if they do not differ, thus leading to Type II error – false negative). Likert (1932) and Remmers and Ewart (1941) also found that many categories result in the internal consistency of the questionnaire.

The seven-point Likert-type scale had point values ranging from one (1) to seven (7) - with seven reflecting favourable items whereas one reflected unfavourable items. A neutral point was included to cater for undecided cases. In my view, forced responses harbour the potential of weakening the reliability of the data given. I also ensured that rated items read positive to make interpretations easy. This way, the high rates were set to imply a favourable state of affairs and the opposite was true for the low rates.

The other mechanism of checking internal consistency that was built into the questionnaire, for ensuring the attainment of trustworthy scores from the respondents, was that of mixing positive and negative questions together in each domain such that the ratings in the scale do not follow any traceable pattern**.** As recommended by several scholars, the arrangement prevents the 'Halo effect' which is a threat involving respondents establishing a particular pattern of ratings items in the same way without having to read them (Oppenheim, 2000: and Cohen et al., 2000). I therefore reversed the ratings of the negative items at the analysis stage (Oppenheim, 2000).

In summary, the questionnaire consisted of items meant to capture: teachers' experiences of IPD activities; teachers' views of the relevance of IPD activities; the level of attention that the activities gave to the potential topic areas; the factors which adversely influence IPD in the region; and the teachers' IPD needs. The questionnaire used is availed (see appendix 6) to have readers see the sections and associated ratings it had. In the section on the teachers IPD needs, teachers were to write in the space provided. This section of written responses therefore collected qualitative data whereas sections with Likert-scale, as highlighted before, collected ordinal data.

3.7.4.2. Interviews

Semi-structured face-to-face interviews were used in this study (See Interview Protocols – Appendices 4 and 5). They were adopted not only because they are a commonly used method of collecting qualitative data, but also because they allowed the teachers and the EO's the freedom and flexibility within given boundaries, of course, to express their opinions in their own words without the constraint of scales.

The interview items were derived from issues raised by the literature on in-service professional development as well as from the contributions by the reference group I have alluded to earlier under Section 3.7.3. The Teachers and Education Officers had different interview schedules with the same questions worded to suit the groups. This arrangement was meant to ease comparisons of responses during the analysis.

In preparation for the interviews, I heeded the suggestions of Bryman (2004) that researchers ought to:

> .....align the interview questions to the research questions guiding the study; ask questions comprehensible to the teachers and officers with "no jargon"; avoid leading or biased questions; and gather respondents' demographic information to later help in conceptualising the responses (pp.324-5).

As both the questionnaire and the two interview schedules were specifically developed, I had to test them for validity and reliability before they were administered to the respective participants. In recognition of the potential confusion observed by Oppenheim (2000), I wrote working definitions of validity and reliability, for both quantitative and qualitative components of this study, in order to provide basis for the actions I took during the data collection processes.

3.7.4.3. Validation of instruments

In this study, validity testing was carried out during and after developing the questionnaire and the interview schedules. This was established by giving the instruments to a team of experts comprising lecturers and Agriculture Education Officers in Botswana, to comment and give suggestions with the aim of improving the instruments' face and content validity, readability and suitability. Among other things, validators were requested: to verify if the items were clear, understandable and meaningful and to suggest possible changes in wording where necessary. Lecturers in the School of Education at the University of Nottingham were also consulted for further expertise advice. Considerable modifications of the instruments were made in the light of their comments together with what literature (Carmines and Zeller, 1979: Oppenheim, 2000) suggested.

In this mixed method study, I viewed validity in two ways. The concern to make the questionnaire valid was addressed by making sure that the questions and the rating scales in the questionnaire were checked by a team of experts. They were checked for readability and clarity (question structure), as well as coverage (Carmines and Zeller, 1979). My view of validity here is in congruent with that of Carmines and Zeller (1979) and Oppenheim (2000).

Conversely, in the case of interviews, I did not view the notion of validity as limited to only making sure that the questions in the protocol were checked by a team of experts for suitability, readability and clarity so that they were not ambiguous, but I also considered the way the questions were to be read out to participants. I ensured that factors like accent did not lead the protocol to source answers that it was not meant to gather. Also, as with the case of the questionnaire, the interview schedules' items had to be encompassing, as much as possible, the entire areas surrounding the phenomenon studied. The act of ensuring confirmation of meanings of what was said by respondents during the interview process (Section: 3.8.2.**)** and managing qualitative data (Section: 3.9.2) also contributed to making the interviews access what they were meant to gather.

3.7.4.4. Reliability of the Instruments

Questionnaire: In relation to the quantitative portion of the study, I considered the notion of reliability as having to do with making sure that, the questions and the rating scales in the questionnaire were understood in the same way by all teachers under any school context, so that consistent responses were attained regardless of the context in which the participants responded and regardless of when the questions were

answered. Carmines and Zeller (1979), for instance, define reliability as 'concerning the extent to which an experiment, test, or any measuring procedure yields the same results on repeated trials' (p.11).

In establishing the reliability of the questionnaire, a pilot test was carried with a randomly selected sample (n=30) from a non-target parallel population of secondary agriculture teachers in the South Central Region of Botswana. Consequently, through the use of Cronbach's alpha (α) formula for assessing internal consistency (Carmines and Zeller, 1979), the same reliability coefficient of 0.89 was attained for pilot test and post hoc test. This high value suggested that the questionnaire maintained its consistency in collecting data. Unlike other approaches like 'Split halves method', Cronbach's alpha was adopted since it saved time (Ibid. p.44).

Interviews: Definition of reliability which is termed 'dependability' from the view point of qualitative research involves collecting data from different teachers and EO's making sure that they understand the questions in the same way (i.e. issue of clarity of questions) as well as making sure that the interview situation is maintained, as much as possible, in the same way across all participants to maximise consistency in the data collection regardless of who conducts the interviews.

Twenty (20) randomly selected agriculture teachers in the South Central Region and five (5) former Education Officers for agriculture were used for pilot testing the interview schedules for teachers and officers respectively. As recommended by Wragg (1978), the twenty selected teachers and five former education officers were 'typical respondents' (p.15), and did not form part of the main target population.

To increase the rigour and robustness of the interview process, an interviewer reliability check was done. In this exercise, two lecturers at Botswana College of Agriculture (One professor as well as one senior lecturer in the department of Agricultural Education and Extension), were asked to play back and listen to the first two recorded interviews and provide me with feedback. In their feedback, these independent persons advised mainly on my interpersonal skills: the way I introduced the sessions, the way I probed, whether my interjections did not interfere with the respondent talk, if at all I talked too much or more than respondents, if I asked the questions appropriately, commenting on my voice, my mannerism and other points they deemed fit. These checks were also conducted during the main data collection stage (Section 3.8.2) where the same independent persons were engaged in cross-checking consistency

Let me point out that efforts to ensure trustworthiness of the data from interviews extended from the validation of the interview schedule as discussed earlier (section 3.7.4.3) and went through the interview sessions, data handling and management up to presentation. In this thesis the efforts to ensure trustworthiness are inherent in the discussion of these processes. They will be recognised in the process of reading the mentioned sections. But in considering the influential role that the interview situation might have in determining trustworthiness of the data (Smith, 1972: Oppenheim, 2000), I made sure that interpersonal interaction between myself and the participants was of a consistent standard as I discuss below.

I attempted to put the respondents at ease through welcoming rapport. I avoided being too social such that derailment was minimised (Smith, 1972, p.20). I tried as much as possible to downplay the power dynamics considering that some respondents still respected me as their former supervisor and/or former lecturer. I asked questions in an interesting manner: not intimidating and authoritative as suggested by Oppenheim (2000).

What ought to be noted here is that total eradication of bias could not be achieved (Oppenheim, 2000: Fielding and Gilbert, 2006). This made it necessary to utilize any opportunity to try and minimise it. Even taking into account ethical issues becomes important in minimising error. For instance, while attempting to have all interviewees agreeing to be interviewed, I ensured that their right to privacy and the right to refuse to answer certain questions, be recorded or be interviewed were always respected. Section: 3.8.2 discusses in details how this was done.

In concluding this section I attest that the information from pilot testing was ultimately used to fine-tune the questionnaire and the interview schedules for effective subsequent usage during the main data collection exercise. The following section therefore provides an account of the data collection processes.

3.8. Data collection process and associated practical and ethical considerations

Before collecting data, I had to gain access to the teachers and education officers who formed the target population for the study. It was a long process since I had to gain acceptance from all relevant education officials from the Ministry to

individual teachers in their respective schools. I applied for and obtained a research permit (Appendix 1a p.454**)** from the Ministry of Education and Study Skills that allowed me to have access to schools, teachers and Education Officers.

Thereafter, I contacted the Regional Education Officers (currently Directors) for the South Central and Central Inspectoral Regions in Botswana where the pilot and the main phase of the study were to be held respectively. The directors also gave their consent and wrote letters (Appendices 1b and 1c, from p.455) to school heads and Education Officers informing them of the study. At my arrival at every school, as a matter of protocol, I first, contacted the school head or his/her deputy who were already made aware of the study and I presented to them a: letter from my supervisor introducing me and the study (Appendix 2 p.457); a letter I wrote seeking permission to meet the agriculture teachers (CD-ROM); information and consent form to be signed and returned; and a copy of the research permit. The individual teachers were also presented copies of the above mentioned documents and their signed consent forms were compiled and kept safely (Appendices 3.2 to 3.5 from p. 458).

I ensured that I was introduced to the teachers as a student researcher. This was especially important since they knew me as either the former In-service Education Officer or former lecturer, and I wanted to suppress the effect of the power threat (Smith, 1972: Oppenheim, 2000). I assumed that telling interviewees that I did not assume any supervisory role would enhance development of good rapport and let them open up and respond genuinely. The power neutral approach I adopted and my ability to 'clarify what the potential benefits' of the study were to the respondents (Walford, 2001, p.34) seemed to have been effective in avoiding resentments that are usually

associated with the process of gaining access to research subjects. Below I describe how each of the data sources was administered.

3.8.1. Administering Questionnaires

Most of the questionnaires were hand-delivered to the coordinators of the agriculture department, who in turn distributed and collected them from the individual teachers. I had to drive around the region to schools which were within reach to ensure that questionnaires and necessary correspondence reach targeted respondents in time. A few questionnaires were mailed to the teachers via the coordinators. Mailed questionnaires reached intended respondents quickly at a low cost. In order to maximise the response rate and control non-response error, the following were done:

i. A cover letter (Appendix 3.3) was enclosed mainly to introduce the study to the respondents and to invite their participation. This letter was also accompanied by information (Appendix 3.4) and consent sheets (Appendix 3.5) to address some ethical considerations;

ii. A letter giving the researcher permission (Appendix 1a) to undertake the study accompanied the questionnaire;

iii. Questionnaires were uniquely coded for follow-up purposes;

iv. Instructions and examples on how to respond to items in the questionnaire were included;

v. Questionnaires were checked for non-responses upon their receipt and follow up were made where necessary;

vi. Where mailing was done, I sent questionnaires through registered mail addressed to Heads of Agriculture departments in schools, who in turn issued and collected all

questionnaires from individual teachers and mailed them back through registered mail as well;

vii. There were opportunities for giving teachers verbal explanations especially where teachers called for clarification: and

viii. My contact details were made available to teachers to enable them to seek clarification if they had any difficulty in answering questions.

I allowed teachers two weeks' time in order for them to respond to the questionnaire without any undue pressure which could have influenced the responses.

3.8.2. Interviews

Letters inviting teachers and Education Officers for the interviews were sent in time (See Appendix 3.2 as example). The letter informed the subject of the purpose and justification of the study. Some terms of reference were also enclosed in the letter to ensure that the respondents had an idea of the kind of information they might be asked during the interviews.

I conducted the face-to-face interviews alone, thus avoiding error which could result from differences between interviewers' ratings where more than one interviewer is engaged (Smith, 1972). In this exercise, I met the selected teachers and Education Officers on a one-to-one basis at their respective schools or offices. Meeting at individuals' offices allowed the interviewees to be more relaxed and participate effectively in the deliberations and ensured quality recordings, for there were reduced interruptions as also observed by Bryman (2004). Thirty six (36) agricultural science teachers from the twelve (12) selected schools and the eight (8) Education Officers

were interviewed as stated earlier in Sections 3.6.1 and 3.6.2 of this chapter. I used a pre-prepared interview schedule to guide interviews, with probes used to elicit details where necessary.

The conversations during the interview sessions did not follow the order of questions as it is an acceptable practice that 'questions may not follow on the way outlined on the schedule' (Bryman, 2004, p.321). Whilst I ensured that all questions were responded to by all selected interviewees, it proved difficult to maintain equal depth of responses as this depended on individuals' abilities to communicate. As a way of avoiding misrepresenting interviewees when quoting them in this study, I adopted 'an "on-the-spot" confirmation or dis-confirmation of my interpretations' (p.195) of meanings from the responses during the interview (Kvale and Brinkmann, 2009). This procedure is supported by Lincoln and Guba (1985) who emphasised the importance of negotiating meaning and interpretations with the subjects. Although an issue of IPD may appear less sensitive as it was not addressing the subjects' private lives, I still adhered to the ethical requirement of ensuring fair representation.

With permission from the participants, all interviews were recorded. Two voice recorders were used in this exercise for backup purposes. Their usage saved time, avoided loss of information, and ensured the capturing of detailed information. I also took short notes while guarding against possible time wastage and interruptions (Kvale and Brinkmann, 2009).

The use of the voice recorders also made it possible for me to establish interview reliability checks to 'strive towards obtaining data that are less

'contaminated' by the interviewing process' (Oppenheim, 2000, p.86). I engaged the same independent persons who checked consistency at the pilot stage, for they were then familiar with the exercise. They provided me with feedback on aspects similar to those already presented under the section on 'Reliability of Instruments [Interviews]' (See Section 3.7.4.4. p.182). The interviewer reliability checks were conducted systematically at this stage.

The first check was done after the first two interviews, which helped me early in the process, to make adjustments where necessary. Thereafter the checks were done after every tenth interview, where two voice recorded interviews were randomly selected from the ten interviews and listened to by the independent persons. The feedback for the subsequent checks was mainly to ensure that I maintained the standard of handling the interview situations. In this case, a random sampling technique was used to reduce selection bias. The procedure for randomisation that was adopted was drawing lots (Gomez and Gomez, 1984) [See process description under Section 3.6.1, p.166 above).

3.8.3. General considerations made

In addition to the points I made above regarding data collection, I find the following aspects worth noting as they also might have had an influence in the quality of data.

Language used: In this study, I used English as a medium of communication when collecting data. The instruments were written and administered in English. However, the native language used in Botswana is Setswana whereas English is an

official language that is used in government offices and the education system. So the teachers and the Education Officers were taught in English during their training and are instructing in the same language. As a former secondary school teacher and Education Officer I had always found the teachers and EO's having a good command of English and on this basis, I had no reason to doubt their spoken and written English when I chose it for use in the data collection process.

Timing of data collection: I chose to collect data at a time when teachers' and officers' work was less demanding so that they were not put under any undue pressure when responding to instruments. The collection of data was done during the first term (January to May) of the schools' calendar year in Botswana. The following section is designed to reflect on myself in relation to the data collection process.

Adherence to ethical guidelines for educational research: I made sure that my research process adheres to ethical guidelines for educational research (British Educational Research Association, 2004). This included following the research approval process devised by the school of Education of the University of Nottingham.

3.8.4. Reflexive account associated with data collection

My understanding of 'Reflexivity' alerts me to look at any possible biases I might have taken into the data collection process as suggested by Richards (2009). In this section I discuss how I understood myself in relation to the research as well as how I account for the choices I made in the process of collecting data. Below I address five significant issues.

a). The issue of overt and covert approach.

When preparing for data collection I weighed and compared the benefits of treating myself as overt or covert researcher. An overt approach is where participants are aware of being studied, whereas with covert they are not (Patton, 2002). Although Patton (2002) used the two terms in relation of making observation, I still find them relevant here. So, I approached this study as an overt researcher because the issues addressed by this study were policy related. I therefore did not find it necessary to be covert when approaching this study as there was nothing to suggest that respondents might conceal truth while made aware of being studied. But as a way of addressing the 'Hawthorne effect' I made an attempt to fully clarify to the teachers and EOs the way the study would benefit the teachers' IPD, thus encouraging them to respond genuinely to either the questionnaire or interview questions. Also during construction and administration of the triangulated data sources for this study, I put measures in place to enhance collection of genuine data. See Sections 3.7.4 and 3.8 above for further details relating to building measures to prevent my preconceptions from influencing the study.

b). The issue of conflict of interest.

One of the dilemmas I had to grapple with during data collection was that of handling conflict of interest in making choices. I felt conflict of interest for I had been once an insider in the researched area. As stated earlier, I was once an In-service Education Officer, and so hold some assumptions on IPD that might have interfered with the research process whether consciously or not. It was for this reason that I had to strive to control my preconceptions at various stages of this study. In the case of interviews, I established measures such as the 'interview reliability checks' alluded to

above in the section on data collection process. Also during the interview sessions I conducted on the spot confirmation of my interpretations of some assertions made by interviewees which seemed unclear. Sending transcripts back to the respondents was also done to ensure that the data spoke for the participants in the way they had wanted. I tried to restrict my interpretation of accounts, observations and views as presented to me and did not alter them in any way to suit my own agenda.

c).The issue of familiarity with research subjects.

The fact that I was familiar with the teachers and officers who were the subjects for this study posed 'familiarity threat' that I had to address during data collection. My familiarity with respondents might have forced some teachers and Education Officers to participate in this study (Bryman, 2008). In an attempt to address the threat, (1) I made it clear in the consent form issued to the teachers and officers that they were free to decline their participation at any stage of this study. (2) I avoided direct delivery of the letters that invited teachers and officers to participate in the study to create a space for them to freely and independently exercise their right of choice to participate. Teachers received their invitation letters through their department coordinators whereas officers received theirs through the mail.

d). The issue of power relations.

Being a teacher educator and a former Education Officer (In-service) I had to deal with building rapport to minimise the seniority and supervisory stigma I might be accorded by the teachers and Education Officers (EOs), some of whom were my former colleagues. Some of the teachers were my former students and others treated me as their former supervisor. It might be possible that some of the EOs and teachers

participated just as a sign of respect for me rather than because they appreciated the importance of the study. Whilst good rapport was needed, I also had a challenge of maintaining a formal research relationship between me and respondents. The formal atmosphere could have limited the collection of interview data because under normal circumstances formality restricts most people from expressing themselves frankly (Smith, 1972: Wellington, 2000). But despite the worry posed by formality, in my view almost all interviewees responded to my satisfaction in this study.

However, counteracting the power influence was, of course, made difficult by limited time to build good rapport between me and respondents. Given this situation, I addressed the existed power dynamics by stressing to the respondents that I was a student and expected to be treated as such. I dressed simply and used simple English language and humour to relax the subjects each time I met them. Also during interviews, I adopted a casual sitting arrangement to level the power scale.

The next step was that of taking the data sets through the management process which is fully discussed in the following section.

3.9. Data Handling and Management

Different data were collected for this study. These included recorded interviews which were later changed to texts (qualitative data) and questionnaire ratings (quantitative data). Additional data were from documents and observation made to verify some claims raised by the respondents.

3.9.1. Managing Quantitative data

When the 228 questionnaires were returned (92.3% response rate), they were checked for missing data and where possible teachers were contacted to complete missed information. All hard copies of the questionnaire were brought to the UK to serve as a source of evidence for data collection and to help me track raw data if needed. The questionnaires were stored in a lockable cupboard where they could only be accessed by me. Each questionnaire was inspected for traces of discrepancies, and for all the questionnaires it appeared that the rating patterns of the negatively stated statements differed from those of the positively stated statements. This suggested that the ratings were genuinely and well thought of by the teachers. As some items were deliberately stated in the negative, it was at this point where I reversed their ratings (Oppenheim, 2000).

In addition, questionnaire items were coded i.e. numbers were assigned to variable labels such that the ratings could easily be used in statistical calculations (Rose and Sullivan, 1996). I used SPSS software to aid in computing the data. Although questionnaires were checked for missing data when collected, there were about 30 entries out of 31008 (i.e. 0.1%) which were identified during entering as missing data. Then '999' was keyed in to represent missing data entries as suggested by (Fielding and Gilbert, 2006, p.316).

Qualitative responses on IPD needs from Section C of the questionnaire were imported into NVivo software for analysis. The NVivo programme enabled me to easily manage the grouping of needs brainstormed by 159 out of the targeted 247 teachers. Some respondents opted not to respond to the section. NVivo was chosen

for its user friendliness. Through the use of 'Matrix Coding Criterion' the software made it easy for me to explore patterns of needs along established attributes (Bazeley, 2007, p.144).

3.9.2. Managing Qualitative data

Transcripts were produced from the recorded interviews. Transcribing involves converting spoken conversation to a written text (Kvale and Brinkmann, 2009). To ensure the rigor and the robustness of the transcripts (i.e. if my interpretations reflected what was meant and transpired during the interview process), I transcribed after interviewing as well as interpreting, an arrangement which helped me to keep reflecting on the scenes of the interviews thus taking into account the physical expressions that possibly reinforced meanings. Kvale and Brinkmann (2009) observed that:

> ... researchers who transcribe their own interviews will [.....] have the social and emotional aspects of the interview situation present or reawakened during transcription, and will already have started the analysis of the meaning of what was said' (p.180).

Nevertheless, absolute perfection in transcribing could not be attained as 'there is no true, objective transformation from the oral to the written mode' (Ibid. p.186). I understood from literature that what is discussed will always remain a matter of recollection and interpretation, which reduces precision (Kvale, 1996).

In this study, full verbatim transcription was conducted in order to capture full meanings. I even included the 'ums', 'mms', as well as repetitions in the texts following a caution by Bazeley (2007) that these might be communicating a particular meaning that is worth capturing. I found selective transcription harbouring the chances

of compromising this worthwhile operation, hence decided not to apply it. Translation of words, where necessary, was done with the English meaning placed in brackets. Line numbers and audio time were also indicated in the transcript to help trace back the quotes when needed. All transcripts in pdf-format can be accessed from the CD ROM provided: in the file named: Transcribed Interviews.

I further strengthened the trustworthiness of the transcripts by establishing some 'transcriber reliability checks' suggested by Kvale and Brinkmann (2009, p.184). With this strategy, I had an independent person transcribing one recorded interview and then we counted the number of words that differed between the transcriptions. The comparison led us to play back the voice recorder to identify and reconcile differences, thus shaping the transcribing process. Rather than just doing the checking once, I adopted a way of doing it systematically, where the first check was done with the first transcript. The subsequent checkings were done after every tenth transcript to ensure rigour and robustness of the exercise. The independent person engaged, in this case, was a final year PhD Motswana student at the University of Warwick in Coventry – UK. Being a linguist by profession and a Motswana by nationality put her in a better place to advise me in issues pertaining to listening skills, note taking and punctuating when transcribing.

In the transcripts, I protected the subjects' confidentiality by 'masking their identities' as suggested by Kvale and Brinkmann (2009, p.187). For this purpose, letters 'T' and 'O' flanked with subscripted numbers were substituted for the teachers and Education Officials' real names respectively. For instance, John became $T_{5.}$ Some

measures were also taken to keep back-ups and transcripts of the recorded interviews in lockable cabinets.

After I had transcribed and confirmed the meanings in the transcripts, as Kvale and Brinkmann (2009, p.198) suggested, the transcripts were then 'regarded as "the" solid rock-bottom empirical data' of the interview section of this study. They were then locked in a cabinet ready for analysis.

3.10. Data Analysis, Interpretation, and Presentation

The qualitative and quantitative data sets for this study were analysed separately to avoid confusion and to give each of them undivided attention.

3.10.1. Qualitative data analysis

In this study, qualitative analysis involved a comprehensive, descriptive and interpretative process of repeated reading of transcripts and related conceptual frameworks, leading to establishment of analytical categories or code labels and sub-labels to which segments of each transcript were related and attached in a manner that was traceable. A category is described by Rose and Sullivan (1996) as a 'homogenous group of data' (p.232). But in this study it is specifically understood to mean a cluster of transcribed segments of similar meaning flagged by a label.

The analytical strategy I used in this study was one which involved the establishment of a-priori categories along which transcripts' segments were coded. The idea of developing a priori categories was drawn from the 'Semi-Structured

Interview Analysis strategy' discussed by Flick et al. (2004, p.253) and the "Framework" strategy described in the work of Bryman and Burgess (1994, p.173). These two frameworks have in common the advocacy for developing analytical categories beforehand. They both emphasise, as the first step, repeated reading of transcripts and related material and using them as the basis for developing a priori analytical categories alongside research questions. They also share similar inherent steps involved in the analysis, although they call and divide them differently. The section below discusses in details how I developed categories, coded and interpreted the interview transcripts for this study.

3.10.1.1. Establishing analytical categories

First, I repeatedly read and made sense of the interview transcripts and instrument items in relation to the research questions. Out of the forty six (46) transcripts, I randomly selected ten of them to be reviewed for the purpose of developing categories, thus having them (categories) grounded in the data. For each of the selected transcripts a preliminary list of analytical categories was produced in line with research questions. As a way of increasing consistency I remained critical and rigorous in thinking and handling issues to inform my pre-determination of categories**.** I also relied on repeating twice, the drawing of categories from a transcript with two days break in between to give the list a second thought with a refreshed mind. The fact that I transcribed the interviews by myself also boosted my familiarity with the data to an extent that I related issues more quickly. It helped me to relate the texts with the existing IPD conceptual knowledge (Flick et al., 2004) and also enhanced the way I fitted text into a wider context of the study while developing the categories.

Secondly, I assembled the categories from the individual transcripts into one comprehensive list. According to the literature, the pre-determined categories have a tendency of compromising the level of depth, detail and openness in qualitative analysis (Patton, 2002). So, I had the categories cross-checked by independent individuals. I engaged two of my PhD non-Batswana colleagues, as peer reviewers, to carry out the process independently after which we compared the lists and reconciled the differences. Although the two colleagues lacked knowledge of the context of the topic area from which they could have further drawn to pre-determine the categories (Bryman and Burgess, 1994: Flick et al., 2004), they relied on repeated reading of transcripts, instrument items and research questions to draw the categories. I do acknowledge that, given the cited limitation, the effort might have left some of my pre-conceptions unchecked compared to cross-checking by somebody who shared a similar 'frame of reference' (context). But within the given limitations, we revised and critically refined the list to ensure as much as possible, that the categories were exhaustive and avoided unnecessary overlaps. The refinement resulted in the establishment of sub-categories in some cases. The refined list of categories was therefore regarded as a coding guide against which all the 46 transcripts in this study were coded.

The guide included the following major categories which, according to the inherent meanings, I labelled:

- Reasons for participation in IPD;
- Description of IPD activities, in which, teachers participated. Shared experience of IPD which had subcategories:

  _____ list of activities,

_____ characteristics,

_____ general organisation of IPD; and

- Factors influencing IPD

Each of these had subcategories, the number of which varied depending on the emerged dimensions. This resulted in a tree-like structure when presented in the NVivo computer software which aided the analysis (Bazeley, 2007). These analytical categories were employed at the second phase of the analysis process as will be seen later on.

The following sections present accounts on how I coded and interpreted the transcripts. Although coding and interpretation may appear to have been presented separately in this report, in reality they occurred and were felt together.

3.10.1.2. Description of coding and interpretation of interview transcripts

Coding, in this instance, has to be understood to mean relating particular passages in the interview transcript to the pre-determined categories of meanings for interpretation, along the set research questions. The categories of meanings were generated as described in section 3.10.1.1 above. The Nvivo computer software was useful in sorting and retrieving segments of similar meaning so that they could be examined together, which saved time.

Generally, the interpretation process involved my engagement with transcripts and interrogating them. I posed and answered questions such as: 'What was going on in the data?', What did it mean?, 'What could be the implication of these in relation to

IPD?', 'Which group of participants might have held this view?' and 'What could be the other dimension of this understanding?'. In most cases I identified alternative dimensions by taking advantage of the 'look up' option in the Word document to get an idea of other dimensions of what was said based on the words' synonyms.

The posing of questions helped me to decide on what goes with what and why. Through intense examination of the texts I accessed meanings, including those in context and those which were embedded in the words used by the respondents (see for instance Chapter 4, Section 4.5). I tracked repeated concepts and ideas by constantly comparing (Glaser and Strauss, 1967: Strauss and Corbin, 1998) the transcripts' segments for meaning and relating them to one another. In this sense, a cross-case comparative analysis was done (Patton, 2002). In the process I managed to capture related ideas and concepts and put them in more refined sub-categories. There were cases where my interpretation led me to code segments from already coded texts (Bazeley, 2007) to develop refined ideas. This also led to the establishment of more sub-categories. To achieve this, I relied on repeated reading of passages and at different times with a refreshed mind. The analysis exercise in this case was felt to have occurred iteratively (Denzin and Lincoln, 2003). And it was this going back and forth that enhanced further interpretation and refinement of responses on the aspects of IPD that the study intended to reveal.

The software helped me to further explore the data through procedures like queries and sets. The 'Matrix coding queries' (Bazeley, 2004, p.143) produced numbers indicating how often different groups reported particular IPD experiences, events, concepts or needs. I was able to make proportional comparisons and establish

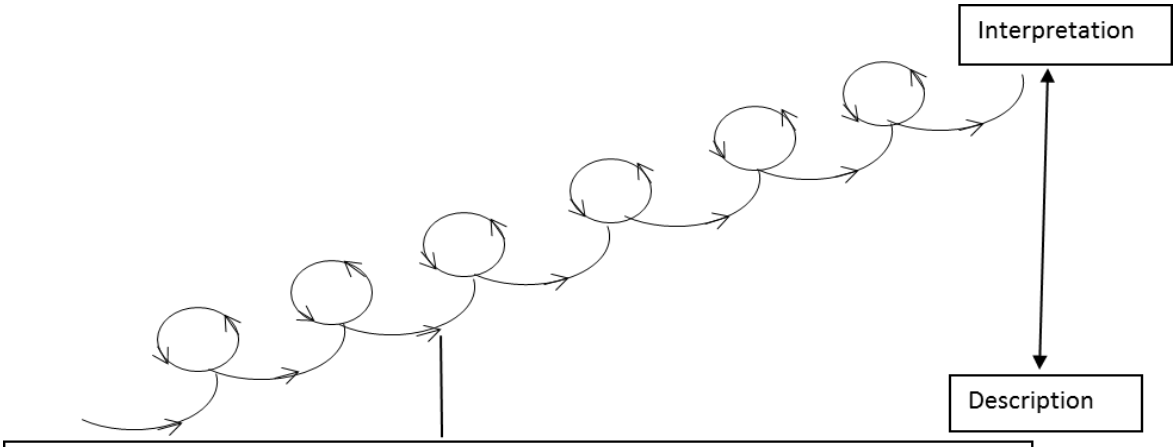
patterns in the data along the given attributes of respondents (Flick et al. 2004). Bazeley (2004) referred to this procedure as 'pattern coding' (p.99). I employed 'One sample Binomial test' to test if differences between compared proportions occurred by chance. One sample Binomial test is a non-parametric statistic suitable for comparing small samples (Coolican, 1999), and the compared samples were small as can be seen with some sections of Chapter 4**.** It is important here to note that I compared the percentages of teachers, not absolute counts, so that the groups remained comparable.

The process of analysing the transcripts through NVivo progressed iteratively primarily through the descriptive and interpretive phases as suggested by Strauss and Corbin (1998). First, each of the transcripts was analysed separately with segments assigned as they came to the 'free nodes'. This phase was considered descriptive for there was more of taking ideas as they came than making interpretations per se. Nonetheless, some small degree of interpretation was necessary as the free nodes increased in number since I had to decide where segments fitted best. Where no match existed a new 'free node' was opened. At the end, a long list of free nodes was developed. The use of free nodes allowed me to break transcripts into bits of information to allow exploration of differing dimensions in the responses. The exercise also helped in accessing and collating related segments of data which were not located at the same portions across different transcripts (Patton, 2002). Text was coded either in the form of a phrase, sentence, paragraph or the whole response segments as long as it carried meaning or idea.

Secondly, I had to move free nodes to tree nodes where I imposed a particular structure by applying pre-determined categories (See Section 3.10.1.1 above). In this

phase I did more intense interpretation. This two-phased analysis procedure can be conceptualised as shown in the Figure 3.3 below.

Figure 3.3: Conceptualized cognitive engagement applied across stages of interviews' analysis (Hypothetical figure)



1	2
Phase 1: This phase involved: *repeated reading of transcripts; *attaching to free nodes, segments of responses or ideas as they arise from transcripts; *Interpretations to locate where segments could best fit but more description; *the use of respondents' own words as node labels (i.e.'Nvivo' code labels (Coffey and Atkinson, 1996)). *The phase results in pieces of information with specific dimensional meanings that could be synthesised into meaningful pre-determined blocks in the next phase.	**Phase 2**: This phase is marked by: *Creation of parent tree nodes from free nodes; *application of a priori categories as labels of parent tree nodes; *Increased interpretation and less description; *emergence of new sub-categories following 'coding on' (Bazeley, 2007) for further interpretation; *making theoretical connections/ pattern coding or meta-coding which is achieved through use of queries. *Establishment of sub-categories helps attainment of specific information that could be useful for policy improvement.

Analysis Phases

3.10.1.3. Making sense of transcripts along research questions

The interpretations of interview data were made on the basis of research questions (See Chapter 1). During the interpretation process I kept on identifying some clear quotes to be used in the writing up of findings as can be seen in Chapter 4 of this report. To ensure representativeness and completeness, especially that all data was considered important, I cited all transcripts' segments that relate to those quoted so that they can be accessed from the supplied CD-ROM: in the folder of pdf-files named: Transcribed Interviews. I acknowledged that presenting all quotes in the body of the text would lead to tautology.

The exercise of analysing interviews was more challenging than expected. I had to take a self-critical stance with the intention to reduce bias, for it is not possible to completely prevent it (Strauss and Corbin, 1998). I remained sensitive not to quickly accept words or expressions of respondents on face value. I banked much on spending a lot of time to create opportunity to think against myself and changed my ideas where necessary as suggested by Miles (2001). I questioned responses in the transcripts to establish alternative dimensions of meanings as shown above.

Before I could start the coding process, I thought of building into the analysis a 'coder consistency check' (p.108) suggested by Richards (2009) who cautioned of the inconsistencies in coding that might occur over time. The following section is set to present how I carried out this process.

3.10.1.4. Establishment of coding reliability

I attempted to build confidence in the analysis of interview data by checking consistency: i) during the development of analytical categories, as discussed in subsection 3.10.1.1 above and ii) at this stage of coding (i.e. assigning transcripts' segments to categories). Coding consistency could be said to have been checked in two stages in this study. I carried it out myself alone and later involved my two colleagues (peer reviews) in coding with the guide applied and compared results afterwards (Richards, 2009).

My coding at first relied on repeated coding of each of the first five transcripts where I had to code a clean version of a document that I had coded earlier, but having allowed a week's time in between to give codes or data segments a second thought with a refreshed mind. Comparing the two coding outputs helped me discover the differences in my coding and enabled me to make amendments where necessary (Richards, 2009). The second phase is where I and my two colleagues coded three transcripts applying the guide in the same way as suggested by Miles and Huberman (1994), Flick et al. (2004) as well as Richards (2009). Comparison of our coding revealed differences, either in: style (large or small segments), meaning of segments at a category, and categories used most by one and not the other (Richards, 2009), which we then reconciled. Of importance here was for us to ensure that we constantly interpreted quotes from time to time. Although the checking process benefited this study, it proved that it could, indeed, take a long time.

3.10.1.5. Reflexive Account of Analysing and Interpreting Interview Data

In trying to answer the question: how pure is the data? which has with it some ontological considerations, I was prompted to reflect on issues that might have infiltrated and biased, consciously or otherwise, the processes of analysing and interpreting the interview data. This section therefore reflects and acknowledges philosophical and practical issues that might have had ethical implications for the analysis and interpretation of the interview data. Here I also recognise the fact that the interview texts attained in this study together with the meanings drawn from them were jointly constructed by myself and the respondents (Richards, 2009). This suggests that I was party to the generation of data for the study; hence a need to reflect on my possible influences on the coding and interpretation of the interview data.

On my part, there is a chance that I might have been selective and left some claims in the transcripts unattended probably because they did not appear to be contributing to answering the research questions: thus leading to loss of information. I was made aware of this limitation by Miles and Huberman (1994) who cautioned that 'the researcher is constantly making choices about what to register and what to leave out without necessarily realising that' (p.56). And this might have happened as part of the process of reducing too much data.

Again, Miles and Huberman (1994) further reveal that the choices usually are couched or 'embedded in a particular logic or a conceptual lens, whether the researcher is aware of it or not' (Ibid. p.57). This implies that my preconceptions of the phenomenon as well as my philosophical position might have influenced my anticipated selectivity.

Furthermore, in the interest of time, I might have concentrated more on what addressed research questions than on what I could learn. But Richards (2009) cautioned that 'qualitative research is not a task to be hurried ... the goal is careful interrogation of the data' (Richards, 2009, p.103).

Additionally, some practical issues, for instance the limited space, might have also influenced me to be selective and give priority to certain aspects and leaving others. The 100,000 worded report I was expected to produce appeared to be too small to accommodate all that could be presented in this study.

So, in an attempt to control all my possible influences, I relied on being critical and systematic in making judgements to limit my assumptions from influencing the process of data analysis. I repeatedly read the codes, going over again on different occasions with time breaks in between to verify that the meaning that I got did not change (Denzin and Lincoln, 2003). The transcriber and coding reliability checks alluded to earlier in this chapter **(**pages 194 and 203) were also built into the study to help reduce the influence of my assumptions on the analysis process of the interview materials.

3.10.2. Quantitative data analysis

In this study quantitative data were understood to be ratings which were computed into means, percentiles (medians and quartiles), frequencies and percentages. Quantitative data analysis therefore involved relating the means to the mean-cut off point established from the ordinal scale used in the questionnaire: and reporting them (arithmetic means) while considering their position in relation to

percentiles (See details under Section 3.10.2.2. below. The quantitative data analysis further involved, in some sections, the counting and comparing of frequencies and percentages of teachers who rated different levels in the scale used.

3.10.2.1. Statistics and rationale for their choice

An arithmetic mean was reported when describing the teachers' perceptions in this study because, unlike median and mode, its value summarised the values of all the ratings in a given variable (Fielding and Gilbert, 2006: Robson, 2011). As a result it enabled me to consider the views of all the teachers for each variable studied. Although the median is comparably considered the best measure of ordinal data (Fielding and Gilbert, 2006) due to its stability, I found it inappropriate to primarily base my reporting on it, for it only informs us of the point in the distribution that is central (Fielding and Gilbert, 2006). In this sense, the median would not fairly represent the views of all the teachers as could the mean. Instead I used the median together with quartiles to support the reporting of the mean. This arrangement is supported by the assertion by Fielding and Gilbert (2006) that 'although a measure may be primarily intended for one level of measurement, it may in certain circumstances ... be the most suitable measure for another' (p.107).

In fact, it has become a common practice that scholars in the social science field are reporting arithmetic means, instead of medians, from likert scales. This was the case with related studies by Desimone et al. (2002) and Koundinya and Martin (2010). However, the arithmetic means are criticised for being adversely affected by extreme values (Fielding and Gilbert, 2006) which lower their consistency as measures of central tendency. It is for this reason that I opted, in this study, to report them in conjunction with the median and quartiles to enhance reliability in reporting

the findings. The median and quartiles are more resistant to effects of extreme values (Dancey and Reidy, 2002).

The quartiles in this case helped to establish how spread the ratings were in the distribution (Bryman and Cramer, 1997) and the median helped to summarise the observed distribution of values using one central value when scores were arranged in order of magnitude (Fielding and Gilbert, 2006). The median being a 'resistant measure' of central tendency helped me detect the arithmetic means that were somehow heavily influenced by extreme values, thus helping in appropriately reporting such means. The understanding is that with values that are normally distributed both mean and median are the same. As soon as the distribution gets skewed the two start differing. The reliability of the mean became questionable when it differed greatly from the median, hence demanding cautious reporting.

I employed the non-parametric inferential statistics tests to identify significant differences in the perceptions on the rated items between the groups of teachers according to selected school and teachers' characteristics. The choice of these statistics was based on my consideration, which I previously alluded to under Section 3.7.4.1, that the Likert-type scale I used yielded discrete data: and therefore, these could not meet the assumptions of parametric statistics. For instance, most of the data was not normally distributed. Specifically, the Mann-Witney U test, the Kruskal-Wallis H test as well as a Chi-square statistic were used in the analysis as will be explained in the following section.

I will indicate, at this juncture, some general choices I made that apply to all the statistical tests I carried out in this study. The null (Ho) and alternative (H_l) hypotheses I set for every test conducted were as follows:

Ho= There is no significant difference between any of the compared groups of means or proportions.

H_l= There is at least one significant difference between any of the compared groups of means or proportions.

I adopted the set Ho, on the premise that under normal favourable circumstances better results of any educational endeavour (IPD inclusive) would be attained if there are less or preferably no differences among stakeholders or elements that contribute to a whole. In extension, differences are a threat to the success of IPD, hence deserve to be attended to so that teachers could receive similar IPD experience. I assumed that common IPD experiences would lead to consistent implementation of the curriculum by the teachers across the region or country at large.

I adopted the 0.05 or 5% level of significance as an indicator of how prepared I was to be wrong about the conclusions I reached (Fielding and Gilbert, 2006). The choice of 5% as opposed to 1% was based not only on the fact that it is the 'most commonly used in sociological research' (Ibid. p.261), but mainly because the social world under which this study was undertaken was relatively uncontrolled as might be the case of an experimentally designed study, hence there was relatively more room for error. The 5% reduced the chances of committing Type II error (Rose and Sullivan, 1996), where I could have lacked evidence to reject null hypothesis while in actual fact there were significant differences that mattered.

In addition, for every test I conducted I always had assumptions that did not 'suggest the direction of the difference' and therefore chose two-sided tests as opposed to one-sided (Fielding and Gilbert, 2006, p.259).

3.10.2.2. Process of quantitative data analysis and interpretation

The process of analysis in this section was aided by the use of computer with the "Statistical Package for Social Sciences" (SPSS) software being employed. After defining variables in the software and entering the ratings from the questionnaire, the data was explored for the interest of knowing its distribution. The box and whisker plots were viewed for this purpose, for they gave pictorial view of the distributions. The data appeared to have more variables which were not normally distributed.

I then began the analysis by computing frequencies and percentages to describe respondents according to demographic characteristics. These statistics were also used to describe the participation of teachers in IPD activities. The differences in the proportions between the groups of teachers who participated in IPD activities were detected through the use of Chi-square statistic. Here, the teachers were compared according to the school and their (teachers') own characteristics (e.g. male versus female: junior versus senior schools etc.). Specifically, Pearson Chi-square and Fisher's Exact Test were reported for the 2x3 and 2x2 contingency table respectively.

In this case, Chi-square compared the counts of teachers I observed with the counts which otherwise would have existed in each cell, if there was no significant difference between the proportions of the compared groups (Dancey and Reidy, 2002:

Fielding and Gilbert, 2006: Robson, 2011). In this case, the expected counts were automatically generated by the test itself from the observed frequencies: and the formula used ensured that expected proportions of the compared groups were the same across the levels of a given dependent variable (Robson, 2011). The formula used to compute the expected count for each cell in a contingency table, for instance, is: (Row total) x (column total)/ (Overall total).

When testing, Chi-square produced a probability value (p-value) at a given degree of freedom, which when compared to the chosen alpha level (0.05), helped in deciding whether I rejected or accepted the null hypothesis set for this study. Where the p-value was less than or equals to 0.05, the test reflected significant difference and therefore I rejected the 'Ho' and accepted the 'H_1' and the reverse became true with p-values that exceeded the alpha level. I then referred to the contingency table to see how the proportions varied. It is worth noting that the computed proportions gave the counts a common base for comparison (Fielding and Gilbert, 2006).

For the items that were measured from the established 6 point Likert-type scale, the following mean cut-off points were derived for the purpose of interpreting the reported means ($\bar{x}$):

1.00 to 1.50 Strongly Disagree/ No attention at all/ Very Irrelevant
1.51 to 2.50 Disagree/ Very little attention/ Irrelevant
2.51 to 3.50 Slightly disagree/ Little attention/ Slightly Irrelevant

---

3.51 to 4.50 Slightly agree/ Much attention/ Slightly relevant
4.51 to 5.50 Agree/ Very much attention/ Relevant
5.51 to 6.00 Strongly Agree/ Exceptional Attention/ Very Relevant

With these mean cut-off points, the highly rated items ($\bar{x} > 3.5$) were favourable and the reverse was true for those that were lowly scored (i.e. they reflected an unfavourable state of affairs). The undecided cases were excluded from the calculations but reflected when reporting. This is discussed in some more detail under Section 3.10.2.3 below. In using the cut-points I simply identified the band under which a given arithmetic mean fell and reported accordingly using the labels shown above which differed according to sections of the study questionnaire.

The differences in perceptions of teachers regarding the rated items between the groups of teachers were detected through the use of the Mann-Witney U test (for two independent groups) and the Kruskal-Wallis H test (for more than two independent groups). The two tests assess significant difference between the mean ranks of the compared conditions (Dancey and Reidy, 2002). The interpretation of the outputs for these inferential statistics was conducted in the same way as the case of Chi-square above. Similarly, the probability values of more than 5% ($p>0.05$) at specific degrees of freedom were considered to indicate a non-significant difference hence accepting 'Ho', while those probability values of less than or equal to 5% ($p\leq0.05$) were considered to reflect differences that were significant, thus leading to rejecting the 'Ho'.

While I could have also attempted to compute factor analysis to observe how, overall, teachers perceived the relevance, characteristics, and content, I found addressing the specifics and giving the individual aspects the attention they deserved being the best option. My argument here is that the findings ought to reveal specifics out of which the policy makers could build the improved IPD at the end of it all. This

might not be effectively achieved if the study had reported findings in general terms. Finally, the quantitative results were presented in tabular form followed by short discussions as could be seen in Chapter 5 of this report.

3.10.2.3. Reflexive Account of Analysing and Interpreting Quantitative Data

As with the case of interview data above (Section 3.10.1.5) the quality of the quantitative data needed to be reflected on, and there was a need to acknowledge factors or variables that might have confounded them. This section, therefore, gives an account of issues that might have influenced the quantitative findings. Besides the mere fact that by nature quantitative approaches appear to be alienating and somehow oppressive on the part of both researchers and respondents (Isaac and Michel, 1995: Bryman, 2008), in this study there might have been some practical issues that threatened the analysis and interpretation processes of the quantitative data.

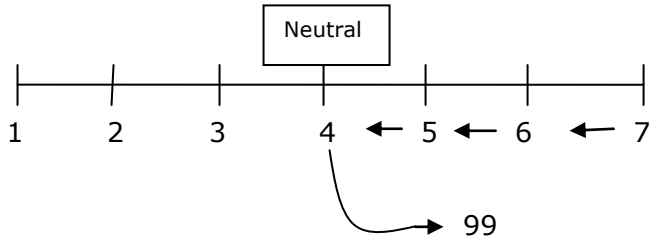
Reduction of scale

Although I did not anticipate any serious adverse effect that might have been caused by the reduction of the 7 point scale to 6 points at analysis stage, there might be some influence that occurred that I was unaware of. So, it is necessary to report the change I made. When running arithmetic means of all items to check the pattern of ratings, given the 7 point Likert-type scale used, I discovered that the majority of them (means) fell within the neutral portion, thus making the interpretation of the findings difficult. Generally, arithmetic means calculated from Likert-type scales tend to be concentrated towards the centre, and where the centre is neutral, findings run the risk

of being erroneously interpreted as if respondents were not decisive on items rated. This was also confirmed by Coolican (1999).

I then considered that if left unattended, the scenario would raise ethical questions including doubts about the relevance of the target group. It could give the impression that the target group was ignorant of the subject matter at hand, which was not the case. Therefore, I chose to change the scale from seven to six points with the neutral point removed from the centre but having its cases reported separately as the undecided group. In the process I flagged all the neutral entries with figure 99 so that they remained accessible.

The SPSS option for recoding into the same variables was employed when reducing the scale to six points. It must be noted that the coding procedure changed the scale without tampering with or biasing the data. The procedure simply substituted the numbers representing the respondents' views with responses maintained in their original position along the continuum as illustrated below.



First, all 4's were changed to 99; all 5's were changed to 4's; all 6's were changed to 5's; and lastly, all 7's were changed to 6's. With this new scale in use, it became easy to make sense of the data and interpret it as described above.

Researcher's knowledge of statistics

It was of paramount importance that the right statistics were used in analysing the data and it was on this premise that I had to be certain about the use and the underlying assumptions of the statistics employed in this study. The experience I had on the use of statistics coupled with the knowledge I acquired from the Data Analysis course that was offered by the School of Education placed me in a better position to effectively select and use statistics in research. I was also supported by lecturers from the School of Education whenever I needed help.

Possible adverse effect associated with sample size

Although it was desirable to have larger sample sizes (n) to improve reliability of the findings, this might have increased the chance of 'finding a statistically significant difference between sample estimates' while in the actual fact there were no differences (i.e. Type I error) (Rose and Sullivan, 1996, p.194). For this reason, I remained cautious whenever I interpreted outputs for inferential statistics involving comparison of means $(\bar{x})$ with relatively larger groups (n) sizes. This also led me to consider the practical importance of the detected differences.

3.11. Chapter Summary

In this chapter, I indicated that the preferred design to explore the teachers' perceptions towards IPD in the context of the central region of Botswana was the mixed method design. This design seemed ideal to me because I understood IPD activity to be a phenomenon that had, aspects that needed interpreting (with meanings sourced) as well as those that needed describing (with facts sourced) in the context of

the study. I noted also that the choice of the design was also prompted by my philosophical standpoint. The perspective that I held, I argued, cherished the employment of ideas and approaches that could best help address the set research questions: and for this reason I considered myself to have realists' and pragmatic assumptions when conducting this study. I also contended, in the chapter, that this perspective couched the choices of data sources as well as the collection and analysis of data.

The scope, study population, and sampling of schools and teachers for interviews were some of the key areas discussed. Also discussed was the development of data sources and their testing for validity and reliability. The processes of data collection and analysis were among the key areas that I described in detail in the chapter, so that they could be accessible to stakeholders and make the findings more plausible as well. I also disclosed that I attempted to ensure rigour and robustness of the findings by establishing some deliberate checks during these processes of data collection and analysis. In the chapter, I have also discussed some practical aspects and ethical principles that I had to consider to ensure that the methods and procedures respected the rights of the informants. Included also were reflexive accounts of my possible data making role and how I attempted to reduce my influence on the findings. This was done purely to reduce bias.

In the next two Chapters, I address the research findings on the perceptions of agriculture teachers about learning through IPD activities. Whilst Chapter 5 is set to present quantitative results, Chapter 4 below presents the qualitative findings for the study.

CHAPTER 4: FINDINGS FROM INTERVIEWS

4.1. Introduction

Given that the overarching question of this study has been to ask the teachers how they perceived and experienced IPD in their context; agriculture teachers were therefore interviewed. Education Officers (EOs) were also interviewed to provide supporting evidence to strengthen the trustworthiness of the findings. The findings consist of both what the teachers and EOs actually said and my interpretations of what they said. A total of 44 interviews (8 Education Officers and 36 Agriculture teachers) were conducted and used in the analysis. The analysis of these qualitative data was done using the NVivo software as fully described in Chapter 3.

The responses analysed in this chapter were sourced in accordance with the research questions which guided this study. Where the data were not limited to provide further meaningful information, I had to follow issues further, through comparing the proportions of the teachers groups which held different views on particular issues. However, the relatively small numbers of teachers in the groups I compared requires the need to emphasize that the findings and implications for these comparisons must be considered as suggestive rather than conclusive.

4.2. Structure of the chapter

Following the introduction above, this chapter presents the profiles of the interviewees. Thereafter, it discusses findings under the following headings and sub-headings: reasons for participation in IPD; description of IPD activities experienced

and expected in terms of forms and characteristics; and lastly the factors influencing IPD.

4.3. Interviewees' Profiles

In order to show the characteristics of the interviewees for this study, I present in Table 4.1 below (See next page) profiles of 43 individual interviewees (teachers and officers). For the purposes of anonymity, the interviewed teachers and officers are identified by the letters 'T' and 'O' respectively and differentiated by subscripted numbers as presented in the table below, where, for instance, John became T_{59}.

4.4. Brief on what to expect in the chapter

Having followed the mixed method design, this study has the quantitative findings presented in Chapter 5 and the qualitative findings presented in this chapter. Therefore the reader will notice that here I present qualitative responses and identify key findings under each section without discussion: except where I briefly highlight suggestions implied by the findings. I chose to jointly discuss the two data sets in Chapter 6. That being the case, readers should expect in here, to get the understanding of what teachers and Education Officers say pertaining to the questions raised by this study. The findings are narratively and pictorially presented. For comparative purposes, I had to 'quantify' qualitative data by counting what was said as suggested by Creswell and Plano Clark (2007) and I paid particular attention to avoid overinflated counts likely to arise from counting the occurrences of codes from one individual more than once.

Table 4.1: Interviewees' profiles

Table 4.1: Interviewees' profile								
Interviewee	ATTRIBUTES AND LEVELS							
	Sex	Age group	Experience in yrs	Qualification held	Responsibility at work	Level or Phase of Education	Location of School	Performance of school
T_1	M	40-49	15+	Degree	Coordinator	Senior	Urban	Low
T_2	M	30-39	5 to 9	Diploma	Coordinator	Junior	Rural	Low
T_3	M	30-39	5 to 9	Diploma	Coordinator	Junior	Rural	Average
T_4	M	30-39	10 to 14	Diploma	Coordinator	Junior	Rural	High
T_5	M	20-29	≤4	Degree	Ordinary teacher	Junior	Peri-urban	Low
T_6	M	30-39	10 to 14	Diploma	Coordinator	Junior	Urban	High
T_7	F	40-49	10 to 14	Diploma	Ordinary teacher	Junior	Peri-urban	Average
T_8	M	30-39	5 to 9	Diploma	Ordinary teacher	Junior	Peri-urban	High
T_9	M	40-49	15+	Degree	Ordinary teacher	Senior	Rural	Average
T_{10}	F	30-39	10 to14	Diploma	Ordinary teacher	Junior	Rural	High
T_{11}	F	30-39	≤4	Degree	Ordinary teacher	Senior	Rural	Average
T_{12}	M	30-39	5 to 9	Diploma	Ordinary teacher	Junior	Urban	High
T_{13}	F	20-29	≤4	Degree	Ordinary teacher	Junior	Rural	Low
T_{14}	F	30-39	5 to 9	Diploma	Ordinary teacher	Junior	Peri-urban	High
T_{15}	M	30-39	15+	Degree	Ordinary teacher	Senior	Urban	Low
T_{16}	M	40-49	15+	Degree	Coordinator	Senior	Rural	Average
T_{17}	M	40-49	10 to 14	Diploma	Coordinator	Junior	Peri-urban	Average
T_{18}	F	40-49	15+	Degree	Ordinary teacher	Senior	Urban	Low
T_{19}	F	20-29	≤4	Degree	Ordinary teacher	Senior	Peri-urban	High
T_{20}	F	20-29	≤4	Diploma	Ordinary teacher	Junior	Rural	Low
T_{21}	M	30-39	5 to 9	Degree	Ordinary teacher	Senior	Peri-urban	High
T_{22}	M	40-49	15+	Degree	Coordinator	Senior	Peri-urban	High
T_{23}	F	30-39	10 to 14	Diploma	Ordinary teacher	Junior	Peri-urban	Average
T_{24}	M	30-39	10 to 14	Diploma	Ordinary teacher	Junior	Peri-urban	Average
T_{25}	M	30-39	≤4	Degree	Ordinary teacher	Junior	Rural	Low
T_{26}	F	20-29	≤4	Degree	Ordinary teacher	Junior	Peri-urban	Low
T_{27}	M	30-39	10 to 14	Diploma	Coordinator	Junior	Peri-urban	High
T_{28}	F	30-39	≤4	Diploma	Ordinary teacher	Junior	Rural	Average
T_{29}	F	30-39	5 to 9	Diploma	Ordinary teacher	Junior	Rural	High
T_{30}	M	20-29	5 to 9	Diploma	Ordinary teacher	Junior	Urban	High
T_{31}	M	30-39	10 to 14	Diploma	Ordinary teacher	Junior	Peri-urban	High
T_{32}	M	20-29	≤4	Degree	Ordinary teacher	Junior	Peri-urban	Average
T_{33}	M	30-39	≤4	Diploma	Coordinator	Junior	Peri-urban	Low
T_{34}	F	30-39	5 to 9	Diploma	Ordinary teacher	Junior	Rural	Low
T_{35}	M	30-39	10 to 14	Diploma	Coordinator	Junior	Peri-urban	Average
T_{36}	M	20-29	5 to 9	Diploma	Coordinator	Junior	Rural	Low
O_1	M	30-39		Degree				
O_2	F	40-49		Masters				
O_3	F	40-49		Degree				
O_4	M	40-49		Degree				
O_5	F	40-49		Degree				
O_6	M	30-39		Masters				
O_7	F	40-49		Masters				
O_8	M	30-39		Masters				

Key: Explanation: Attribute has a level e.g. Sex has male and female as its levels (Bazeley, 2007).
Coordinator: A teacher responsible for the affairs of the department. He/she oversees others.
Ordinary teacher: is used here to refer to any other teacher supervised by the coordinator.
Senior and Junior: are shortened forms of senior secondary and junior secondary schools. (See definitio Chapter 1)
Peri-urban: describes a place having the features of an urban and a rural set up.
Low, Average, and High: are levels of performance (See Chapter 3, section 3.6.1 to see how they were arrived at)

The process of analysing the interviews which yielded the findings in this chapter is presented in Chapter 3 section 3.10.1 of this thesis. However, during the analysis process of the interview transcripts, I identified some specific quotes that I have used as evidence in this chapter. For every quoted interview text, line number or numbers preceded by 'L' or 'LL' respectively are shown to help locate quotes in their original interview transcripts if necessary. To ensure representativeness and completeness, especially that all data was considered important, I cited all transcripts' segments that were similar to those quoted so that they could be accessed from the CD ROM provided: in the folder of pdf-files named: Transcribed Interviews. Being voluminous, transcripts could not fit in the appendix section hence the use of CD ROM.

In this chapter I present the responses received into five main categories which address the research questions stated in Chapter 1. The categories are:

- reasons for participating in IPD,
- IPD activities in which teachers participated,
- descriptions of IPD activities teachers experienced and desired, and
- factors influencing IPD.

Each of these categories has sub-categories.

4.5. Reasons why teachers participated in IPD activities (RQ1)

When the teachers and Education Officers (EOs) respectively responded to the questions: *Why do you participate in IPD Activities?* and *Why do you think teachers participate in IPD* activities?, they gave different reasons that reflected them (teachers and EOs) to have attached value or importance on IPD. I ultimately interpreted and grouped the reasons into four. As will be seen in the quotes below, the interviewees

appeared to participate in IPD because they perceived it to be: i) closing the gap in knowledge left by teacher training institutions; ii) helping to improve performance; iii) helping teachers to overcome challenges; and iv) helping teachers to update knowledge.

Closing the gap in knowledge (5)

The teachers and EOs who valued IPD on the basis that it closes the knowledge gaps contributed as follows:

> *As you are in the field there are certain things .... that you might not have learnt at College. Therefore it is important that you are ...taken for short courses and workshops (T_8, LL.19-22).*
>
> *... [IPD] is very important because at school is not like we learn everything. We really need to keep on learning (T_{11}, LL.22-23).*
>
> *... our teaching materials are produced locally and at times, there are some things which are included in those materials which teachers maybe never got to learn where ever they received their training. So it is important for either the teachers or the government to try to fill those gaps (O_7, LL.28-32).*

Other respondents, such as T_3, T_{14}, T_{36} and O_3 seemed to share the same reasons as above (See quotes location: **List 1**- Appendix 7).

Improve performance (10)

Those interviewees who seemed to value IPD because it improves performance, posited:

> *I believe [IPD] is important because it can develop someone in his or her work and increase performance which in this case is referring to the teaching and raising students performance scores (T_{34}, LL. 16-17).*
>
> *IPD, I view [it] as an initiative undertaken...to be able to deliver effectively the right material in class (O_3, LL.22-23).*
>
> *I found [IPD] important because it helped us to improve somehow in the workplace' (T_{30}, LL.21-22).*

Eight other teachers shared a similar view. (See: **List 2**- Appendix 7)

Overcome challenges (4)

Those respondents who seemed to believe IPD helps teachers overcome challenges, stated:

> *... the moment you get in-serviced you learn new things: you get rejuvenated on how to approach certain problems that you encounter and how to approach certain challenges ... (T_{22}, LL.230-232).*

> *...all along in life we experience many challenges and through those workshops they help us to develop and learn as to how to act when we face the challenges and so on. Tackling the relations at the work place and even outside (T_{34}, LL.142-145).*

Two other teachers and two EOs also appeared to have similar sentiments. (See: **List 3**- Appendix 7).

Update knowledge and skills (20)

Some of the teachers and EOs seemed to value IPD on the grounds that it updates knowledge and skills of teachers. For instance, the teachers said:

> *... it [IPD] is very important because you end up knowing what is happening around you (T_{31}, LL.29-30).*

> *... if you keep engaged in IPD activities, you get a chance to learn about new developments (T_{26}, LL.14-15).*

> *It is very important because it refreshes the teachers O_8 (LL.18-19).*

Eighteen other teachers and two EOs saw IPD to be updating knowledge. (See: **List 4**- Appendix 7).

Based on the number of times each reason was mentioned, I identified the popularity of the reasons for which teachers participated in IPD. For instance,

- Updating knowledge and skills – mentioned 20/39 times
- Improving performance – mentioned 10/39 times
- Close knowledge gap – mentioned 5/39 times
- Overcome challenges – mentioned 4/39 times

NB/These reasons were elicited from the total of 31 teachers out of 36 who were interviewed. There were cases where some teachers gave more than one reason hence 39 occurrences.

The responses of the 5 teachers were either unclear or reserved by the respondents

Updating the knowledge gap and helping to overcome challenges were respectively the most and least common reasons for which teachers participated in IPD. Updating the knowledge and skill is understood here to mean bringing a new version of existing knowledge and skills. Closing the knowledge gap has to do with the provision of knowledge that teachers never acquired, for instance, from their initial teacher training programmes.

Whilst the discussion of these findings is continued in Chapter 6 (p.309**),** the following section presents findings to address the research question that sought to gather the information on the activities in which the teachers participated.

4.6. IPD activities in which teachers participated (RQ.2)

Presented here are the activities in which the teachers said they participated when responding to research question three.

When asked about the activities they participated in, or took advantage of, to learn, the teachers mentioned (as will be seen in the direct quotes later): workshops, meetings, Schools' Agriculture fairs, Part time courses (self-sponsored), Further University training (nominated), Informal professional discussions, and Learning from

students. Table 4.2 below (See next page) summarises the teachers' responses to this question.

It appears in the table below that, workshops and meetings were attended by many teachers, with workshops appearing to be the most popular activities because they were attended by all the teachers. The schools' agriculture fairs were the third in popularity, followed by informal professional discussions, learning from students, part time courses, further university training, classroom observations, tours, and seminars, in that order.

Table 4.2 also shows that the teachers attended both departmental and cluster meetings, with cluster meeting being more popular. Additionally, it appears that the most popular workshops content areas were those associated with students' syllabus. But of interest to take note of here, is that the performance management system (PMS) tended to be addressed more by the workshops than the professional aspects.

In order to let readers appreciate what the teachers actually said, below I present some of the actual quotes captured when they shared about the activities they participated in.

Workshops and meetings

One of the teachers said:

> *Oh! I just think of the activities such as the workshops, meetings and even the agriculture projects because some of these things I did not even do them at College. So it is for my first time ...* (T_{29}, LL. 14-16).

The attendance of workshops and meetings by the teachers was also reflected in the responses of O_2 (LL.144-147), O_1 (LL.44-46), O_4 (LL.74-79) as well as O_5 who responded as quoted below:

> *Sometimes they have workshops –school based workshops; they have cluster meetings; they have workshops on item writing which are usually initiated in schools* (O_5, LL.61-65).

Table 4.2: Compiled list of IPD activities in which teachers participated

Table 4.2: Compiled list of IPD activities in which teachers participated								
TEACHER	**IPD ACTIVITIES**							
	Workshops		**Meetings**	**Schools' Agriculture fairs**	**Part time courses (self-sponsored)**	**Learn from students**	**Informal professional discussions**	**Other**
	Participated?	**Content focus?**	**Participated? Type?**					
T_1 (LL.116-120)	✓	Syllabus areas				(L.271-) ✓		
T_2 (LL.40-42)	✓	Professional areas					(LL.128-130) ✓	
T_3 (LL.58-63)	✓	-CA, Bees	(LL.43-47) ✓ Cluster	(LL.47-63) ✓			**(LL.190-192)** ✓	
T_4 (LL.23-25)	✓	Leadership, PMS						
T_5 (LL.26-27)	✓	CA, PMS	✓ Cluster					
T_6 (LL.33-35)	✓	CA, PMS			(211-213) ✓			
T_7 (LL.23-24)	✓	Syllabus area						
T_8 (LL.30-31)	✓	Poultry	(LL.179-180) ✓ Cluster		(LL.30-47) ✓			
T_9 (LL.114-115)	✓		(LL.125-129) ✓ Cluster	(LL.31-34) ✓				Tour(LL.31-34) Further Uni. training
T_{10} (LL.30-34)	✓							Seminar(LL33-34) Observation(L.225)
T_{11} (L.26)	✓		✓ Dept-l	(LL.197-198) ✓				Tour(L.29)
T_{12} (LL.30-34)	✓	Bees, professionalism	(LL.165-168) ✓ Cluster				(L.165) ✓	
T_{13} (LL.31-33)	✓	Computers, guidance	(LL.225-228) ✓ Dept-l	(LL.199-202) ✓	(LL.86-87) ✓			Seminar(LL.177-180)
T_{14} (LL.36-37)	✓	PMS, CA						
T_{15} (LL.15-18)	✓	Bees, Fish	(LL.185-189) ✓ Dept-l				(L.185-189) ✓	Further Uni. training
T_{16} (LL.26-44)	✓	PMS	(LL.251-259) ✓ Cluster	(LL.71-78) ✓	(303-321) ✓	(L.404-) ✓		Further Uni. training
T_{17} (LL.369-377)	✓	T/Methods	✓ Dept-l				✓	
T_{18} (LL.126-128)	✓	T/Methods, Moderation				(L.68-) ✓	✓	Further Uni. traiining
T_{19} (LL.32-33)	✓	Syllabus based	(LL.249-250) ✓ Cluster	(L.33) ✓				
T_{20} (L.15)	✓	PMS	(LL.74-75) ✓ Dept-l					
T_{21} (LL.43-44)	✓	PMS				(L.390-) ✓	(L.85) ✓	Tour,
T_{22} (LL.73-81)	✓	Item writing, PMS,			(L.198-) ✓	(L.314-) ✓		Further Uni. training(L.30-)
T_{23} (LL.40-41)	✓	Item writing, PMS,		(LL.216-219) ✓				
T_{24} (LL.24-25)	✓	PMS	(LL.176-179) ✓ Cluster				(LL.77-86) ✓	Seminar(LL.24-25)
T_{25} (LL.40-45)	✓	PMS , Orientation	(LL.82-87) ✓ Cluster	(LL.32-33) ✓				
T_{26} (LL.39-41)	✓		(LL.193-197) ✓ Cluster					
T_{27} (LL.79-87)	✓	Item writing	(LL.176-179) ✓ Cluster	(LL.281-283) ✓	(LL.79-87) ✓	(L.71-) ✓		
T_{28} (LL.29-30)	✓	Syl. areas, Item writing	(LL.36-38) ✓ Cluster			(L.31-) ✓		
T_{29} (LL.14-16)	✓		✓ Dept-l	(LL.148-149) ✓		(L.34-) ✓		
T_{30} (LL.25-26)	✓		✓ Dept-l					
T_{31} (LL.34-35)	✓	CA, Special Ed., AI	(LL.126-131) ✓ Cluster					Tours
T_{32} (LL.35-38)	✓	PMS			(246-248) ✓			Observation(30-32)
T_{33} (LL.31-37)	✓	Computers, special Ed.						
T_{34} (LL.27-30)	✓		✓ Cluster				(LL.72-74) ✓	
T_{35} (LL.21-22)	✓	PMS, Bees	✓ Cluster					Observation(114-117)
T_{36} (LL.35-38)	✓	Live skills	(LL.174-180) ✓ Cluster					Observations(L.171)
Totals	36/36 =100%	Syllabus areas=22 PMS=13times Professional areas=11times	16 cluster +7 departmental 23/36= 64%	10/36=28%	7/36=19%	8/36=22%	9/36=25%	F-train -5/36=14%: Ob-4/36=11%: T-4/36=11%: Seminar3/36=8%

Key:

✓ Indicating participation

Cluster of Schools: Are groups of schools in the same vicinity which meet, usually for subject specific issues (McDevitt, 1998: Coolahan, 2002).

CA: Continuous Assessment

PMS: Performance management system

Dept-l: departmental

However, cluster meetings were found by some teachers to have contributed less to teacher learning. The quote below is evidence to this.

> *As teachers there is nothing that we are learning because cluster meetings are just open meetings …. it is all about trying to meet the requirements of the system and not to address the needs of the teachers* (T_{24}, LL.176-179).

Another nine teachers shared a similar observation here. (See: **List 5**- Appendix 7). In support of these teachers were O_6 (LL.294-297) and O_8 who commented:

> *... what I have discovered is that in these meetings they resolve to do things but never implement them. There is a lot of talking but no implementation is done. And I think is the problem of shortage of In-service Officers who could be motivating the teachers ...* (O_8, LL.223-226).

The ineffectiveness of the cluster meetings in this regard could have been because of lack of: Education Officers to oversee activities at cluster level (T_{36}, LL.183-184: T_{16}, LL.263-266: T_{22}, LL.304-311), transport (T_{25}, LL.82-87: T_{16}, LL.230-232), time to meet more often (T_{25}, LL.82-87: T_{16}, LL.230-232: T_{26}, LL.193-197); and guidelines (T_{24}, LL.176-179).

Schools' Agriculture fairs

One of the teachers said:

> *When I started teaching I did not know how to 'judge' poultry ... but I learnt the poultry judging skills from engaging in BATA activities. I have been a judge for projects at some of these fairs* (T_{27}, LL.281-283).

Nine other teachers (see Table 4.2) also indicated to have learnt through the schools' agricultural fairs. The existence of the fairs was confirmed by the supervisors (O_4, LL.297-304: O_5, LL.65-66). For instance, O_5 said: *'They [teachers] arrange fairs: competing amongst themselves. They go for bench marking in other schools to see how other schools are doing'* (LL.65-66).

Moreover, the data analysis revealed that the agriculture fairs, especially those held in clusters, might have slightly promoted some degree of networking or linkages among the teachers, through which they learnt from one another. Apart from that, no other set up existed to link teachers. For instance, T_{21} said:

> *The only link that we have is through agriculture fairs which happen once in a year. But beside that to be honest with you there is no link with regard to the curriculum ... And I believe time has come: time is ripe now that we should improve in that area* (LL.78-82).

Several other teachers and EO concurred with this sentiment. (See: **List 6**- Appendix 7).

The data showed that the fairs could have been very effective in helping teachers network, if it was not for the lack of: feedback (T_6, LL.189-195), transport (T_4, LL.131-134), supervision and funds (T_{27}, LL.291-302; T_5, LL.250-252; T_{16}, LL.256-259; T_{18}, LL.262-267). These were therefore noted as challenges that need to be addressed for the teachers to benefit more from the fairs in future. Otherwise some teachers will continue not to take them seriously as observed by O_1 (LL.280-281).

Part time courses (self-sponsored)

Captured while still discussing the part-time course he undertook, T_8 said:

> *So, the course [I attended] was about the rearing of Setswana chickens. It was held at BCA. But for that course we were paying something like P150-00. So, the course was good in the sense that some of the lecturers were from BCA and there was this other gentleman who was from South Africa* (LL.38-41).

Part-time learning was also attempted by six other teachers as shown in Table 4.2. Participation of the teachers in part-time studying was also confirmed by some Education Officers who said:

> *Some [teachers] especially those near Gaborone, go and get part time training on computers, on accounts and others and some go for higher education for*

> *masters and so on. But the rate is still very low, we still look to the government to develop us* (O_5, LL.308-310).
> *Yes! I know of Agriculture teachers [who are] doing courses with BOCODOL [through distance mode]* (O_3, LL.228-231).

The analysis showed that self-sponsoring to do part-time courses posed a challenge to the teachers who seemed to find it difficult to pay fees from their already committed salaries. For instance, like T_{22} (LL.198-200), T_{35} posited:

> *Even if you are corresponding with the outside Universities, the problem is money. I once I attempted to enrol to do an administrative course and the way the things were done in the process of attempting to enrol I stopped* (LL.163-165).

Although the government has a standing policy to allow teachers to sponsor their own part-time studies and later be reimbursed ([4]Moka, 2010: O_2, LL.62-68), the analysis showed that the teachers perceive the policy to be restrictive. For instance, T_{16} said:

> *So, for me to be reimbursed it has to be something linked to the teaching of agriculture, which is unfair. So, the development is cut in that sense, it discourages one because if you are to choose a course now you look at the current trends* (LL.339-341).

Actually, the teachers felt a need for the policy to be accommodating and open up with the fields like Agricultural education that are practically oriented and could not easily be done through distance mode (T_{22}, LL.217-222: $T_{10,}$ LL.195-198). The quote above, as an example, reveals the call by teachers on the government to meet their part time training costs irrespective of the courses they intend to pursue.

Further University training (where teachers are nominated)

On further university training, one of the teachers said:

> *I started with diploma and after 6 years I went to further my education at BCA to do my BSc* ($T_{22,}$ LL.30-31).

[4]Moka (2010) -not real name- personal communication. Officer coordinating selection of teachers for further studies.

Several other teachers who benefited from the upgrading programme by government were T_1, T_{16}, T_{18}, T_9 and T_{15}. This upgrading of teachers by government was also confirmed by O_2 who explained: *'The government has been sending some teachers for further studies that is from their diploma level to degree level'* (LL.56-58). However, teachers felt the process of nominating teachers for further training was slow. For instance, T_4 said:

> *We are kept for a very long time in the field without being taken for further training. Like right now I am in my 11th year with diploma* (LL.191-193).

This slow process of training teachers was also reflected in comments of several other teachers (See: **List 7**- Appendix 7). Confirming this observation one Education Officer said:

> *The quota is discouragingly low. One would not blame the teachers even if they were to be disgruntled because really, from time to time you need a breather to leave a regular job- go to a refresher course- something that can keep you sharpen your mind. But this kind of opportunity in Botswana it comes after a very long time* (O_4, LL.341-344).

This slow process is one of the concerns that teachers raised about IPD in general and these are grouped and presented later on in this chapter as factors lowering teacher morale (p.246).

Again, some teachers indicated to have participated in provisions that might have needed no planning. These included informal academic discussions with colleagues either at school or departmental level (T_{34}, LL.72-74: T_2, LL.128-130: T_{24}, LL.168-170) as well as learning from students as they interacted with them (T_1, LL.271-273: T_{21}, LL.390-393). As indicated in the table above, several other teachers have also indicated to have learnt from students.

Although several teachers (See Table 4.2 above) seemed to have made good use of informal discussions to learn from colleagues, a few teachers appeared to have had difficulty in learning from colleagues. For instance, T_{32} said *'Yah! casually we do [share ideas] but it is rare'* (L.196). But Garet et al. (2001) pointed out that an ongoing collaboration of teachers for purposes of planning is one of the core features of high quality professional development.

Also a concern was raised by several teachers (T_{22}, LL.79-81: T_{24}, LL.24-25: T_{34}, LL.26-28) with regard to the falling frequency at which IPD provisions were offered compared to years back. For instance one teacher posited:

> *The only way we could be learning ... would be by organising workshops,... But it is rare to have such kind of workshops these days. In the past things were easy as things were running'* (T_4, LL.137-140).

It can be interpreted from the quote that the teacher here identified a shift in frequency in occurrences of IPD opportunities offered to them.

Key findings from this section are that:

Workshops and meetings have been attended by many teachers and workshops were the most popular IPD provisions.

Teachers also participated in Schools' Agriculture fairs, Part time courses (self-sponsored), Further University training, Informal professional discussions, and Learning from students classroom observations, tours, and seminars.

Contrary to my expectation, the activities that are within reach, e.g. classroom observations, informal discussions seem not to be popular with teachers. Unfortunately the data lack explanation as to why this is the case, thus a question for further investigation.

The frequency of some IPD opportunities has been identified to have declined e.g. workshops. This outcome also remains an area for further investigation as data lack explanation as to what caused the decline.

The most popular workshops' content areas were those associated with students' syllabus. However, PMS issues appeared to have been addressed more than professional aspects which matter in the practice of teachers.

The next section presents the teachers' accounts or views of the IPD they had experienced. In this section the teachers' expectations are also presented.

4.7. The characteristics of IPD activities experienced and desired by teachers (RQs.4-5)

The findings in this section captured the teachers' accounts of aspects related to the nature and organisation of IPD activities. These cover the general IPD framework as well as aspects on needs assessment, information dissemination, duration of activities, as well as the scope of feedback and follow up ensured.

4.7.1. Framework of IPD

The findings showed that the IPD framework mainly used in the region is one in which a few teachers, at a time, are first trained in a workshop setting and later are used to disseminate information to the rest of the teachers in their respective clusters or schools. The following quotes are evidence to this:

> *Take for an example, right now we went for a workshop for the whole week and after that we are expected to report back the information gathered in a week to other teachers in hours* (T_{36}, LL.137-138).
>
> *We do not have the capacity to train all the teachers, the few teachers that we provide training to, these establishments (Other sister departments) can take these teachers and use them as teacher trainers, so that they can train those that are not yet exposed to this kind of training* (O_4, LL.99-102).
>
> *The resource persons were some of the teachers who had attended other PMS workshops and they were trying to cascade down to the rest of the teachers. So what I have observed ... is that the information gets distorted along the way... and ultimately there is confusion. Again the way, in which the content is delivered, it is delivered such that it is not intended to facilitate any change per se, it just for you to know and thereafter there is no follow up to see whether really after the workshop you are implementing* (T_{24}, LL.79-85).

Usually they invite one teacher to represent others and mainly the coordinator usually goes ($T_{34,}$ LL.28-31). [Also reflecting few numbers are T_{22} (LL.113-116), T_{21} (LL.113-114) and T_{11} (L.56)].

Other respondents including teachers and EOs described the model as that which involved training few teachers to later train others at their respective schools (See **List 9**- Appendix 7). I also understood from the teachers' responses, with the quotes above serving as an example, that the framework led to information distortions and it did not allow for follow ups and evaluation after implementing whatever learnt. The framework was also criticised for not allowing teacher trainers enough time to resource their counterparts at school and cluster level (See T_{36} above). As a way forward for the future, the teachers suggested an increase in the number of those invited to attend the activities, so that each time many, if not all teachers, get first-hand information. Mentioned 7 times (See: **List 13**- Appendix 7). E.g.

> *...all the teachers should ...get it from the horse's mouth ...Because... someone ...when he comes back to report what was done ..., he may report just some [information],...* (T_1, LL.180-186)

Key findings here are as follows:

The framework which appeared to be common was that which some teachers were trained and thereafter were used as teacher trainers to resource others in their respective clusters or schools (Cascade model).

Aspects identified as shortfalls of the used framework include: distortion of content as it was relayed down the levels; no follow-up and evaluation allowed; teacher trainers not allowed adequate time to resource their counterparts; and few teachers allowed to get first-hand information.

Suggestions: Teachers felt the need to be all invited for the activities in order for them to receive first-hand information.

4.7.2. Reflections on needs assessment (i.e. how it was done?)

It appeared from data analysis that some form of IPD needs assessment was carried out in schools. For instance, just like T_{14} (LL.127-129), T_{20} (LL.42-44) and T_8, LL.104-106, T_2 said:

> *... those [workshops] that are conducted internally, they are based on our needs as teachers. So, we forward our needs to staff development coordinator who will then organise a workshop basing on those needs. That is why I am saying to some extent they meet our needs* (LL.110-113).
>
> *what basically happened is at the beginning of the year the staff development committee would just ask people to come up with the topics and compile them. Then they keep on selecting topics to address from that list* (T_{34}, LL.116-118).

Although the quotes above suggest that needs assessment might have been carried out, the expressions like '... to some extent...' (T_2), indicate some degree of shortfalls.

However, the Education Officers also seemed to support the view that needs assessment was conducted. Below are the responses of some EOs when explaining how they contacted teachers to access areas of IPD need:

> *...otherwise as inspectors go out, as they inspect the teachers they tend to see really the weak areas of teachers and do make recommendations to a relevant department to say please can you assist the teachers in this area. If I can give you an example, for instance as we were going to the schools we found out that the way teachers were scheming and the way the teachers were preparing their lesson plans were not really up to the mark. So then we made a recommendation to say please! can you put it in your plan that teachers, nationally, should be in-serviced on scheming and Lesson planning* (O_2, LL.123-130).
>
> *Yes! We have school visits. We also sometimes send out questionnaire to schools to identify their needs.... So, we get information from schools because we do not want to offer them things that they do not need. And usually cluster leaders also meet as a cluster to identify their needs and they send their request here for cluster level activities* (O_5, LL.172-176).

The data above reflects how the Education Officers contacted the teachers to access areas of IPD need. Three different routes through which IPD needs were

compiled from the teachers were identified here. First, the Staff Development Committees compiled areas of need from teachers, usually at the beginning of the school term. This was done in preparation for the internal IPD provisions. Second, the Education Officers also during their routine school visits, identified areas of need as they interacted with teachers and students, for the organisation of IPD provisions regionally or nationally. Third, it also appeared that questionnaires were sometimes used by the Education Officers to elicit needs from the teachers (See O_5 above).

However, some respondents seem to show the feeling that needs assessment was not done. As an example, one teacher responded:

> *I do not think so. I do not know maybe they do that with other teachers but with me I have never been involved in needs assessment* (T_{28}, LL.78-79).

Amongst those who felt there was no need assessment done were T_{22}, T_{35}, T_{23} and T_7 (See quotes location: **List 10-** Appendix 7)

Data analysis has further shown that sometimes teachers did not contribute in eliciting areas of IPD need. For an example, some Education Officers and one teacher who was also a staff development coordinator shared:

> *But ...., I asked them to give me the topics but I never got anything so I do not really find it worthwhile to run a workshop when I do not know the needs of the teachers* (O_3, LL.58-60).
>
> *... And the other thing, our teachers even if you appeal to them and say please bring the information [areas of need] to the Office directly, you do not get anything* (O_2, LL.171-173).
>
> *you see when I put up a chart for needs assessment and say give me areas where you need to be workshoped, very little would be coming. They would be thinking in the general terms but they would not go into the specifics of the areas of need in the particular department* (T_{27}, LL.42-44).

In addition, the data analysis showed that the responsible department lacked the necessary capacity to reach the majority of the teachers for needs assessment. E.g.:

Our snag [difficulty] in this area is that even up to this point we have only one officer for teacher training and development, which is Mr X ... . So then things has not been so easy. [Researcher: What about Mrs Y?] Oh! Yes! Even Mrs Y... , therefore only two of them (O_2, LL.120-123).

You may find that there is one in-service officer in the region and the region is just too wide: this person cannot manage (T_{16}, LL.186-188). This sentiment was also shared by T_6 (LL.202-204).

Furthermore, it appeared that teachers expressed high demand for need assessment. Some of the teachers suggested:

...we should also be involved, maybe when drawing the plan maybe for the year, asked what we need and how. All those topics that we feel we need to be helped on, they should be coming from us (T_4, LL.92-96).

... I really believe on down-up planning because the people who are resourced are the people who understand what they are in need of. So that is what I am really at (T_{22}, LL.244-246).

Eight other teachers and four EOs expressed need for needs assessment in future. (See: **List 11**- Appendix 7).

Key findings here are as follows:

There were mixed feelings about the conduction of needs assessment. Some teachers felt that their needs were assessed because they were given the opportunity to suggest topic areas they would like to be assisted in. However, there were instances where needs assessment was either inadequately carried out or not carried out at all.

The staff development committees and Education Officers were understood to have attempted carrying out needs assessment.

Identified shortcomings were: some teachers were reported to have resisted requests to provide areas of needs when requested. Shortage of Education Officers was also blamed for poor needs assessment in schools as not all teachers could be reached.

The process of need assessment lacked a well-defined approach to ensure that all teachers were reached.

Suggestion: the teachers called for a continued needs assessment to be carried out in future.

4.7.3. Information dissemination (instructional methods & motivation offered)

Among the common and interesting strands of information the teachers included in their descriptions of IPD opportunities they experienced, were: usage of instructional methods and the respect they were offered. This information was captured and analysed.

4.7.3.1. Methods

The data indicates mixed feelings amongst teachers regarding the type of instructional methods and techniques used during formal IPD activities. One group of teachers thought that activities were interactive and involving in nature (i.e. participatory). For example:

> *Generally the workshops that I attended were not lecture workshops. We were just exchanging the ideas. They were just open discussion workshops* (T_{36}, LL.127-128).
>
> *Yah! They kept on involving us, asking us questions and allowing us to comment and all that* (T_{2}, LL.79-80).
>
> *Most of the time we were exchanging views and we were even a forum whereby we could dispute that [something]. It was an open environment* (T_{8}, LL.46-47).
>
> *It was more of a collaborative workshop than being taught. It was like sharing what we can do in this case. After discussing we came up with a tool that had to be common for all the schools that had attended so that we can assess the students in the same way* ($T_{6,}$ LL.71-74).
>
> *It was not like lecturing because they gave us some guidelines on how the setting of items should be done and then they gave us time to sit and prepare the paper: like we came back with cluster examination questions from the workshop* (T_{23}, LL.99-102).

Ten other teachers and five EOs subscribed to this view. (Can see: **List 24**-Appendix 7).

Conversely, several other teachers said they were mainly lectured at rather than being involved:

> *It was mostly lecturing and then we got into groups after which we presented the exercises. But mostly it was lecturing* (T_{11}, LL.71-72).

> *Yes! He was lecturing most of the time, but there were some cases where he was giving some group work* (T_4, LL.54-55).

Ten other teachers seemed to have been mostly lectured to. (Can see: **List 25**-Appendix 7). The data may imply the use of both learner-centred and instructor-centred approaches.

`Based on the number of teachers who commented on this issue, it shows that the majority (15/27=56%) of the teachers thought of instructional methods used to have been interactive. Only slight minority (12/27=44%) thought of them as lecture dominated.

As a way forward, the data below indicates that some teachers called for the more interactive and practically oriented activities. Some said:

> *...workshops which are practically oriented. We need to carry them as if things are happening and it will be easier to later on engage students if we know what we are doing* ($T_{26,}$ LL.176-178).

> *I believe that during those workshops the resource person and us should both participate in the presentations,* said T_{34} (LL.175-176).

Eight other teachers and an EO appeared to be calling for making future activities participatory (interactive and involving). (Can see: **List 26**- Appendix 7)

Key points to draw here are that:

- The majority of the teachers thought that activities were interactive and involving in nature whereas the slight minority felt they were mainly lectured at rather than given the opportunity to interact.

- Teachers suggested the need for more interactive and practically oriented activities in future.

4.7.3.2. Respect offered to teachers

In sharing their experiences on IPD activities the interviewees included how they were generally treated. On this issue some teachers said:

> *No! They [organizers and resource persons] treated us cordially with respect and with high professionalism* (T_{26}, L.81).

> *Amm! Like I said, we were part of the workshop; we were not treated as students per se* (T_6, LL.74-75).

The other teachers who seemed to be impressed by the manner in which teachers were treated include: T_{32}, T_{23}, T_{35}, T_{30} and T_{28}. (See quotes' location: **List 17-** Appendix 7)

Some teachers also stated that they were not strained by having to listen for long hours without a break. For instance:

> *We had a break around 10am and lunch around 1pm and another break at 3pm* (T_{30}, LL.43-44).

> *...we had some breaks. Like we started the workshop at 8:30am and then we had a break at 10am and then from 10:30 am we started up to 1:00pm. Then from 2pm up to the end of the workshop* (T_{28}, LL.206-208). *A similar observation that breaks were given was held by* T_5 (LL.80-81) and T_{35} (LL.48-49).

In my judgement, this is a welcome development that deserves to be promoted so that teachers can always associate learning with pleasure. However, it was evident in the data that some comments suggested a need for the needs, interests and expectations of teachers, as adults, to be respected in future so that they enjoy learning. (Can see: **List 19**- Appendix 7) E.g.

> *...at the end ... there should be refreshment and things like that especially after spending a very hectic day not no television no what...* (T_{15}, LL.101-112).

It can be drawn as a key message from this section that teachers were generally respected.

4.7.4. Duration of activities

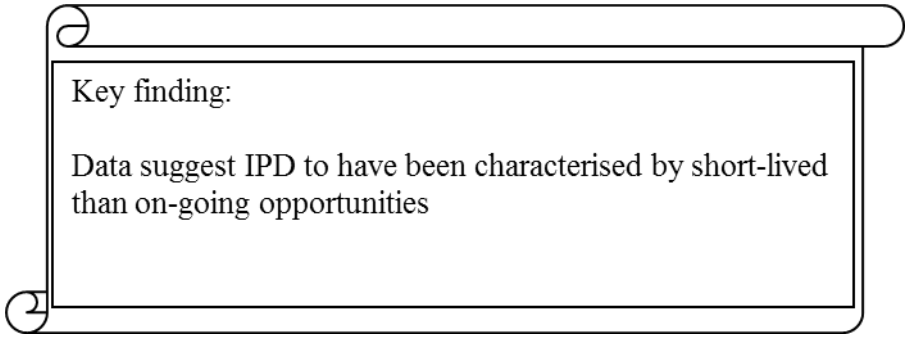
Captured from the teachers' accounts was also the length of time during which IPD opportunities were held. For an example, respondents said:

> *It was at Kanye Education Centre and it was a weeklong workshop (T_{28}, L.107).*
>
> *It was just a two day workshop but not exactly two days because we just attended it during the afternoons after the lessons (T_{13}, LL.45-46).*
>
> *It was just a one day activity (T_{26}, L.61).*
>
> *During the school calendar days. They leave their classes and they come here for two weeks (O_5, LL.208-209).*

Five other comments reflected these short duration (i.e. T_{20}, L.52: T_{34}, L.190: T_{36}, LL.50-52: T_{31}, L.101: T_1, L.28).

The duration of IPD activities attended by teachers ranged from two weeks to a few hours with some undertaken in the afternoons. This therefore led me to classify these activities as short-lived rather than on-going. By short-lived activities, here, I

refer to those which do not offer teachers ample time to develop and change their practice with feedback given to reinforce efforts leading to desired outcome. It could be because the organisers limited duration of activities to avoid utilization of teaching time, since most of the activities were held during school calendar days. This possibly led to rushing the instruction during sessions as was reflected, for instance, in the accounts by T_{24} (LL.96-98), T_{34} (L.133) T_{21} (LL.216-221), T_{20} (LL.24-26) and T_{29} (LL.125-128).



4.7.5. Follow up and Scope of feedback

The teachers and EOs were asked to share their view on the follow-up and feedback mechanism used to monitor the success of the activities. Some of the teachers responded:

> *No there was no good feedback because after the workshop there was just this evaluation form which I think it was not enough and I think if maybe they could have done that maybe in future to follow what and check if what they have delivered is being followed (T_8, LL.71-73).*
>
> *... there is no follow up to see whether really after the workshop you are implementing. What and how you implement is just up to an individual: there isn't even time frame given (T_{24}, LL.83-86).*

Eleven other teachers held a similar viewpoint (Can see: **List 32**- Appendix 7). This data shows that some of the teachers felt that there was not enough adequate follow up

and scope of feedback was not ensured to monitor progress of IPD initiatives. This view also gained support of O_4 (LL.178-182) and other two EOs who contended:

> *...Effort was made to ensure that there was a follow up. But you find out that the resources are limiting. And again you find that you want to visit a school there is no vehicle to take you there* (O_1, LL.158-160).

> *It is only unfortunate that we do not evaluate to see whether the workshops have been very effective or not. I think it is mainly us doing only what we are supposed to do without necessarily evaluating to find out if any impact was made* (O_6, LL.297-300).

Participants' responses indicated that lack of follow-up to monitor progress was mainly due to limited work force which could not cope with the demand (T_{22}, LL.154-158: O_5, LL.86-88: O_3, L.160: O_5, LL.86-88). On the other hand, teachers claimed to be ignorant of the need to report back progress on whatever they implemented, e.g. T_3 (LL.135-137), T_1 (LL.152-153) and T_{11} (L.74).

Respondents also tended to mention the feedback which concentrated on the evaluations of the proceedings of the IPD activities. E.g.

> *Well I think so because usually we have the questionnaire at the end which they fill to evaluate the whole training exercise and if they were happy with the venue (O_7, LL.160-161).*

> *Then at the end of the day we wrote a small quiz just to see whether we understood the concepts, but no certificates were awarded (T13, LL.60-61)*

Whilst these evaluations were useful, there were less important than checking if the teachers implemented what they had learnt and measuring the change thereafter. The data lacks evidence to suggest if this had ever happened.

Key points here are that:

- Follow-up by conveners to evaluate application and impact was rarely done.
- The teachers also rarely reported application progress of whatever that was meant to be put into practice after attending IPD activities.

4.8. Factors influencing IPD

It was in the interest of this study to identify factors that adversely influenced teachers' participation in IPD. This section therefore presents the findings on such factors which were sourced through interviewing teachers and Education Officers (EOs).

Some of the factors were raised by teachers and EOs as concerns during their description of IPD they experienced. Some were specifically raised as a response to the question that sought to identify things that influenced teacher participation in IPD. These factors include issues of availability of time for learning versus workload, shortage of Agriculture Education Officers, teachers' morale, material and financial resources, and systems politics or tensions.

It ought to be noted here that although some factors were actually said by respondents, I interpreted or deduced some others from the teachers and EOs' accounts. It is also worthy to note that I identified some factors on the basis of their importance even if they were not frequently repeated. It was the importance of their implications that mattered to me. Again, in some cases respondents suggested some improvements they would like to see happen in future and these are also reflected.

4.8.1. Availability of time for learning versus workload

The data showed that, too much workload either took time that teachers could have used for personal development, or exhausted teachers to the extent that they could not learn during or after work. The quotes below reflect this concern.

> *...So just consider where you have bulk classes; really how much time have I got to instil the practical skills and knowledge and the right attitude towards the subject:... I do not have enough time really. The syllabus is also so comprehensive that when I ... try to take them (students) to the garden to conduct practicals ..., there is the syllabus to finish and tests to write. So it is very difficult ...* (T_{26}, LL.290-300).

> *Even if the load is high like that, the teacher-student ratio is too much (is high). Tota (Really) we do not have time to really learn and to improve ourselves* (T_{11}, LL.229-230).

The Education Officers expressed similar concerns as follows:

> *So the teachers' load, class size in agriculture and number of classes that they teach I think are overwhelming them and end up not doing nothing. I remember raising this at the meeting of PAC when the syllabus was presented, telling them that with agriculture: the syllabus is too long; the class sizes are just too big; the number of classes they teach are many and so these guys are so overwhelmed that they end up doing nothing* (O_7, LL.327-331).

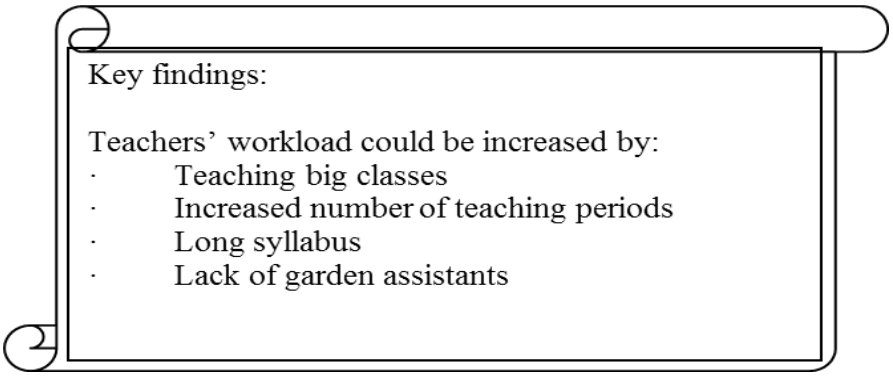
> *... for a subject like agriculture, let us take the minimum as an example, and say Agriculture has 4 periods per week in a five day timetable that would mean that for a teacher to have a minimum working load should have 6 classes. And now you visit the schools and you find that the class size is around 50 students now in the junior schools in and around Gaborone and that is around 300 students. And for somebody teaching practical subject to impart or develop skills and evaluate them for each and every student of 300 students is practically impossible. And teachers have been complaining and I have spoken to the director who said she will take it up with other relevant people* (O_6, LL.318-325).

> *...we can see that at the moment teachers are overwhelmed by the practical [work] in schools, ...* (O_8, LL.151-152).

The analysis of data above, and that cited below, show what appeared to contribute to an increased teachers' workload and hence a lack of time to learn. These aspects include:

a. Bigger class size which also appeared to have impacted negatively on the teaching of practical skills (T_{16}, LL.420-426: T_{14}, LL.133-135: T_{21}, LL.333).
b. Increased number of teaching periods (T_{27}, LL.239-241: T_{16}, LL.329-332: T_{24}, LL.211-214: T_{10}, LL.216-218).
c. Lengthy syllabus which consists of many content topics and related practical components (T_{11}, LL.226-232: T_{17}, LL.272-282: T_4, LL.201-202: T_6, LL.226-227: T_{18}, LL.243-246: T_7, LL.213-217). and
d. Lack of garden assistants at junior secondary level who could look after projects during after hours, weekends and school holidays (T_{17}, 213-214: T_1, LL.225-227).

So, for teachers to have time for professional development, these aspects need to be addressed.



4.8.2. Shortage of Education Officers specialising in Agricultural Education

It appeared that the teachers attributed some of their IPD problems to the shortage of Education Officers who specialise in Agriculture. For example:

> *... again as agriculture teachers in this region we do not have anyone say at the regional office that we are suppose to deal with, all those there they are babysitting and they are not well vested in the matters pertaining to agriculture. So really it is a hopeless situation* (T_{24}, LL.135-138).

> *...in our subjects we have so many (PEO) posts that are vacant. And I had a feeling that at the end they will be filled but up to now nothing has been done. We need people to oversee us, support us, guide us, direct us, and we need people who will see to it that we are doing the work* ($T_{1,}$ LL.294-297).

Other teachers who shared similar view were T_{27} (LL.295-302), T_{36} (LL.183-184) and T_{16} (LL.263-266).

The problems associated with shortage of Education Officers countrywide have also been acknowledged by the Education Officers. For instance, O_5 (LL.449-450) disclosed that, as officers, they were actually responsible for other subjects as well as agriculture. In addition, O_8 said:

> *One other thing that is a factor influencing IPD is that the system is also not catering for in-service as is shown by having only two Officers for in-service for the whole country. Even if they are determined to train teachers really they cannot afford it. They are really thin on the ground* (LL.254-257).

Unfortunately, the government has cut expenditure to recover from the impact of recession. As a result it may not be possible to hire more Education Officers soon. One Education Officer who revealed the government's position on this matter said:

> *... because of this problem of recession, the government is not able to recruit more officers. So then the government will still do with the skeletal staff that they have for now until things are OK that is then that they can employ more officers* (O_2, LL.42-45).

These data show that the teachers find it hard to work and learn without supervising officers supporting them. This suggests that interim measures may be of help, if they are to be put in place to close the gap.

4.8.3. Morale of teachers

Given that learning in IPD is a long process that involves teachers experiencing instructions, trying out things in practice and observing outcomes to determine their change in beliefs (Guskey, 1986:2002), it is likely that teachers may encounter frustrations in this long process leading to low morale. It appeared from the data that the low morale might have adversely impacted some teachers' commitment to learn. For instance, when discussing on the need to advance in academic qualification, T_2 posited:

> *I look at it as when you apply is taking a long time. Is like, I see things being very difficult. Being given a chance to go for further studies is not an easy thing the way I see it. This is why I am reluctant to even attempt* (LL.178-180).

It is evident from this excerpt that this teacher talks from a position of an individual who lacks courage to continue learning due to the unfavourable experience he/she encountered.

It is also evident in the data that several teachers could not apply and make good use of the information from the IPD activities due to some cited problems. For example:

> *... there are some issues tse eleng gore (which) at times when you present them to the school heads, they tend to question them if I may say that. Now, it is important that as we are coming from these development workshops we are followed with (by) a letter or something to notify and support what we are going to do* (T6, LL.140-144).

> *... there is no follow up to see whether really after the workshop you are implementing. What and how you implement is just up to an individual: there isn't even time frame given* (T_{24}, LL.84-86).

It is evident in the excerpts above that the low teacher morale might have been also encouraged by inadequate support and supervision expected of school administration and EO's. The other responses, which reflected some frustrations by teachers in an

attempt to apply the new ideas gained through IPD, appeared to be T_{17} (LL.123-128 & 293-295) and T_{28} (LL.140-143).

Several other reasons might have led to the low morale. It could be due to: lack of incentives or benefits attached (T_{22}, LL.188-190); lack of recognition of the teachers' learning efforts by the authorities (T_{17}, LL.198-206: T_5, LL.317-318); slow or no progression in career path (T_{12}, LL.137-138); frustration resulting from unfair practices where some teachers were favoured more than others (T_{31}, LL.205-209: T_{34}, LL.170-172: T_1, LL.263-266: T_{26}, LL.225-234: T_{24}, LL.127-133); and slow processes (T_{30}, LL.144-147: O_4, LL.341-344: T_{36}, LL.200-203: T_{13}, LL.258-262). I therefore posit that the teachers would be motivated to participate fully and learn from IPD opportunities if these aspects are reversed and made favourable.

4.8.4. Material and financial resources

Whilst teachers had expected to learn more from the internet, as was reflected by several teachers (e.g. $T_{19,}$ LL.167-168), the data showed that a considerable number of the teachers did not benefit much from internet. On this, some teachers said:

> *...we still have issues with computers and all the like. Like right now we have not been having access to internet to conduct any research* (T_{26}, LL.171-173).
>
> *Our internet is always down, computers down; today they would say server, the other day internet, next time electricity, there is always a problem* (T_5, LL.187-189)
>
> *...those computers are for students. So if I go there and find a student I would bounce back because they are for students. It is only that we teachers we take advantage here and use them probably in the afternoons* ($T_{32,}$ LL.145-147).

Others who shared a similar view were: T_{15} (LL.178-180), T_{21} (LL.353-355), T_{36} (LL.216-217), T_9 (LL.64-68), T_4 (LL.131-134), T_{22} (LL.67-68) and T_{35} (L.146). These

findings show that the teachers might not have benefited because of problems associated with internet connectivity on the one hand and difficulty in accessing computers in the other.

Some materials which were obstacle to the teachers' learning were the: outdated books found in schools (T_{29}, LL.105-106: T_{11}, LL.94-95); dilapidated structures (T_{17}, LL.266-270) in which field trials could be carried out to facilitate learning by both teachers and students.

Lack or shortage of funds also limited the participation of teachers in the learning activities. Some of the teachers who shared this observation stated:

> *...from that workshop we were expected to go and resource other colleagues in our region. But it did not happen because they ended up saying they were encountering financial problem and therefore could not call other teachers for further workshops and at the end of the day the few teachers who attended the workshop were the only people who benefited* (T_{22}, LL.113-118).
>
> *Like they try to organise these workshops but the problem is they always say there is a problem of money* (T_{29}, LL.184-185).
>
> *When we talk of finance, for instance, is one main threat that I am faced with* ($T_{33,}$ L.164).
>
> *On the other hand, the government would say I do not have enough funds so, I cannot fund many teachers* (T_{3}, LL.276-277).

Five other teachers and three EO's observed that lack of funds hindered IPD initiatives (Can see: **List 39**- Appendix 7). There is therefore, a need to address the issue of finance to improve the situation (T_{27}, LL.291-295).

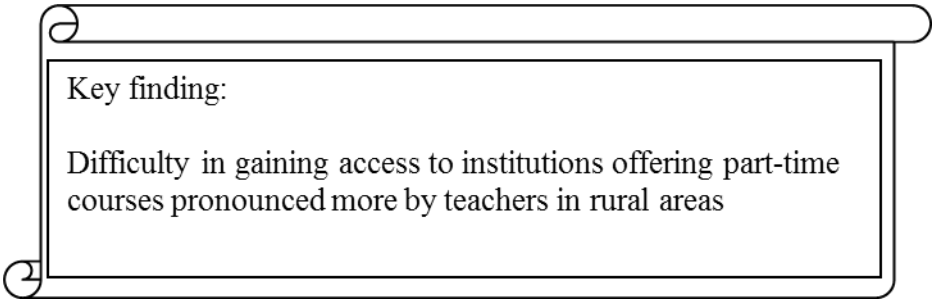
4.8.5. Access to learning institutions

Further analysis revealed that school location might have led to some disparities in affordability to learn. For instance some teachers shared:

> *... people who are working in the rural areas they do not have any access to the institutions* (T_{22}, LL.51-52).
>
> *The main problem is that I failed to do the learning, because I was looking at the distance. By that time I did not have any good transport* (T_3, LL.258-259).
>
> *I am ready to learn. It is only that in our area the radios have poor reception. The area is also far from institutions* (T_{34}, LL.57-58).

Others who cited the location to have probably determined access of institutions by the teachers were: T_2 (LL.183-184), T_{35} (LL.161-162), O_6 (LL.231-240) and T_{11} (LL.263-265).

The findings above reveal that the teachers, especially those in rural areas, might have found it hard to access learning institutions where they could have done part-time courses, for instance. This implies that those in towns might access institutions easily.



4.8.6. Invitations for teachers to attend activities

Data analysis has shown mixed feelings among the teachers regarding the timing and consistency of their invitations to attend formal IPD activities. There was one group of teachers which appeared satisfied that they had received invitations well in advance. For instance, one of the teachers said:

The school knew about the workshop because I was informed well in time and I was able to prepare for that workshop (T_{23}, LL.92-93).

Among others in the above group were T_3 (L.147) and T_5 (LL.130-135). On the other hand, some few teachers expressed that they received invitations late

...most of the time you find that you just get a notice that there will be a workshop: getting a notice on Friday that there will be a workshop in Gaborone from the 1st and the 1st being Monday (T_8, LL.213-218).

This view was also held by T_{26} (LL.103-104) and T_7 (LL.89-92). But the small number of teachers here limited me to further interrogate the data to find out the groups of teachers which were invited in advance and which were not. But I settled for at least acknowledging both views.

However, the analysis of data showed that the Education Officers confirmed the timeliness with which invitations were usually sent to teachers. The quotes below are evidence to this:

... the invitations are sent well in advance, is only that in the schools when they select teachers to attend, I think most of them are selected very late (O_6, LL.106-107).

The invitation was fine because attendance was very good and I think a little hick up (problem) was with transport (O_3, LL.149-150).

The findings above might show that the school administrations delay the process of inviting teachers to attending IPD activities.

Another group showed concern that the invitation criteria used was somehow inconsistent because it appeared to sideline other teachers. Some teachers revealed this when they stated:

... there is no provision for secondary school teachers to further their education upto masters degree. That chance, at this time, is given to deputies and school heads (the management) (T_1, LL.264-266).

... but the other one was a coordinator and as such he was supposed to go because he was a coordinator (T_{28}, LL.85-86).

Four other teachers shared similar sentiments. (See: **List 12**- Appendix 7). The data here seems to confirm the claim that invitations were inconsistent because it comes out clear from the quotes that the deputy heads and coordinators had to attend on the basis of their positions.

On the invitation aspect, the teachers suggested the following for the future:

- that teachers receive equal chance to attend the activities. Mentioned 6 times (See: **List 14**- Appendix 7). E.g.

  It is the coordinator or senior teacher who goes mostly... But it is unfair... Taking the old and the new teachers to the in-service activities will provide a good balance. (T_{32}, LL.170-176)

- On another note, teachers suggested a need to be recognised for merit when selected for further studies and also in a manner that would be beneficial to the system (T_{36}, T_{24}). Mentioned 5 times (See: **List 15**- Appendix 7).E. g.

  Tota (Really) we should be recognised by merit: by what we do. Like right now ....I have never scored less than 86% in my JC results, and I tried all those (T_{17}, LL.340-346).

- They also suggested that invitations be sent well in advance with agenda included for participants to prepare for it. Mentioned 6 times (See: **List 16**- Appendix 7). E.g.

  So, invitation should be made well in time so that we can be able to prepare for them (T7, LL.89-92).

Key findings here are that:

· Teachers had mixed feelings about the way they were invited for the events. Some felt they were invited well in advance, but others felt the invitations arrived late.

· Invitations might have been inconsistent because some teachers appeared to have been given priority.

· Suggestions: Teachers felt the need: for invitations to reach them well in advance; to be afforded equal chance for attending IPD activities; and to maintain consistency when nominating teachers for further training so that the exercise is done in the best interest of the entire system.

4.8.7. Welfare issues

In sharing their experiences on IPD activities the interviewees included how they were generally fed, accommodated and transported. These are addressed here separately. On how the teachers were fed and accommodated, some teachers and Education Officers shared:

> *No! For the workshops or meetings ....Even the school based workshops there is always something to eat (refreshments are provided), I think that is the support* ($T_{35,}$ LL.146-148).
>
> *we were catered for when it comes to accommodation and food* (T_{10}, L.60).
>
> *I think even the organisation was very very OK. ...but accommodation is not offered but at least they give you some subsistence allowance and nowadays it is very high that of BEC ... it is better than nothing* (T_{15}, LL.57-61).
>
> *We invited them and asked them to look for accommodation for themselves in Francistown and then we reimbursed them* (O_1, LL.84-85).

Eight other teachers and four EOs had similar view about the provision of meals and accommodation. (See: **List 18**- Appendix 7).

The above findings imply that the teachers were generally satisfied with the food and accommodation. It therefore suggests that the teachers were fed and accommodated fairly well when attending IPD activities.

The data shows two different views concerning the provision of transport for teachers to attend the activities. Some respondents felt that transport was provided and these teachers and Education Officers said:

> *No! For the workshops or meetings we are provided with transport* ($T_{35,}$ L.146).
>
> *The transport was provided even the lunch or the meals there were just fine* (T_{20}, L.24).
>
> *Yah! We are provided with transport, food, accommodation and so on* (T_{29}, L.210).

On the other hand, some found transport to be problematic:

> *Maybe the most unfortunate thing is that sometimes we would be using open vehicles (pickups) to transport teachers and that was the only problem I observed myself* (O_3, LL.149- 153).
>
> *...it was difficult because sometimes you will be using this public transport from place A to B where you pay only P20-00 and you then find it difficult to go to place C where you will also wait in the queue just to claim the P20-00 back. So you then end up giving up* (T_{28}, LL.117-120).
>
> *...we were told to use public transport and we will be refunded and somebody to sit down and write that claim for P20-00 is something that you would just say hah! let me just leave it wa bona (you see). For which it was not suppose to be the case, we were supposed to have been provided with transport* (T_{10}, LL.94-99).

This issue of the transport being problematic was also indicated by T_{14} (LL.47-48), T_9 (LL.64-68) and T_4 (LL.131-134).

The data above shows that teachers had mixed feelings about the way transport was provided to reach venues where IPD activities were held. A considerable number

of teachers reflected dissatisfaction, because the shortage of transport limited their attendance of IPD activities. Comparative analysis further revealed a larger proportion of rural school teachers (4/14=29%), compared to that of those in peri-urban (1/16=6%) and Urban (0/6=0%) schools, to have raised this problem. Actually, closer examination of this proportions shows that problems of transport increased with the decrease of the socio-economic status of the location; not even a single teacher from the urban schools raised the problem. This could imply that different locations were not fairly accorded transport. The data also reflects (e.g. T_{28} and T_{10} above) that the process of claiming back money after the teachers had used public transport could be stressful, thus calling for improvement.

Furthermore, the teachers tended to voice welfare-related suggestions here.

- They suggested the need for school administrations to organise transport and avoid instances where teachers fail to attend external IPD activities. E.g.

  > *...Also as the school administration they should organise transport for taking teachers to workshops not to be told to use public transport which one may fail to get...*(e.g.T_{28}, LL.282-286).

- Also some comments implied a need for the needs, interests and expectations of teachers, as adults, to be respected so that they enjoy learning. (Can see: **List 19**- Appendix 7) E.g.

  > *...at the end ... there should be refreshment and things like that especially after spending a very hectic day not no television no what...* (T_{15}, LL.101-112).

Key findings drawn from this section are that:

- meals and accommodation were provided for when teachers attended IPD activities.
- Some teachers were satisfied with transport whereas others were not. Moreover, it appeared teachers, from rural schools, were dissatisfied more with the provision of transport. This might suggest an imbalance that needs addressing.
- The data also shows ($T_{15,}$ O_1 and O_8 for instance) that where accommodation facilities were not available, teachers looked for accommodation themselves and later paid subsistence allowance. The same applies to transport. Unfortunately, the refunding process for transport expenses appears to be unsupportive of the teachers as it takes long.
- Suggestions: School administrations to organise transport; need to continue catering for teachers' meals and accommodation.

4.8.8. Venues

When the interviewees shared on the activities they participated in, some reflected on the venues as follows:

> *It [workshop] was in Kanye Education Centre. Ah! That one was super: it was excellent. Accommodation, meals were well done. We were treated like adults* ... (T_{19}, LL.92-94).

> *We were not actually happy with the venue because ...we were using classrooms* (T_1, LL.53-57).

> *One was [held] at the Cumberland Hotel that of bee keeping which was a workshop* (T_9, (LL.46-47).

> *It was held at CICE and the facilitators were the lecturers. It was also a good workshop* (T_{18}, L.127).

It can be understood from the quotes above that the Education Centre, School facility e.g. classroom, hotel and other institution's facility were venues for IPD activities. Data analysis revealed that these venues tended to be mentioned several times by teachers and EOs. This therefore suggested that they were the common venues for formal IPD activities. In terms of popularity (i.e. using teachers' counts only), it appeared that the use of:

- An education centre was mentioned 17 times (Can see: **List 20.A**- Appendix 7).
- A school facility e.g. classroom, library was mentioned 13 times (Can see: **List 20.B**- Appendix 7).
- A hotel was mentioned 3 times (Can see: **List 20.C**- Appendix 7).
- Any facility of other institutions such as BEC, BCA or CICE, UB and KRTC was mentioned 9 times (Can see: **List 20.D**- Appendix 7). Figure 6.5, p.348 depicts the popularity of these venues.

It appears in the data above that the most popular IPD venues were Education Centres followed by the use of school facilities. Third in popularity were the facilities of other institutions whereas the least popular venues were the hotels.

Although the school facilities appeared to be the second popular venues, some teachers including T_1 (LL.53-57) above, seemed to be unhappy with them. For instance, T_{17} commented:

> *we are also professionals we do also visit some institutions and you find that when there is a workshop you would see that really these people have attended a workshop issued with a notepad , a pen, to show that there is seriousness in the whole thing. and even the paraphernalia and the software that is used. But here, if they say a workshop it means going to a classroom which is always like that without air conditioner, sitting on chairs some of which are broken*

> *and some of these things tend to demotivate us: they do demotivate us to an extent that missing a workshop to some people do not think is a bad thing* (LL.403-410).

This assertion shows that some teachers considered the use of school facilities as venues to be disrespectful to them. In the same group, some (i.e. T_{15}, LL.104-111, O_4, LL.160-165, T_{13}, LL.172-175 and T_{33}, LL.117-118) held a view that refreshing and motivating venues e.g. hotels could be chosen to boost the learning morale of teachers.

However, some respondents did not mind the use of school facilities or any other place so long as it was relevant for the topic at hand and offered the opportunity for hands on and real life experiences. For instance,

> *Yah! They are of good benefit the school based workshops because really we will be home and addressing local problems* (T_{35}, LL.110-111).

> *And again, for the venue I would say just the place that suits the workshop at that time* (T_{29}, LL.125-129).

Nine other teachers and one EO shared the view that venue should be dictated by the aim of the activity or topic at hand. (Can see: **List 21**- Appendix 7)

Key findings drawn in this section are that

Education Centres, school facilities, facilities of other institutions, and hotels were the common IPD venues. The most and the list popular venues were Education Centres and hotels respectively.

Some teachers were uncomfortable with the use of school facilities

Suggestion: Considerable number of teachers emphasised on venues relevant for the topic at hand and also which make learning an enjoyable experience.

4.8.9. System politics or tensions

Several collusions in the IPD activity system seemed to have stifled progress in the teachers' professional development. One such tension was detected amongst the sister departments that had some interest in the IPD of teachers. Some officers blamed the inadequate in-service support provided to teachers on the somewhat sub-standard performance of other departments. The tension seemed to be voiced mainly by the officers. For an example, one officer said:

> *I think these other departments are not doing enough; because even the coursework training that we are doing, I feel we should be resource people but not trainers. It is for the training department to be doing this. In fact, for all the training that we have done we are trying to bridge the gap and also to involve them. Like the HOT (High Order Thinking) training: we invited TT&D, we invited Secondary department, we invited Primary department so that they can come and receive training with a group of teachers who will act as Trainer of Trainers after, that is helping TT&D. Even with the coursework assessment, we invited TT&D knowing that TT&D is responsible for training, so that they can be here, trained with some people and then go out there and use these people to help them continue with training. But in most cases we do not see them doing that* (O_7, LL.71-80).

The other Officer from the other department said:

> *... like we have different agricultural officers in different departments..... Maybe the most important thing is for the officers in these departments to realise that they cannot work in isolation. My main problem right now is that we think we can work in isolation .....Yes! they [sister departments] work in isolation, you see! .... the problem is with us officers. I do not know whether we are fighting for the teachers or what? But we are working towards the same goal. .... But the working together is lacking. I want teachers to see that myself I am powerful and effective than others, but if we can avoid that I think it will be fine* (O_3, LL.194-210).

This spirit of not working together was also observed by O_4 (LL.401-404) and O_5 (LL.279-280). When contributing, O_5 said *'It looks like we do not work as a team, we work as separate* [entities] *and this makes things very difficult*'.

Data analysis revealed here that the tension might have been due to the overlapping roles of the concerned departments: which might have made it difficult to hold someone in the department responsible for failing to help teachers in certain practical undertakings. For instance, the quote below seems to reflect the existed overlap.

> *Now the question is who should supervise school based assessment? It is a question now between secondary department and BEC. We are saying we do not supervise school based assessment although to certain extent we should be involved* (O_8, LL.153-156).

The above question shows that the EO (O_8) was not clear with the written roles (mandates) of the departments in relation to helping teachers assess students. There is therefore a need to clarify these roles which will help evaluate the effectiveness of the individual departments in relation to IPD for the teachers.

Data analysis also revealed possible collusion between the timing for IPD events, teaching aspects and teachers' personal obligations. Several teachers expressed this concern, for instance

> *...Mmm! I would say I am not happy with them [workshops held over the school holidays] because as teachers we also have other obligations to address or attend to'* (T_{17}, LL.198-199).

> *Yah! ... tota (really) during the holidays most of us if I may quote 'Agric teachers' throughout the term we are engaged* (T_6, LL.125-127).

Other teachers who expressed a similar concern include: T_{34} (LL.185-187), T_2 (162-165), T_6 (LL.125-128) and T_{12} (LL.75-80). Confirming the collusion O_3 posited *'there is a clash: the school heads are opting for school holidays whereas the teachers are for school calendar days'* (LL.366-367).

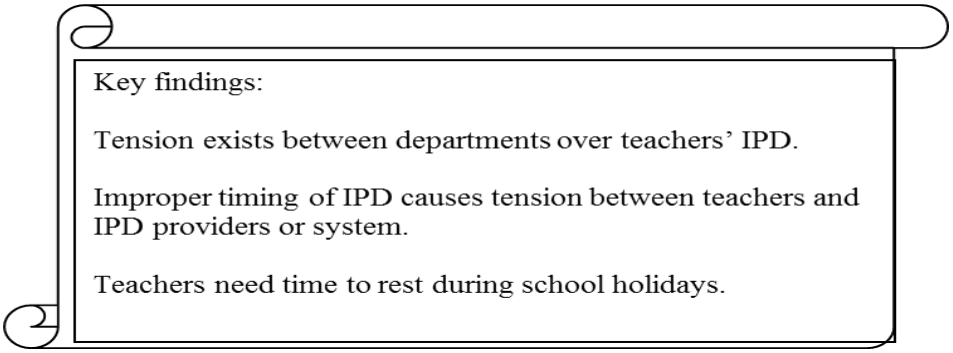
The data above shows that the clash could be between the teachers and the school heads. The school heads might have emphasised the use of the school holiday period for IPD activities to prevent loss of teaching time. On the other hand, the agriculture teachers could only (considering the nature of their subject) rely on the school holiday period to take leave for their private obligations. Whilst these might be genuine reasons, the clash may exist because one camp fails to understand the other. For that reason, there is a need for both camps to reach a common understanding and strategize the way forward. Forcing the teachers to learn when they are not prepared, may prove fruitless. This discussion is further developed in Chapter 6 (See pp353-354).

The data indicates that the teachers might not be against learning during the school holidays, per se. They might simply be calling for consideration of their personal needs; a significant number of the teachers were willing to have school holiday time used for in-service training activities provided proper arrangements were made. On this, some teachers said:

> *I am not worried personally myself, isn't it? Another teacher may not but I am talking about myself and I have indicated that I need to be developed. First of all they should be prepared for that, isn't it? That is why I am open to say to me now during the school holidays I would organise my time knowing that at such time I will be in this workshop and I will be developed which will benefit me on this ...* (T_{21}, LL.208-212).
>
> *... during the term, maybe we take a day or two and then we have to rush through the whole thing, you see. But during the school vacation I think it would be the best time* (T_{29}, LL.126-128).
> *... Imagine two weeks being out of the station, you find that you miss a lot, you miss a lot. I think it could be better if it is done maybe during the holidays because I do not think we very much need those days* (T_9, LL.163-165).

Sixteen other teachers shared a similar view (Can see: **List 40**- Appendix 7).

This finding suggests that the use of holidays for IPD activities can still be explored in future, but time must be allowed for the teachers to cater for their private obligations.



4.9 Chapter summary

In this Chapter I presented the findings of the qualitative phase of this study without detailed discussion, since all discussions are in Chapter 6. As key findings, it appeared that amongst the reasons given the majority of the respondents perceived IPD to update knowledge. Probably this was a reflection that teachers felt their knowledge base is getting obsolete.

Also presented, in this Chapter, are findings related to needs assessment, invitations, aspects of information dissemination, duration of activities, and scope of feedback ensured. Finally, several factors, amongst them: the shortage of In-service Education Officers, funds and materials, were identified to have constrained IPD in the region. Meaningful comparative analysis of the teachers' responses in this chapter was restricted by the small numbers of teachers I had to compare.

Whereas the next Chapter presents the quantitative findings of this study, Chapter 6 will continue the interpretation and discussions of these findings in conjunction with those from the quantitative phase of the study.

CHAPTER 5: QUANTITATIVE FINDINGS

5.1. Introduction

In this chapter, I present the findings from the survey part of the study. A total of 228 questionnaires were returned by teachers and used in the analysis. The findings are presented in both tables and charts with accompanying brief comments. Also to note is that the presentation of the results here, is in relation to the research questions outlined in Chapter 1**.** In line with the type of data, frequencies and percentages as well as arithmetic means and percentiles were the descriptive statistics reported. Chapter 3 (Section 3.10.2) discusses in detail how quantitative data analysis was done. The section discusses the choice of the statistics employed at length.

Readers should not expect detailed discussions of findings in this chapter. The Chapter is mainly set to group and present what was found. Joint interpretation and discussion of findings are presented in chapter 6.

5.2. Structure of the chapter

This chapter begins by presenting the distribution of teachers according to selected teachers' demographic characteristics and school attributes. Figures are used to reveal the findings pictorially. Table 5.1 under Appendix 11 summarises these findings. These data were compiled to show the composition of the population and provide background information that might impact the provision of IPD to the teachers in the region. Thereafter, the chapter presents Tables 5.2 and its associated Figures 5.10 up to 5.15 (in that order) to show how the teachers responded to individual items on their participation in IPD provisions. The chapter continues to

present Figures 5.16 to 5.27 to show how teachers responded to items about relevance, characteristics, and content of IPD. Key Tables 5.3 to 5.5 under Appendix 11 summarise these findings. The figures and tables in this chapter are presented under the key areas aligned to the research questions.

Readers will be referred to Tables 5.8 to 5.31 for the statistical test results. Some of these tables are presented in the reduced forms in the chapter and the appendix section of this report. Complete pdf versions of these tables can be found in the CD-ROM enclosed (In the folder entitled 'Comparative Analysis Tables'). Also presented in the chapter are the IPD needs of teachers and these are in Tables 5.44, 5.45 and 5.46 included in the text.

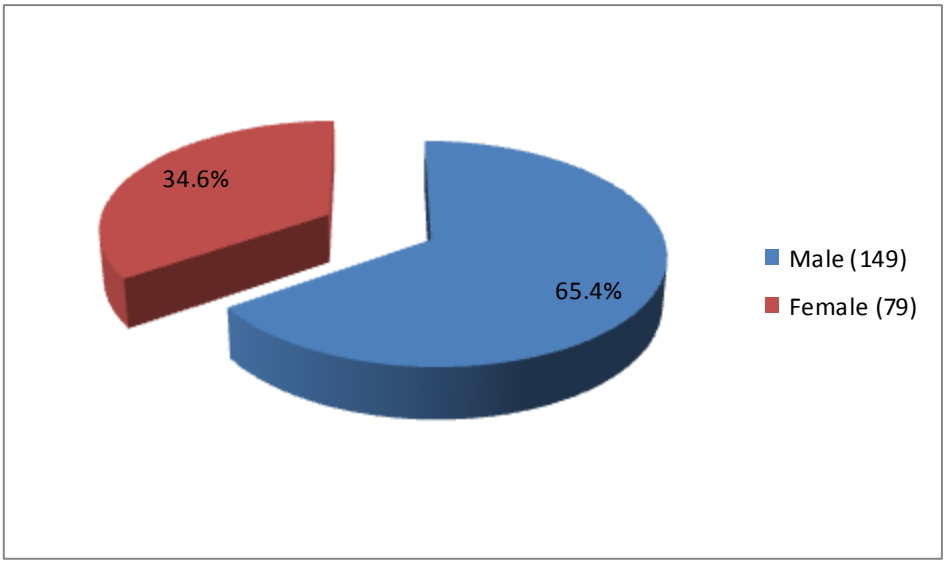
5.3. Demographic Characteristics of Respondents

Table 5.1 under Appendix 11 presents findings on the distribution of secondary agricultural science teachers in Botswana who were involved in the study by demographic characteristics. Pie charts are provided in this section to pictorially show the distributions. The aspects covered are: sex, age, highest academic qualification, teaching experience, position of responsibility, phase of education, school location, and school performance.

Sex. Figure 5.1 below shows that there were nearly twice as many male as females who were involved in the study. As all teachers were studied, it follows that there were, by far, fewer female secondary agriculture teachers in the Central region of Botswana, than their male counterparts. The findings seem contrary to the statistical trend of the general secondary teachers in Botswana: in terms of their distribution by

sex as disclosed in the latest report by Ministry of Education and Skills Development (2007). The report indicated that out of the 168220 secondary teachers there were 87309 (52%) female teachers and 80911 (48%) male teachers. This reflects an almost equal number of males and females in the entire teaching force then.

Figure 5.1: Distribution of agriculture teachers by sex

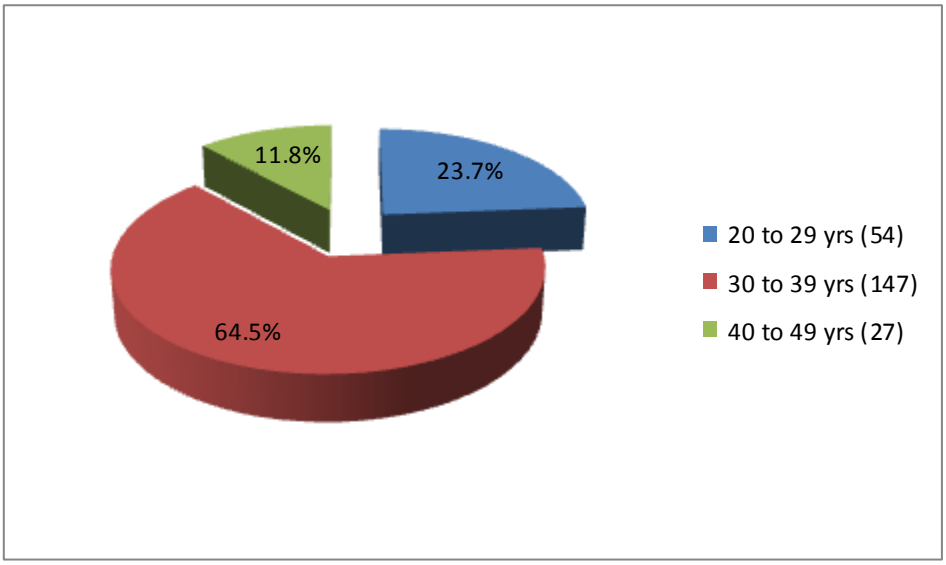


However, the findings tended to follow a similar statistical trend of the teachers at secondary level across Sub-Saharan Africa where, 'with notable exceptions, the percentage of female teachers is low' (Mulkeen et al., 2007, p.35). As a result, it is not surprising to see female agriculture teachers constituting a smaller percentage here.

Age. Figure 5.2 below indicates that the majority of the teachers were in the middle age bracket (i.e. 30 to 39) and compared to the older teachers of 40 to 49 years, they still have a potentially long service to offer to the Botswana education system. This is therefore, good reason to invest more money in training them together with the young

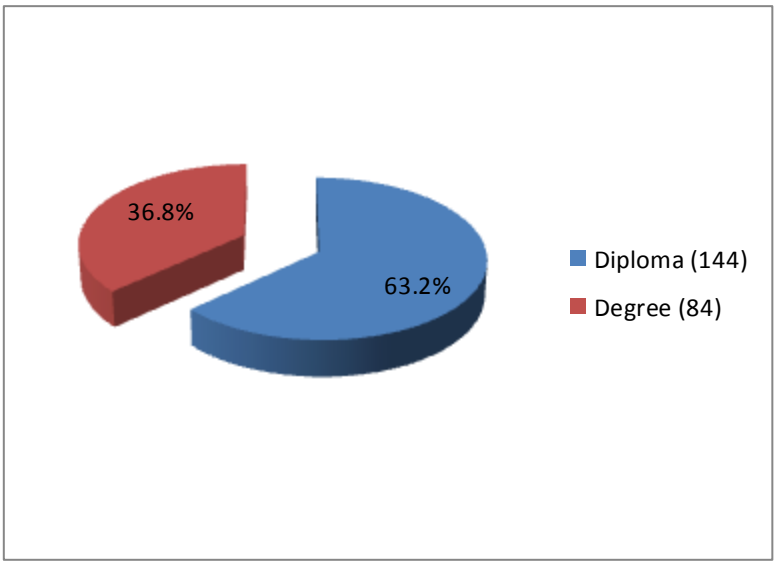
teachers to ensure proper implementation of Agriculture programme in secondary schools.

Figure 5.2: Distribution of agriculture teachers by age group



Highest Academic Qualification. Figure 5.3 shows that teachers having degree qualification were slightly more than half by number, of those teachers with diploma qualification.

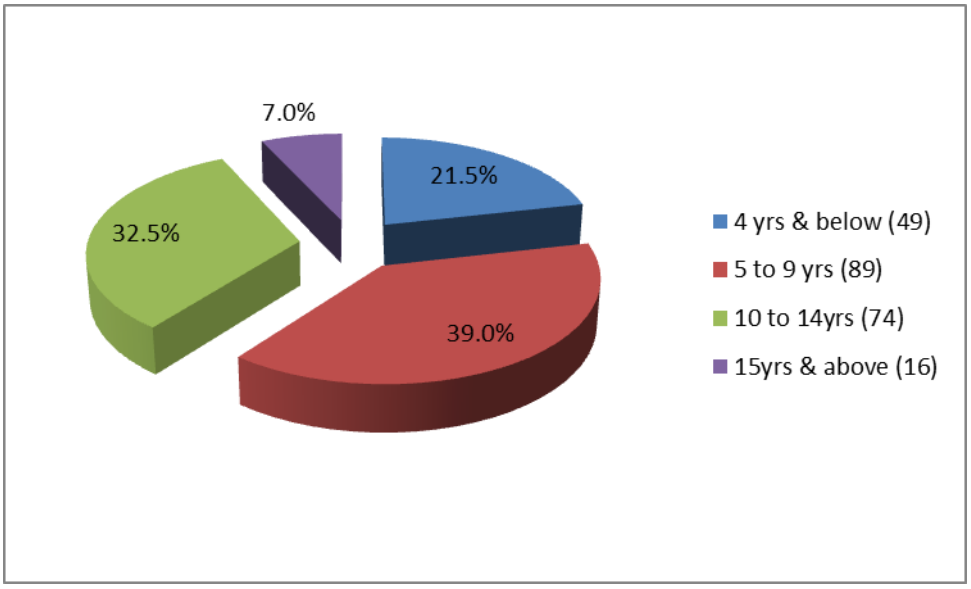
Figures 5.3: Distribution of agriculture teachers by academic qualification



This is, by most standards, impressive in terms of teacher training. According to the latest compiled records of the Central Statistics Office, 82% of the secondary teachers were trained with Diploma and above (Republic of Botswana, 1999). It would, therefore, appear that comparatively more secondary agriculture teachers are better trained than the rest of the teachers

Teaching Experience. It is shown in Figure 5.4 that slightly more than half of the agriculture teachers in the region occupied the bottom two brackets of teaching experience, and thus need to accumulate more teaching experience.

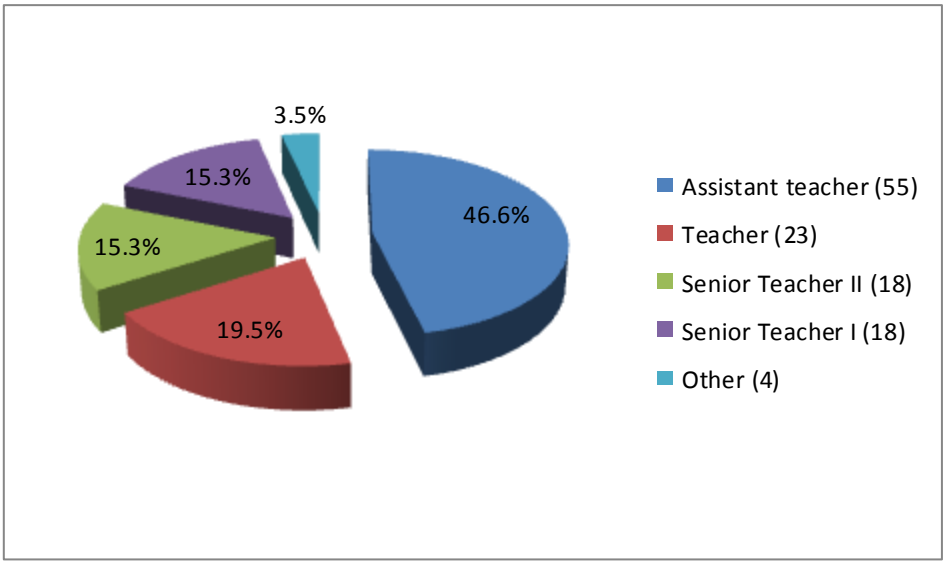
Figure 5.4: Distribution of agriculture teachers by teaching experience



There is therefore, reason to support them closely through in-service professional development activities to effectively implement the agriculture curriculum. Similarly, the most experienced teachers might still need support for they might be occupying positions of responsibility that are challenging.

Teaching positions. Figure 5.5 below reveals that the assistant teachers' group formed the largest proportion of agriculture teachers in Central region schools. Therefore, most teachers might have been comparatively fresh in the system, thus creating a need for them to receive in-service support to effectively implement the curriculum.

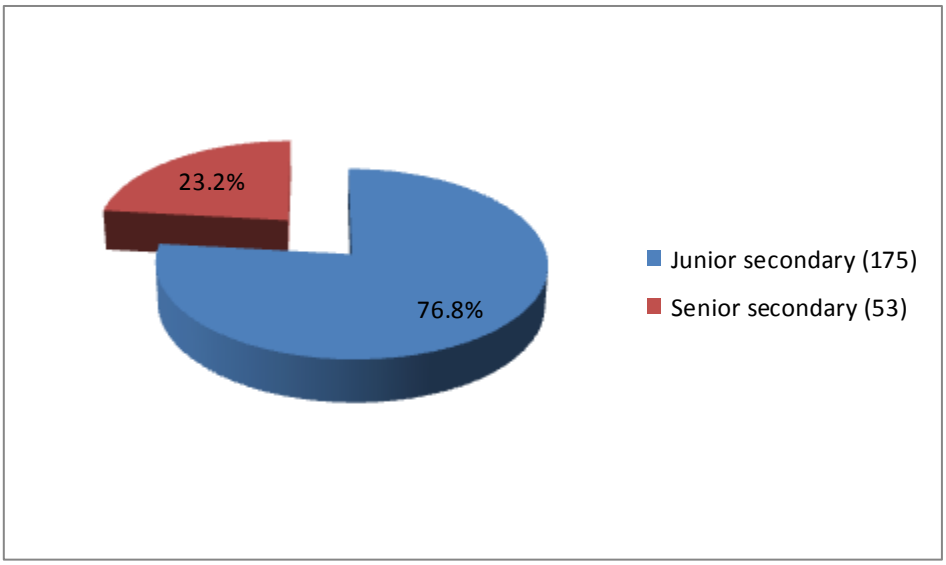
Figure 5.5: Distribution of agriculture teachers by teaching position



The 'others' group were either heads of department (HOD) or deputy school heads. There was a more or less equal distribution of 'teachers' in each of the senior teacher positions for agricultural science curriculum.

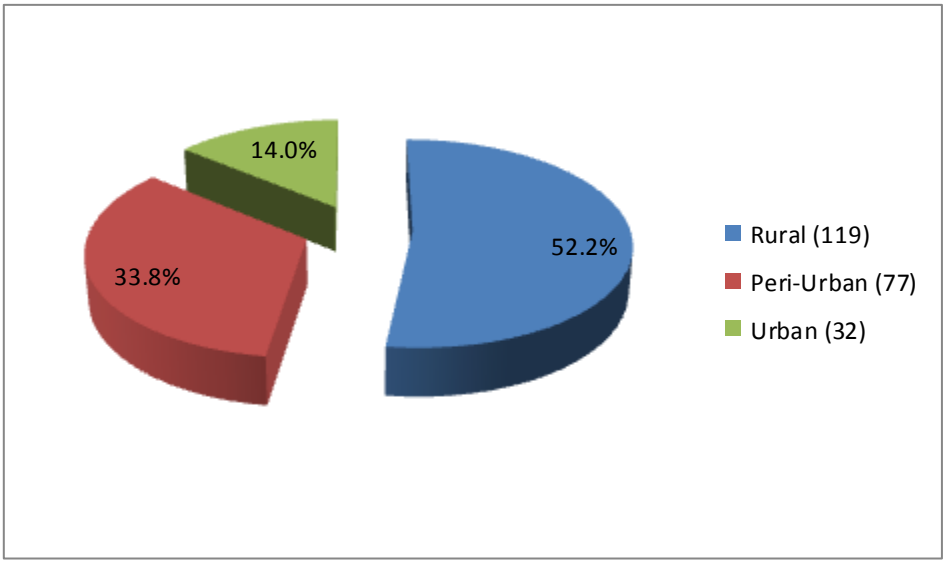
Phase of education. Figure 5.6 below reflects that the majority of the teachers taught in the junior secondary schools. This probably could be that there are many junior secondary schools (i.e. 59) than senior secondary schools (i.e. 8) in the region. This might serve as the basis for assigning more money for training to be spent in junior secondary schools than senior schools.

Figure 5.6: Distribution of agriculture teachers by phase of education



School location. Figure 5.7 shows that there were more teachers in the schools located in rural areas than those in the peri-urban and urban areas combined. Again, the teachers' distribution resembles school distribution.

Figure 5.7: Distribution of agriculture teachers by school location

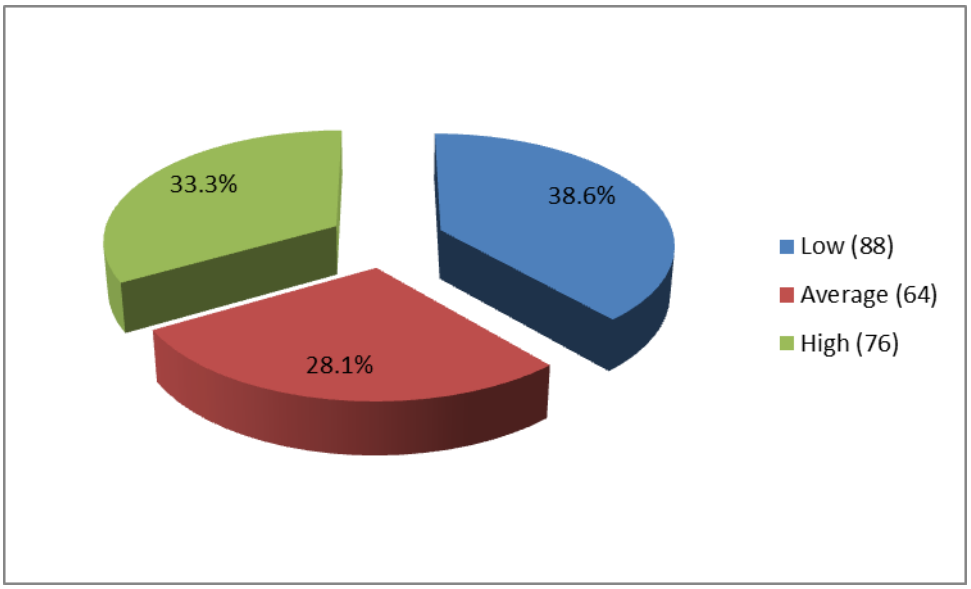


This pattern could also reflect the distribution of the population in the Central Region. The region is made up of many rural areas and this then translates to a greater

population in rural areas than in other areas. This could therefore suggest an IPD funding pattern where rural schools are allocated a larger share followed by those in the peri-urban and urban in that order.

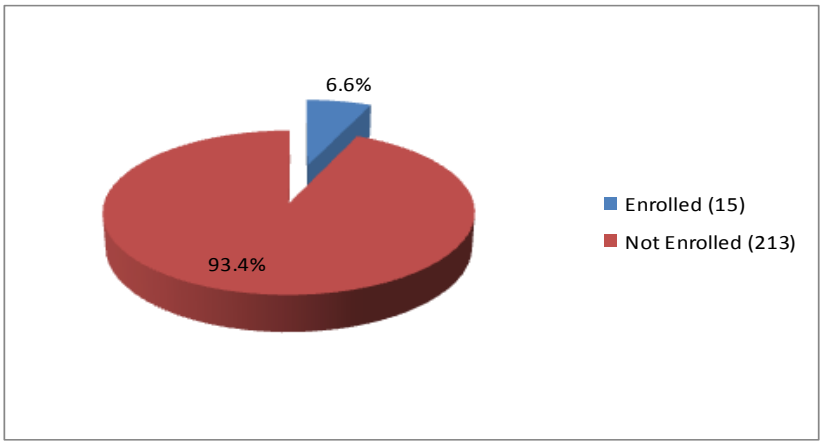
School performance. Figure 5.8 shows that a slight majority of the teachers were from low performing schools. This might suggest a need to concentrate efforts of IPD in those schools to address a large number of teachers. Ultimately this might even lead to improved teachers' practice and students' performance (Leu and Price-Rom, 2006).

Figure 5.8: Distribution of agriculture teachers by level of school performance



Part-time course for enrichment. Figure 5.9 below reflects that very few teachers took part-time studies. It is surprising that the proportion of teachers taking it upon themselves to learn was not large. But one reason for this might be lack of funds to pay tuition.

Figure 5.9: Agriculture teachers' enrolment in part-time courses



5.4. Rate of teachers' participation in IPD activities (RQ2)

Table 5.2 below presents frequencies and percentages of teachers who participated and did not participate in each of the listed IPD activities. On the whole, a large number of teachers participated in most of the IPD activities listed.

It can be learnt from Table 5.2 that in about six of the activities listed, relatively few teachers participated. Some reasons for this might be that: very few teachers were nominated for further training each time. It could also be that the rate at which the teachers joined the system increasingly surpassed the capacity of training them to attain high qualifications. Networking with farmers has time implications, and given that the teaching of agriculture poses heavy load on the teachers, it is highly possible that they lacked time to network. The low number of teachers who used e-learning provisions could be explained by lack of access to computers in most schools. Part time learning through distance mode could have been made difficult by lack of funds for instance or could be that there were no courses offered that met the interests of teachers. Few teachers participated in conferences and seminars probably because they were rarely organised.

Table 5.2: Participation of Secondary Agriculture Teachers in IPD activities (n=228)

Activity	Participated?		Time of Participation [Count/(%)]				
	No Count/(%)	Yes Count/(%)	Some Yrs Ago	0ne Yr back	Last Six Months	More Often	On-Going
1. School based workshop for all teachers in the school.	37(16.2)	191(83.8)	16[8.4]	14[7.3]	23[12.1]	100[52.4]	38[19.9]
2. Agriculture related workshop.	52(22.9)	175(77.1)	76[43.4]	28[16]	30[17.1]	26[14.9]	15[8.6]
3. Seminar (i.e. where one paper is presented and discussed).	131(57.5)	97(42.5)	49[50.5]	14[14.4]	18[18.6]	9[9.6]	7[7.2]
4. Conference (i.e. where many papers are presented and discussed).	158(69.3)	70(30.7)	36[51.4]	17[24.3]	6[8.6]	6[8.6]	5[7.1]
5. Meetings.	51(22.4)	177(77.6)	3[1.7]	1[0.6]	2[1.1]	117[66.1]	54[30.1]
6. Farm Visit/ Tour.	88(38.6)	140(61.4)	79[56.4]	20[14.3]	11[7.9]	20[14.3]	10[7.1]
7. Networking with farmers (i.e. linking and learning from them).	150(66.1)	77(33.9)	38[49.4]	9[11.7]	7[9.1]	15[19.5]	8[10.4]
8. Schools agriculture fairs.	38(16.7)	190(83.3)	49[25.8]	44[23.2]	12[6.3]	54[28.4]	31[16.3]
9. Agriculture fairs organised by Ministry of Agriculture.	106(46.5)	122(53.5)	50[41]	35[28.7]	9[7.4]	20[16.4]	8[6.6]

Key: (%) Calculated out of the total number of teachers
[%] Calculated out of the number of teachers who participated

(**Table 5.2 continues**)

Activity	Participated?		Time of Participation [Count/(%)]				
	No Count/(%)	Yes Count/(%)	Some Yrs Ago	0ne Yr back	Last Six Months	More Often	On-Going
10. Guiding or being guided by somebody (Mentorship).	99(43.4)	129(56.6)	35[27.1]	13[10.1]	14[10.6]	45[34.9]	22[17.1]
11. Observing lessons of fellow teachers.	34(14.9)	194(85.1)	32[16.5]	19[9.8]	31[16]	55[28.4]	57[29.4]
12. Having colleagues observing my teaching and giving feedback.	35(15.4)	193(84.6)	25[13]	18[9.3]	32[16.6]	66[34.2]	52[26.9]
13. Getting students evaluating my teaching.	45(19.7)	183(80.3)	24[13.1]	21[11.5]	24[13.1]	69[37.7]	45[24.6]
14. Induction programme for a new teacher.	51(22.4)	177(77.6)	52[29.4]	14[7.9]	18[10.2]	48[27.1]	45[25.4]
15. Enrolling on part time course through distance learning programme.	193(84.6)	35(15.4)	14[40]	3[8.6]	3[8.6]	3[8.6]	12[34.3]
16. Further training to attain higher qualification in agriculture.	188(82.5)	40(17.5)	26[65]	2[5]	4[10]	3[7.5]	5[12.5]
17. Use of electronic learning provisions (i.e. e-learning).	144(63.2)	84(36.8)	19[22.6]	2[2.4]	9[10.7]	33[39.3]	21[25]
18. Self-directed reading of books.	32(14)	196(86)	7[3.6]	9[4.6]	13[6.6]	100[51]	67[34.2]

Key: (%) Calculated out of the total number of teachers
[%] Calculated out of the number of teachers who participated

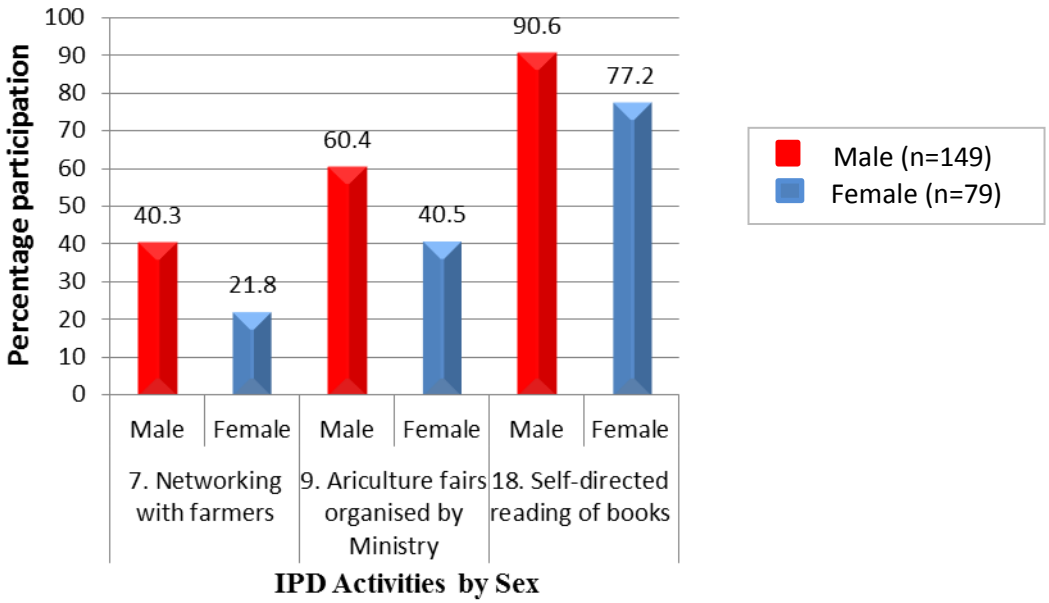
It also appears in Table 5.2 above that, of the teachers who participated in the activities, a comparatively large proportion of them, for about half of the activities, did so, some years ago. This pattern appears to be the case with about nine (9) of the activities listed in the table (i.e activity 2,3,4,6,7,9,14,15, and 16). This therefore raises a question as to what could have led to fewer teachers participating in these activities currently than some years ago.

However, it can be further seen in Table 5.2 that it is with the other half of the activities in which comparatively many teachers reflected participation that seemed to be more often and ongoing (i.e. activity 1,5,8,10,11,12,13,17, & 18). The reflection of the more current participation on these activities by considerable proportions of teachers is a desired state of affairs which needs to be further promoted with the rest of the activities.

To elicit further information, I compared the participation of the teachers across their established different groups: and it is reflected in Tables 5.8 to 5.13 (may see CD-ROM) that there were several activities in which the participation of the groups of teachers differed significantly. These differences are therefore, discussed below together with their implications.

Table 5.8 (Appendix 10) show detailed test results that significantly ($p<0.05$) larger proportions of male teachers, than those of females, participated in Networking with farmers, Agriculture fairs organised by the Ministry of Agriculture and self-directed reading of books. These significant differences are shown pictorially by Figures 5.10 below.

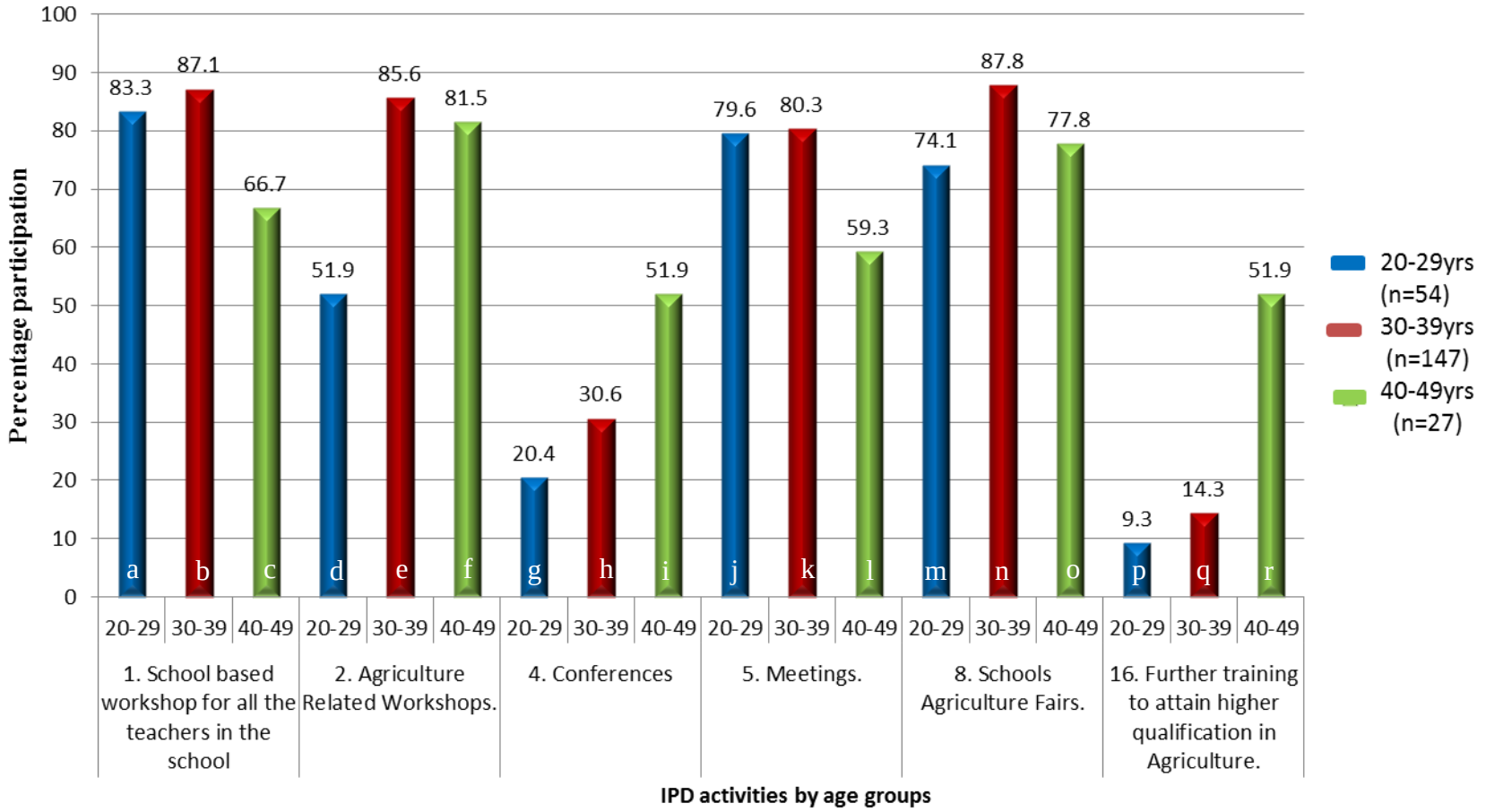
Figure 5.10: Percentage participation of agriculture teachers in IDP activities compared by sex



These findings could imply that the female teachers found it difficult to balance the attendance of these learning activities with home chores which, traditionally, are stereotyped to be female roles. The mentioned activities require extra time to be done.

A reduced version of Table 5.9 (Appendix 10) reflects test summary results that there is at least one significant ($p<0.05$) difference amongst the proportions of the three age groups of teachers (20-29yrs, 30-39yrs, and 40-49yrs) who participated in: school based workshops for all teachers in the school; agriculture related workshops; conferences; meetings; school agriculture fairs; and further training to attain higher qualification in Agriculture. Figure 5.11 below provides a pictorial view of these findings.

Figure 5.11: Percentage participation of agriculture teachers in IPD activities cmpared by age groups



IPD activity	1	2	4	5	8	16
Significant difference (s) detected	b>c	e & f>d	i>g & h	j & k>l	n>m	r>p & q

Specifically, the mean separation test showed that a significant larger proportion of the middle aged group of teachers (30-39yrs) participated in school based workshops than the veterans (40-49yrs). The test further showed significantly larger proportions of the two older groups of teachers (30-39 and 40-49yrs), compared to those of the younger teachers (20-29yrs) to have participated in agriculture related workshops. The proportion of the eldest group of teachers (40-49yrs) who participated in conferences was significantly larger than those of the younger groups (30-39yrs and 20-29yrs). The two young groups of teachers (30-39yrs and 20-29yrs) participated in meetings in significantly larger proportions than the veteran teachers (40-49yrs). A significantly larger proportion of the middle aged group of teachers (30-39yrs) participated in the schools' agriculture fairs than the young teachers (20-29yrs). The veteran teachers (40-49yrs) had opportunity to further train and attain higher qualification in agriculture in significantly larger proportion than the two young groups of teachers (30-39yrs and 20-29yrs). All other differences are not significant.

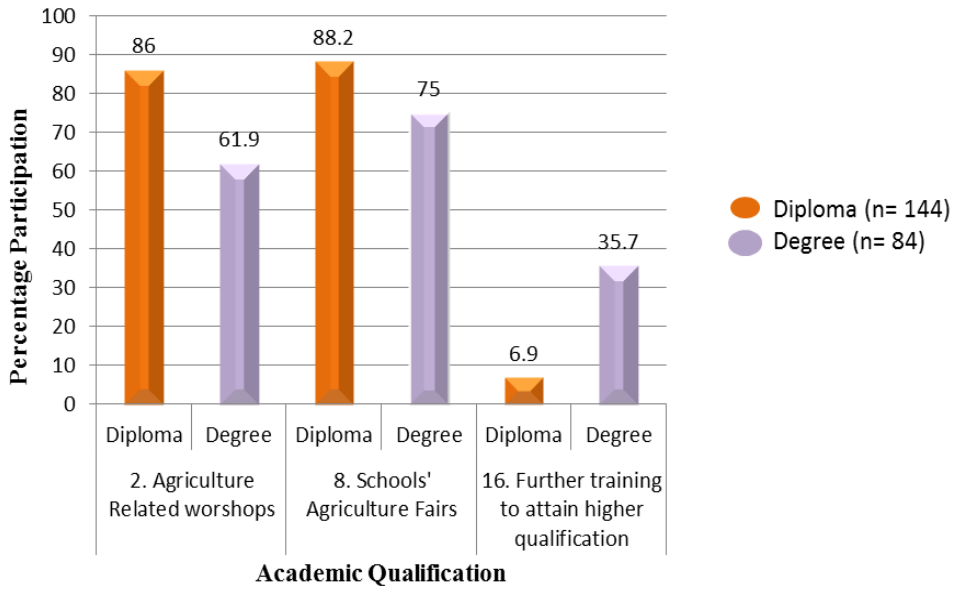
Interestingly, with regard to conferences and further training, the proportion of the veteran teachers who participated is larger compared to those of the young groups. This could be because the opportunity to attend to these activities decreased with time (This could be for various reasons - See Chapter 6, Table 6.2: p.320). It could also be that the selection criteria for attending the activities favoured the older and experienced teachers. If this is so it reflects a greater need for younger teachers to be exposed to these activities in future.

Figure 5.11 and its accompanying Table 5.9 further show significantly ($p<0.05$) larger proportions of the two younger groups of teachers (30-39 and 20-29

yrs), compared to that of veteran teachers (40-49yrs), to have participated in the: School based workshops for all the teachers and meetings. This could be that older teachers who might have held positions of responsibility, lacked time to attend due to busy schedules.

Table 5.10 (Appendix 10) shows test results that significantly ($p<0.05$) larger proportions of teachers with diploma qualification, as opposed to those having degrees, participated in: Agriculture related workshops and Schools' agriculture fairs. Figure 5.12 below visualises these significant differences.

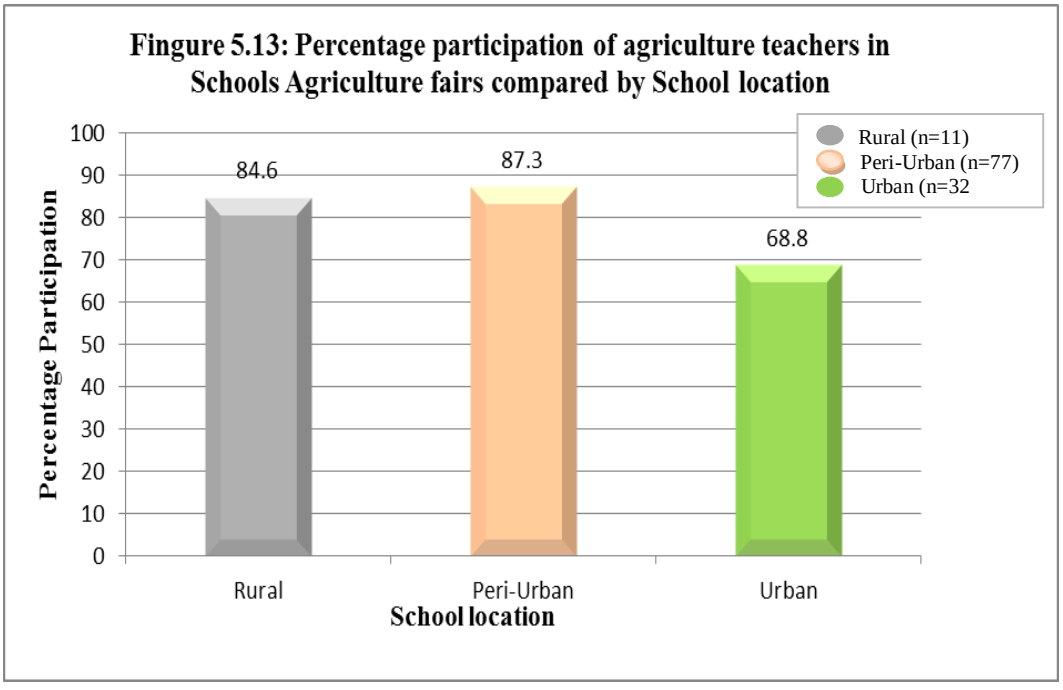
Figure 5.12: Percentage participation of agriculture teachers in IPD activities compared by Academic Qualification



These findings could imply that the teachers with degree qualification felt proficient with the skills offered by these activities, and hence found little need to attend. It might suggest that the more qualified teachers became the less they participated in the cited activities. It could also reflect an imbalance in the way the activities were rendered across the groups of teachers which possibly resulted in the diploma holders being exposed more.

Conversely, it could also be seen in Figure 5.12 that a significantly ($p<0.05$) large proportion of teachers with degree qualification as opposed to diploma holders, further trained in Agriculture Education. This difference might not be reliable because some teachers might have acquired their degree qualification as part of their initial teacher preparatory training: not necessarily that they were given the opportunity to train during their tenure as teachers. For that reason such teachers might still expect to be accorded the opportunity to increase their qualification to at least MSc degree as part of IPD.

It can be learnt from Table 5.11 (Appendix 10) that significantly ($p<0.05$) larger proportions of teachers in the peri-urban and rural areas participated in the 'schools' agriculture fairs' compared to that of the teachers in the urban centres. Figure 5.13 below visualises this finding.

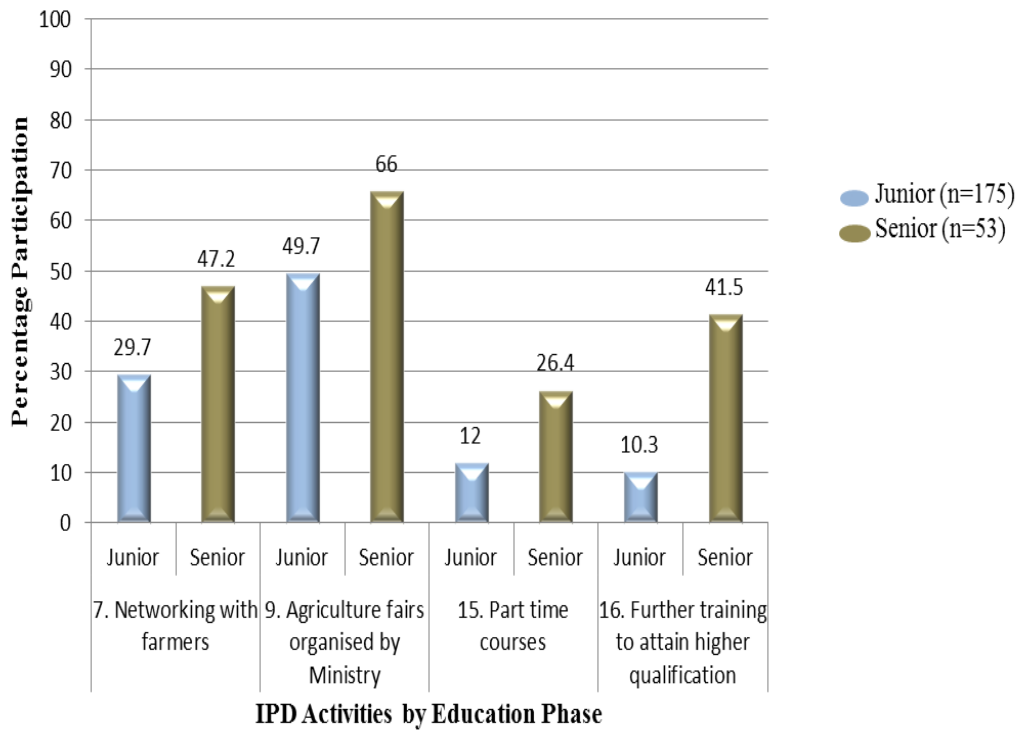


NB Significant difference detected: rural & peri-urban> urban

This outcome could be due to tendency by the teachers in the Urban Centres to be too occupied by the busy town life to attend. It could also be that the timing of these fairs clashed with prominent social activities that are commonly undertaken in urban centres and this may not be the case in peri-urban and rural areas. This reflects the need to encourage these teachers to participate and learn from the fairs.

It can be seen in Table 5.12 (Appendix 10) that a significantly ($p<0.05$) larger proportion of the senior secondary teachers, as opposed to the junior school teachers, participated in: networking with farmers, agriculture fairs organised by the Ministry, enrolling in part time courses, and further training in Agriculture. Figure 5.14 below visualises these differences.

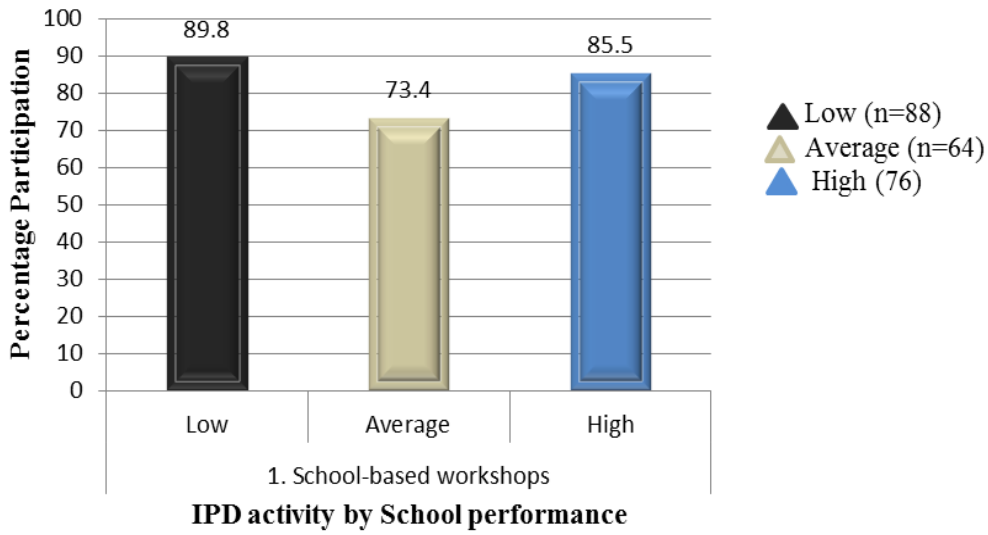
Figure 5.14: Percentage participation of agriculture teachers in IPD activities compared by Education Phase



The reflected outcome could imply that these activities tended to be of more benefit to the senior than junior school teachers. It could also be that the senior school teachers, all of whom are degree holders, were better enlightened to recognise the benefits of attending the activities than teachers with diploma qualification who, in fact, constituted the higher percentage of teachers in the junior schools.

It is reflected in Table 5.13 (Appendix10) that significantly ($p<0.05$) large proportions of teachers from both low and high performing schools, compared to that of the teachers from average performing schools, participated in the 'school based workshops for all the teachers in the school'. Figure 5.15 below provides a pictorial view of this finding.

Figure 5.15: Percentage participation of agriculture teachers in school-based workshops compared by School performance



NB Significance difference detected: Low & High > Average

This could be because the participation of teachers here tended to be given more emphasis by the schools in the extremes of the performance continuum with the

intention to improve low performance on one hand and maintaining high performance on the other.

Key areas of the section

Taking account of the significant differences that were detected between the groups of teachers regarding their participation in the IPD activities, I point to the following:

Many teachers (84%) participated in school based workshops availed for all the teachers in the school. However, the veteran teachers (40-49yrs) and the teachers from the average performing schools seemed to have participated less in these workshops. The majority (77%) of the teachers participated in agriculture related workshops. However, fewer younger teachers and those teachers with degree qualification appeared to have participated in this activity.

While the minority (31%) of the teachers, in general, participated in conferences, the young groups of teachers (20-29yrs and 30-39yrs) tended to attend conferences in much lower numbers than the veteran teachers (40-49yrs). Many teachers (78%) attended meetings. However, few veteran teachers (40-49yrs) participated in the meetings, compared to the two young groups (30-39 and 20-29).

Although, in general, few teachers (43%) networked and learnt from farmers, the female teachers and those teachers from the junior schools appear to have participated in much smaller numbers. This implies that they may need more encouragement than the rest of the teachers' groups, to learn through networking with

farmers. The majority (83%) of the teachers participated in schools agriculture fairs. However, relatively small numbers of: young teachers, teachers with degree qualification, and those from urban centres participated in the fairs.

Generally, about half (54%) of the teachers participated in the agriculture fairs organized by the Ministry of Agriculture. Nonetheless, the female teachers and those from the junior schools appear to have participated in smaller numbers compared to male teachers and those teaching at senior level respectively. While, in general, few (18%) teachers enrolled for part-time courses, the low enrolment seems to have been more intense with the teachers in the junior schools than those at senior level.

Very few teachers (18%) had the opportunity to attain higher qualification in agriculture. However, fewer young groups of teachers (20-29 and 30-39yrs), teachers with diploma qualification, and those in junior schools appeared to have participated in acquiring high qualification in agriculture. Although, in general, many (86%) teachers took part in self-directed reading of books, relatively few female teachers read books for self-enrichment compared to male teachers.

The detection of no significant differences allows me first to conclude with certainty, on the bases of the overall proportions observed in Table 5.2 above, that considerably larger numbers of agriculture teachers in the Central Region of Botswana, regardless of levels of demographic information, participated in the following: farm visits/tours(61%), mentoring(57%), observing lessons of fellow teachers(85%), Having colleagues observing individual teachers and giving them feedback(85%), Getting students evaluating their teaching(80%), and induction

programme(78%). Conversely, I confidently conclude that the minority of the teachers participated in seminars (43%) and the use of electronic learning facilities (37%).

Secondly, I note that many of the teachers participated in about half of the activities some years ago. This therefore suggests a need for reviving the organisation of IPD activities that might have somehow become dormant.

General comment on Section 5.5 to 5.7

Let me at this juncture present aspects that seem to cut across most of the remaining sections of this chapter. In the next sections (Sections 5.5 to 5.7) arithmetic means and associated standard deviations are reported to indicate the teachers' perceptions of the aspects studied. Figures are used to present the findings whereas their associated tables are placed in the appendix section.

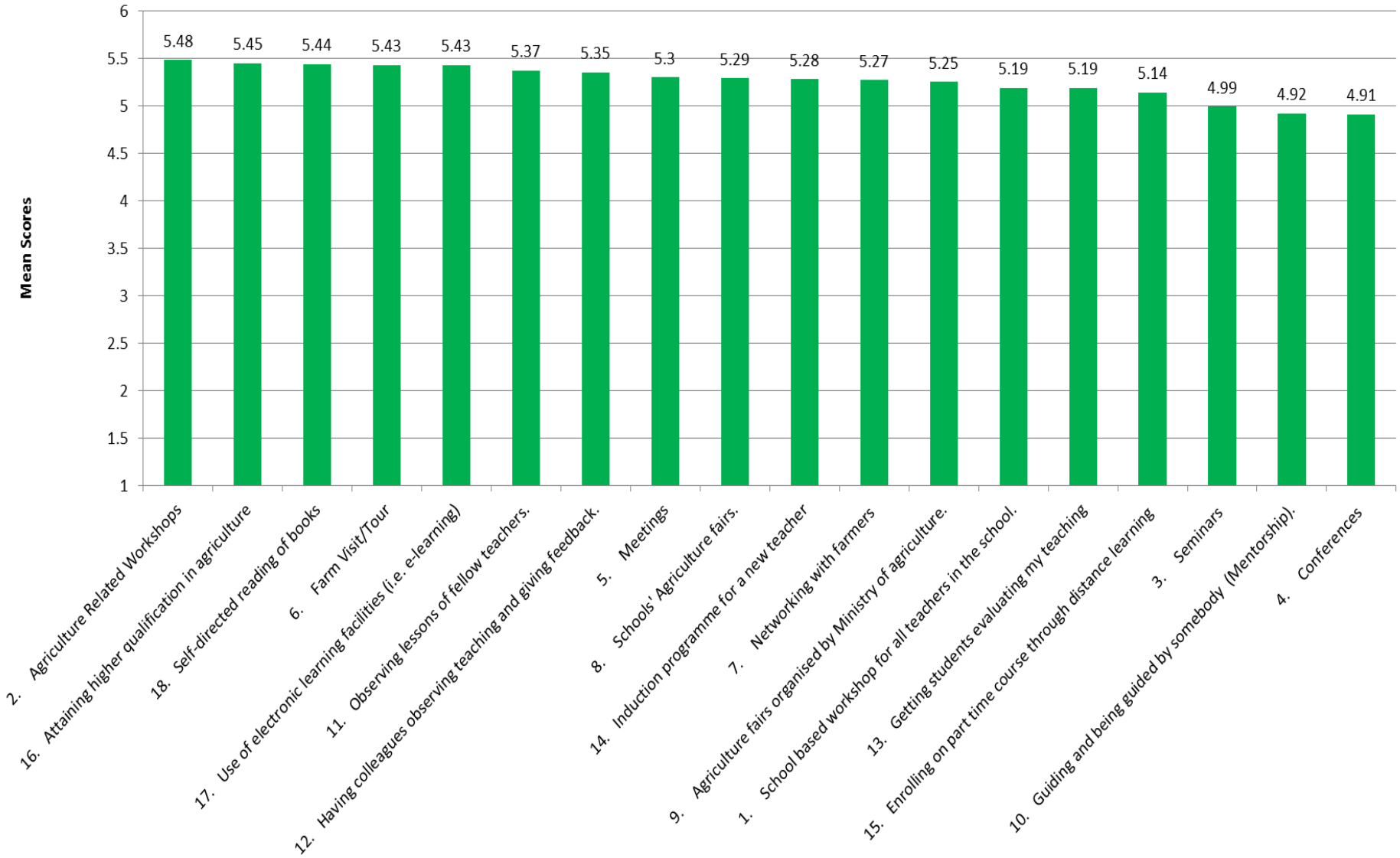
The tables include percentiles to further help to interpret the mean scores. What appears common in the attached tables is the general picture that the medians are closer to the means. This builds confidence in relying on the means. It also shows that there were not many extreme scores that destabilised the mean scores; hence dispelling any doubts about the conclusions drawn from the means. It also has to be noted here that for each rated item under each section (i.e. relevance, characteristics and IPD content) there were very few teachers who remained undecided and their ratings did not count for they were out of the scale. I find this clarification helpful to avoid repetition.

5.5. Perceived relevance of IPD activities (RQ3)

Table 5.3 (Appendix 11) presents arithmetic means, standard deviations and percentiles indicating the perceived relevance of IPD activities in helping the agriculture teachers learn. The quartiles show that, for all the items, the distribution of the ratings tended to concentrate on the higher portion of the relevance scale. **Standard deviations** reflect that individual scores did not vary greatly from the means. The magnitudes of arithmetic means reflected levels of IPD activities' relevance as perceived by the teachers.

Figure 5.16 below provides pictorial view of these findings and shows that the teachers rated all the listed IPD activities 'relevant' ($\bar{x}$=5.50 to 4.51). Although a sizable number of teachers remained undecided about some activities as reflected in Table 5.3, these findings imply that all the IPD activities listed in the figure here could be appropriate for agriculture teachers in sharpening their knowledge and skills.

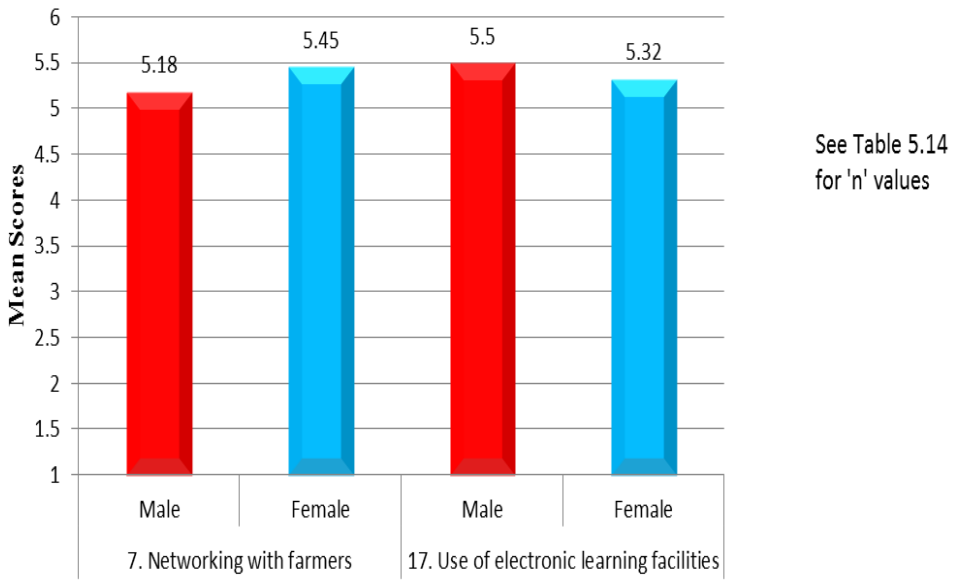
Figure 5.16: Perceived Relevance of IPD Activities in helping agriculture teachers learn (N=228)



Rating Scale: 1 = Very irrelevant; 2 = Irrelevant; 3 = Slightly irrelevant; 4= Slightly relevant; 5 = Relevant; 6 = Very Relevant

However, in Tables 5.14 to 5.19 (See CD-ROM for complete tables), a comparative analysis revealed some significant differences in the way some groups of teachers perceived the relevance of some activities. Figure 5.17 below provides an overview of the differences in teachers' perception presented in Table 5.14 (Appendix 10) that female teachers perceived 'networking with farmers' to be relevant significantly ($p<0.05$) more than did their male counterparts.

Figure 5.17: Perceptions of agriculture teachers on the relevance of IPD activities compared by Sex (N=228)

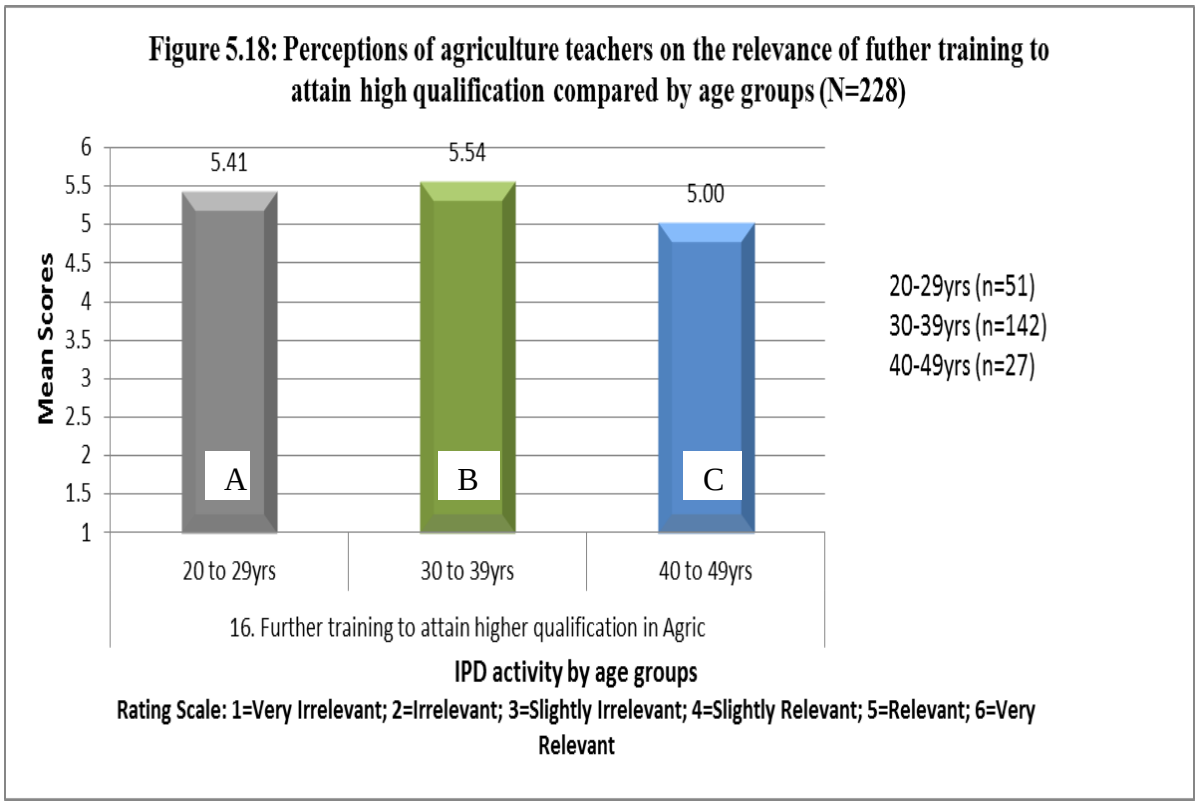


Rating Scale: 1 = Very irrelevant; 2 = Irrelevant; 3 = Slightly Irrelevant; 4 = Slightly relevant; 5 = Relevant; and 6 = Very Relevant

The finding could be a reflection that the female teachers were merely voicing out the desire to have time to network than to always be engaged in the stereotypic family roles that disadvantage them. It can also be observed in Figure 5.17 and its accompanying Table 5.14 that male teachers perceived 'the use of electronic learning facilities' significantly ($p<0.05$) more relevant than did female teachers. This could

also imply that the male teachers, compared to the females, had time to study the use of electronic devices.

Figure 5.18 below and associated Table 5.15 **(Appendix 10)** shows that the teachers aged 20-29yrs and 30-39yrs perceived 'further training to attain higher qualification' relevant, significantly ($p<0.05$) more than those aged 40-49yrs.



*Significant difference detected: A and B> C

The veteran teachers could be feeling out-aged to study further. It is common in Botswana that elderly people consider education as a task of children (Johannesson and Thamuku, 2009). The young groups of teachers could be still feeling energetic to further learn and attain higher qualifications.

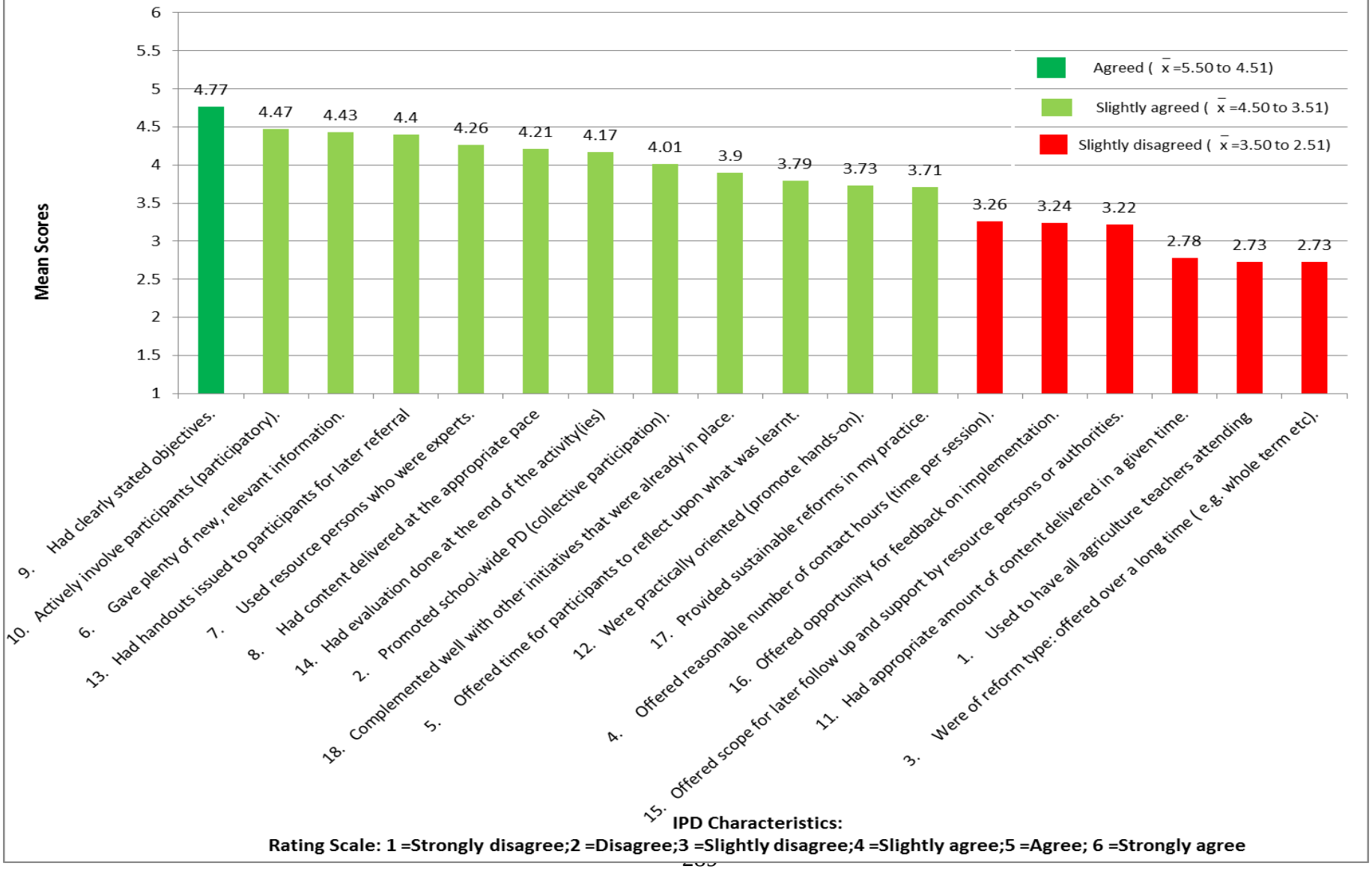
5.6. Characteristics of IPD activities in which teachers participated (RQ4)

Figure 5.19 below, displays arithmetic means ($\bar{x}$) indicating the teachers' agreement or disagreement with the individual statements that describe the IPD experienced by the teachers. The teachers' ratings of the characteristics ranged from 'Agree' to 'Slightly Disagree': i.e. basing on the mean-cut-off points ($\bar{x}$ =5.50 to 2.51) generated from the scale used (see p.211). The associated Table 5.4 (Appendix 11) shows details of these findings. In extension, the table reveals the distribution of the ratings within the given quartiles to be concentrating towards the lower portion of the scale implying the teachers were not very satisfied with most of the items.

Figure 5.19 shows that teachers agreed ($\bar{x}$ =4.77) with the statement that the activities they participated in had 'clearly stated objectives'. The figure also reflects that teachers slightly agreed ($\bar{x}$ =4.50 to 3.51) with eleven (11) of the statements listed (i.e. No's 10,6,13,7,8,14,2,18,5,12,&17). This could imply that the way IPD activities were conducted, with respect to the above aspects, could need improvement where deemed fit. But otherwise their conduct was generally satisfactory.

The teachers slightly disagreed ($\bar{x}$ =3.50 to 2.51) with six (6) of the characteristics as shown in the figure (i.e. No's 4,16,15,11,1&3). This implies that the teachers considered IPD activities they have experienced to have fallen short in these areas and probably these are the areas that need addressing to improve quality of the future IPD activities.

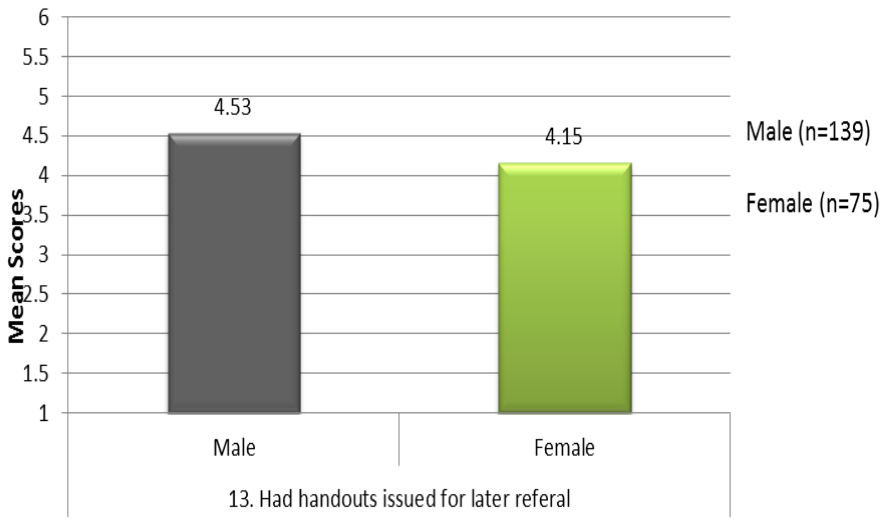
Figure 5.19: Level of agreement or disagreement on the characteristics of IPD activities as percieved by agriculture teachers (N=228)



Rating Scale: 1 =Strongly disagree;2 =Disagree;3 =Slightly disagree;4 =Slightly agree;5 =Agree; 6 =Strongly agree

In extension, the statistical tests conducted in this study (see complete Tables 5.20 to 5.25 in CD-ROM) revealed significant ($p<0.05$) differences in the way groups of teachers perceived some characteristics. These differences are discussed as follows. It can be seen in Figure 5.20 and associated Table 5.20 (Appendix 10) that the male teachers agreed significantly ($p<0.05$) more, compared to the females, that 'hand-outs were issued to participants for later referral'.

Figure 5.20: Perceptions of agriculture teachers on whether handouts were issued for later referal compared by sex (N=228)

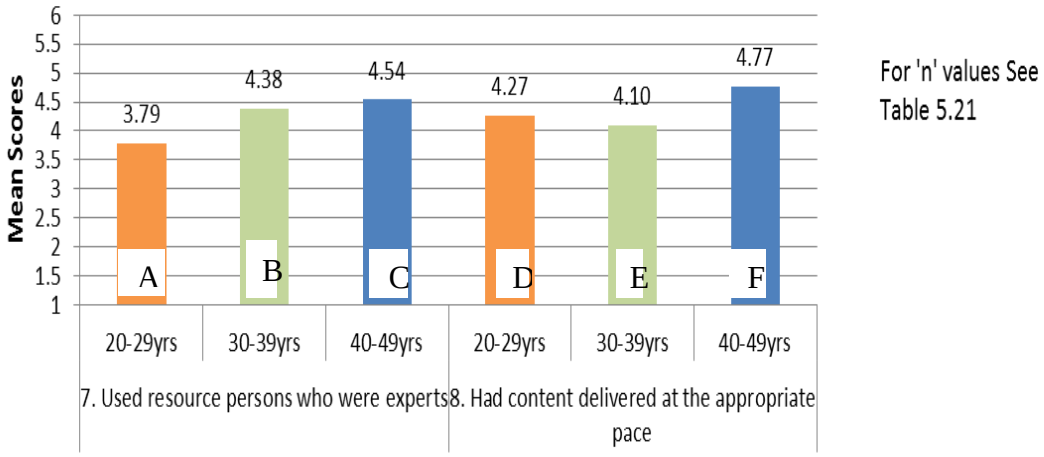


Rating scale: 1 =Strongly disagree;2 =Disagree;3 =Slightly disagree;4 =Slightly agree;5 =Agree; 6 =Strongly agree

Figure 5.21 below and the associated Table 5.21 (Appendix 10) show that the teachers aged 40-49yrs, 30-39yrs and 20-29yrs significantly ($p<0.05$) differed in perceiving that the activities 'used resource persons who were experts in their fields'. Specifically, the two older groups of teachers (40-49yrs and 30-39yrs) significantly ($p<0.05$) agreed more than the youngest group (20-29yrs). Probably this reveals

different expectations of teachers differing not only in age but also in perspective, experience and interests.

Figure 5.21: Perceptions of agriculture teachers on some IPD characteristics compared by Age group (N=228)



IPD characteristics by Age

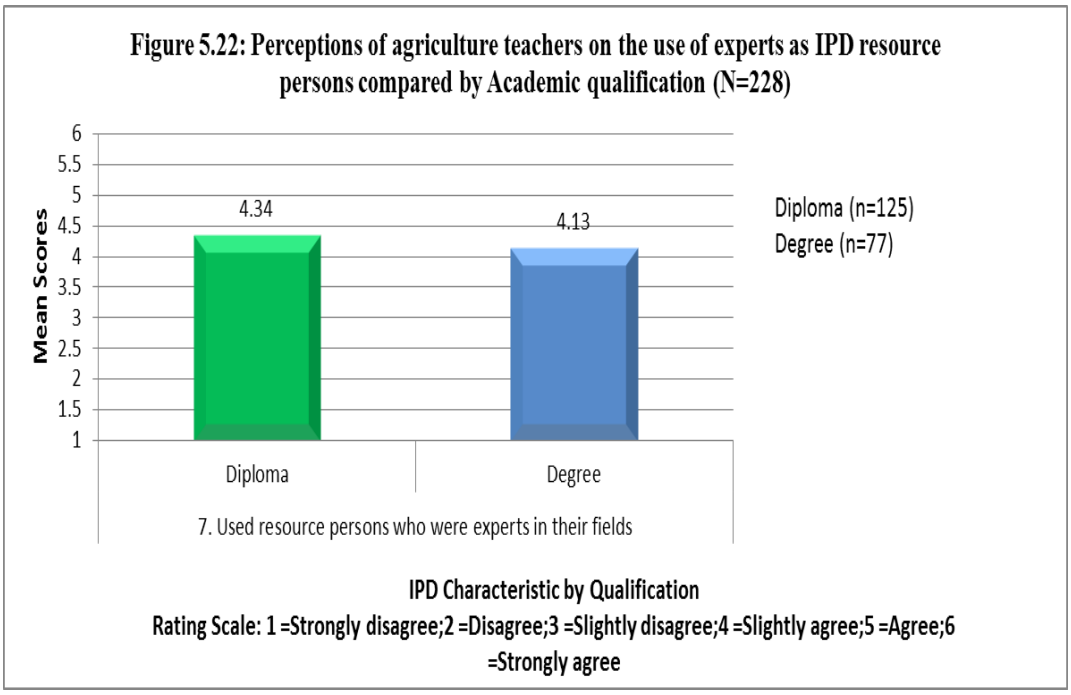
Rating Scale: 1 =Strongly disagree;2 =Disagree;3 =Slightly disagree;4 =Slightly agree;5 =Agree;6 =Strongly agree

Item	7	8
*Significant difference detected	B & C> A	F > E

Figure 5.21 and associated Table 5.21 (Appendix 10) further reflect that the degree of agreement of the teachers aged 40-49yrs and 30-39yrs significantly ($p<0.05$) differed that the activities 'had content delivered at the appropriate pace'. It became evident that the veteran teachers (40-49yrs) significantly agreed more than the 30-39yrs group in this respect. This could be a reflection of differences in expectations among people with varying ages as pointed out by Smith (1982).

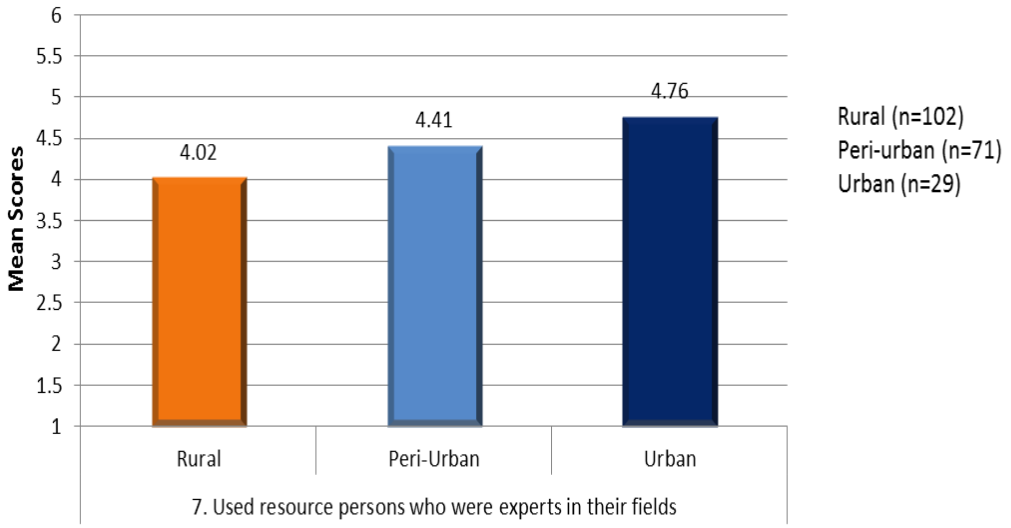
Figure 5.22 and accompanying Table 5.22 (Appendix 10) show that teachers with diploma qualification compared to those with Degree agreed significantly

($p<0.05$) more that the resource persons who were experts in their fields were used to lead instructions during IPD activities.



On the same statement, Figure 5.23 below and the associated Table 5.23 (Appendix 10) indicate that there was a significant ($p<0.05$) difference in the way teachers in Urban, Peri-urban and Rural areas perceived the characteristic that the activities 'used resource persons who were experts in their fields'. Specifically, the repeated Mann-Witney test showed that teachers in the urban centres agreed significantly ($p<0.05$) more than those teaching in rural areas. This could mean the degree of agreement increased with the increase in quality of the socio-economic status of the location.

Figure 5.23: Perceptions of agriculture teachers on the use of experts as IPD resource persons compared by school location (N=228)

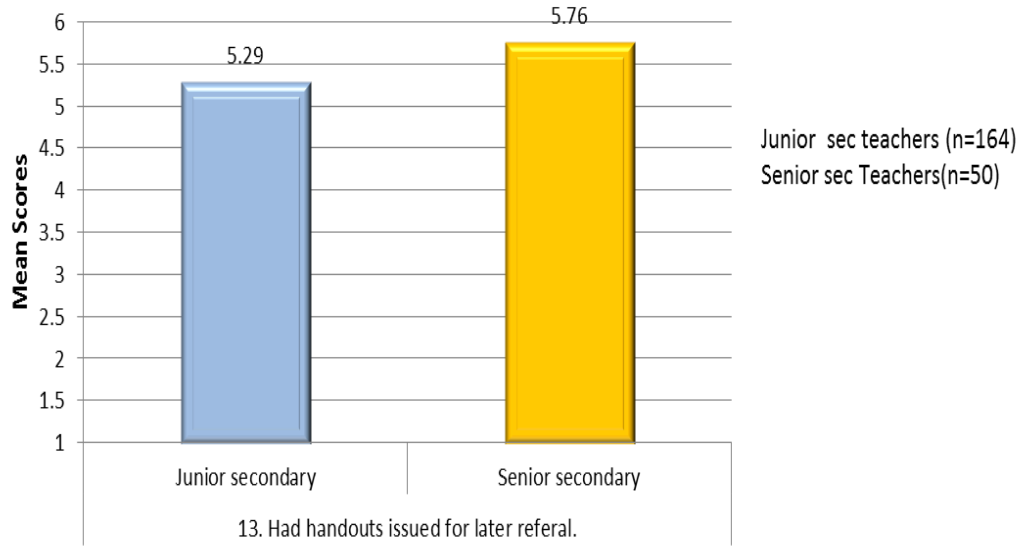


Rating Scale: 1 =Strongly disagree;2 =Disagree;3 =Slightly disagree;4 =Slightly agree;5 =Agree; 6=Strongly agree

*Significant difference detected: Urban> Rural

Lastly, Figure 5.24 below and accompanying Table 5.24 (Appendix 10) show that the teachers in senior schools compared to those in the junior schools agreed significantly ($p<0.05$) more that the activities 'had hand-outs issued to participants for later referral'. This could be because hand-outs were mostly used with senior secondary teachers as a strategy to avoid mounting costly workshops, especially since they (senior school teachers) comparatively appeared few in number. None other than the above differences, in this section, were detected.

Figure 5.24: Perceptions of agriculture teachers on whether handouts were issued for later referal compared by education phase (N=228)



IPD Characteristic by Education phase

Rating Scale: 1 =Strongly disagree;2 =Disagree;3 =Slightly disagree;4 =Slightly agree;5 =Agree;6 =Strongly agree

In summary I would say: a). the IPD activities experienced by the teachers were satisfactory with respect to the items with which teachers agreed and slightly agreed, that are the majority. However, the fact that the characteristics were not highly scored exerts some degree of need for their improvement if resources and time permit. b). the activities might have dissatisfied teachers (with respect to those with which they slightly disagreed) in that they probably: had few teachers in the department invited; were of one-off type (offered over a short period of time that could not allow mastery of content); offered participants less contact hours; had inappropriate amount of content delivered at a time; did not offer scope for later follow up and support by resource persons or authorities; and did not offer the opportunity for the teachers to give feedback on how the implementation, of whatever learnt, progressed. There is

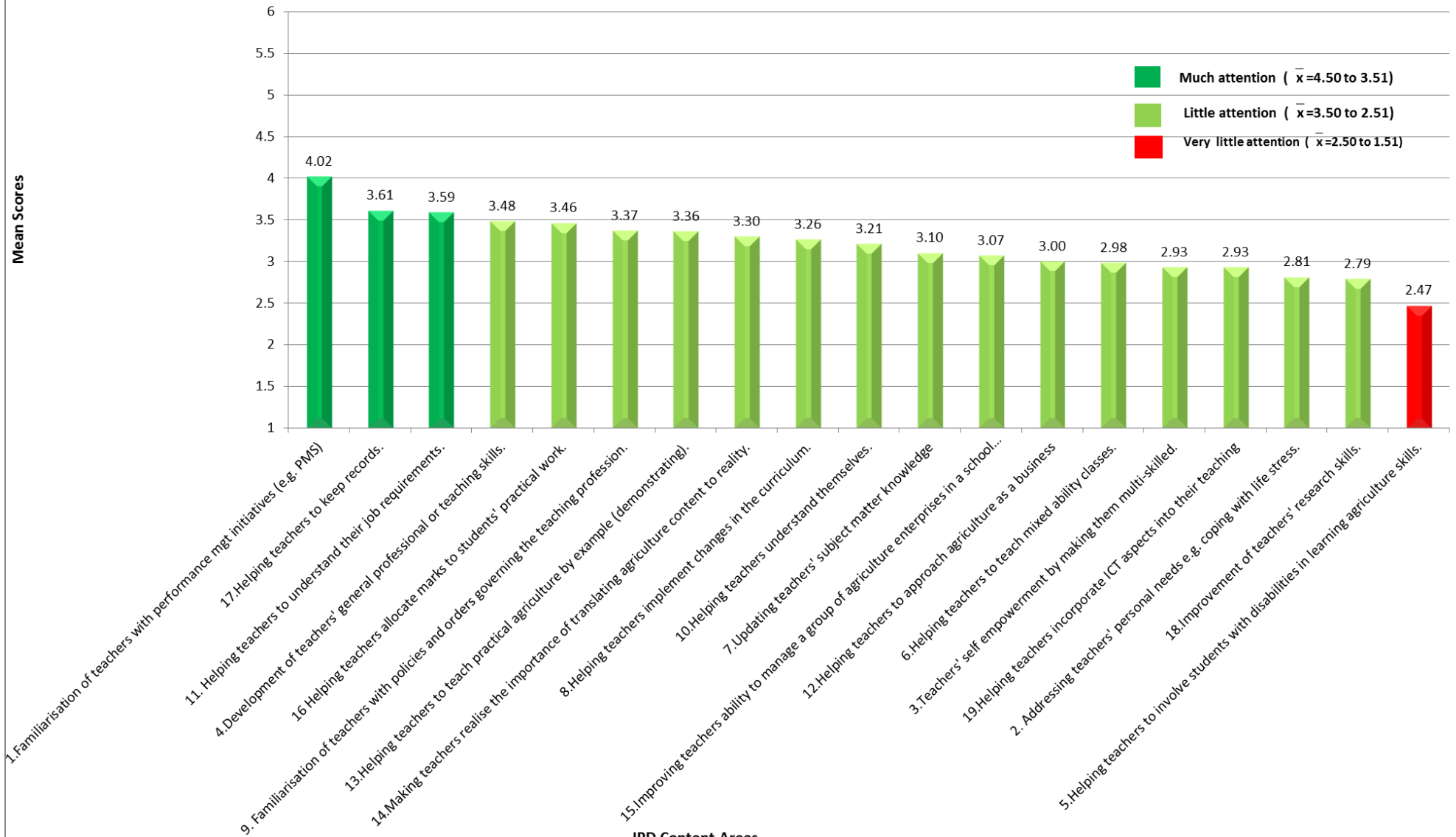
therefore a definite need for improving these characteristics to render IPD opportunities helpful to the teachers.

c) Additionally, I find the characteristic that the activities: 'had handouts issued to participants for later referral', 'used resource persons who were experts in their fields', and 'had content delivered at the appropriate pace' to require revision, with the aim of ensuring that they are perceived as satisfactory on similar footing by all groups of teachers.

5.7. Perceived Attention Given To IPD Content Areas (RQ6)

Figure 5.25 below show items and their means reflecting how much attention teachers thought was given to the IPD content areas. Table 5.5 (Appendix 11) presents details of these findings. It is shown in Figure 5.25 that the teachers' ratings of the topic areas ranged from 'much attention' to 'very little attention'. The interpretation was based on the mean-cut-off points ($\bar{x}$ =4.50 to 1.51) generated from the scale used. Drawing from the quartile ranges in Table 5.5 the ratings with the majority of the items appear to have been somewhat distributed around the centre of the scale with some scores towards the lower band.

Figure 5.25: Percieved attention given to IPD content for agriculture teachers (N=228)



Rating Scale: 1 =No attention at all;2 =Very little attention;3 =Little attention;4 =Much attention;5 =Very much attention; 6 =Exceptional attention

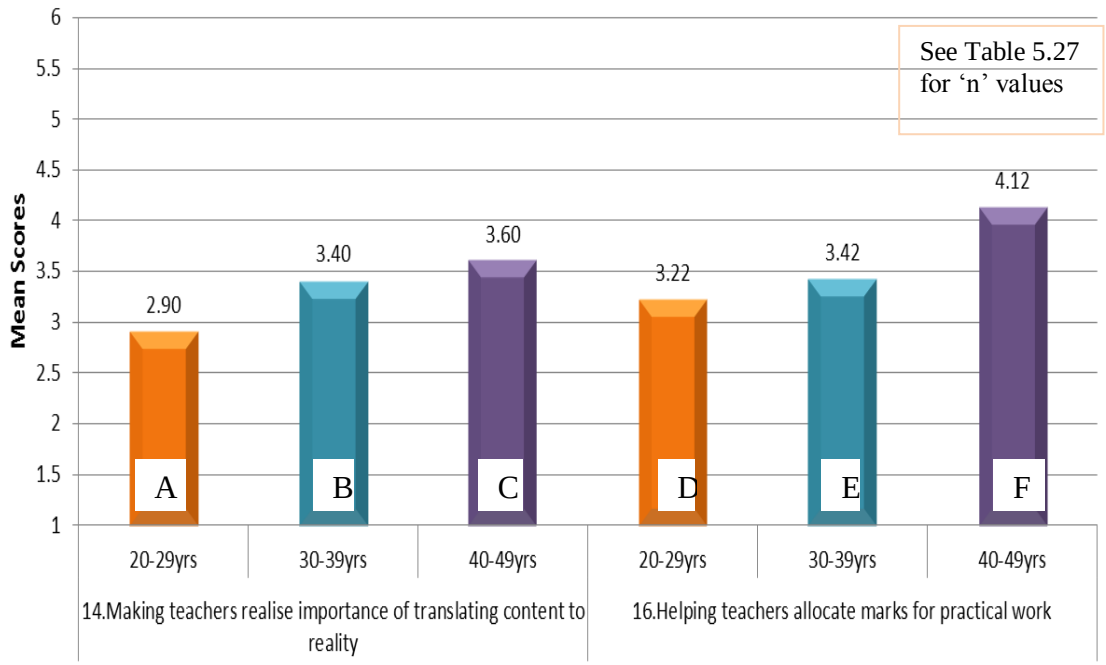
Specifically, Figure 5.25 indicates that the teachers perceived '**much attention**' ($\bar{x}$ =4.50 to 3.51) was given to: 1. familiarisation of teachers with government initiative of improving performance (e.g. PMS); 17. helping teachers to keep records; and 11. helping teachers to understand their job requirements.

Figure 5.25 further shows that the teachers perceived '**little attention**' ($\bar{x}$ =3.50 to 2.51) was given to fifteen (15) of the topic areas, which is the majority of the items (i.e. No's 4,16,9,13,14,8,10,7.15.12,6,3,19,2,&18 in that order). Whilst I recognise the possible efforts that might have been made so far to help teachers in these areas, these findings indicate a demand for more IPD opportunities that would, with urgency, sharpen the skills and knowledge of teachers in the areas indicated.

It can also be learnt from Figure 5.25 that the teachers perceived the 'help given to them to involve students with disabilities in learning agriculture skills' to have received 'very little attention' ($\bar{x}$ =2.47) (i.e. No. 5). This implies that the area could be the one in which teachers need relatively more help. Moreover, the statistical tests conducted (see Tables 5.26 to 5.31 in CD-ROM) indicate some significant ($p<0.05$) differences in the way groups of teachers perceived the attention given to certain content areas. These differences are presented below.

It can be observed in Figure 5.26 below and the associated Table 5.27 (Appendix 10) that at least one significant ($p\leq0.05$) difference existed between the teachers aged 40-49yrs, 30-39yrs and 20-29yrs, in the way they perceived the amount of attention given to: 'making teachers realise the importance of translating agriculture content to reality' and 'helping teachers allocate marks to students' practical work'.

Figure 5.26: Perceptions of agriculture teachers on the attention given to some content areas compared by age group (N=228)



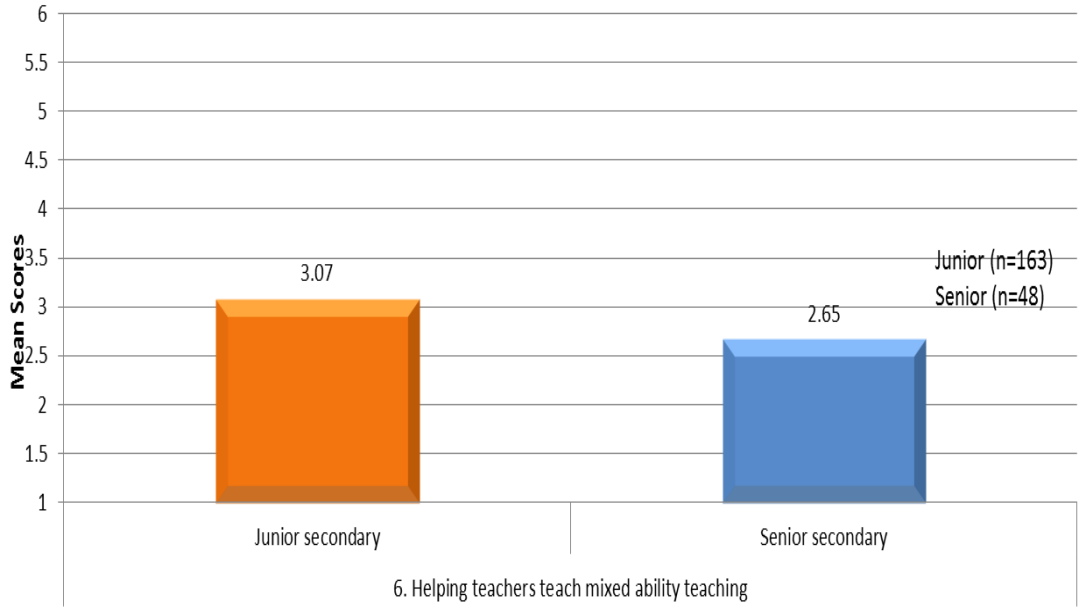
Item	14	16
*Significant difference detected	A < B & C	F > D & E

Comparing the sizes of the means to the mean-cut-off points established from the scale used, the teachers aged 40-49yrs perceived the two topic areas to have been given 'much attention', as opposed to 'little attention' rated by the two younger groups. It could be that the two areas used to receive attention long time ago, before the rest of the teachers join the field probably.

Figure 5.27 below and accompanying Table 5.30 (**Appendix 10**) show that the teachers in the junior secondary schools rated the attention given to 'helping teachers to teach mixed ability classes' significantly (p=0.05) more than did those in the senior secondary schools. It could be that the department concerned tended to address the

demands that were associated with mixed ability teaching in junior schools than in senior schools depending on the demand.

Figure 5.27: Perceptions of agriculture teachers on the attention given to helping teachers on mixed ability teaching comapared by education phase (N=228



Content area by education phase

Rating Scale: 1 =No attention at all;2 =Very little attention;3 =Little attention;4 =Much attention;5 =Very much attention;6 =Exceptional attention

In summary, I tend to understand that: a) 'group A' content areas were fairly addressed by IPD activities and only need further addressing if time and resources permit. b) Content areas in groups B and C, which also constitute the majority, may not have been adequately attended thus creating a definite need for them to frequent the agenda of the future IPD activities. It is worth noting that the areas, the attention of which was significantly perceived different by the groups of teachers, form part of group B which is found to be needing attention.

5.8. In-service Professional Development Needs of teachers (RQ7)

As reflected in Chapter 1 this study was designed, among other things, to reveal areas of IPD need identified by agricultural science teachers. The teachers were then requested to outline IPD needs in their own words without any imposed restrictions. Thus the findings presented in this report are the teachers' constructs. Of the targeted 247 teachers, 159 of them presented their needs after which they were collated and grouped. The data analysis yielded three main categories of teachers' IPD needs, each with sub-categories. The categories were: Teaching Strategies; Subject matter aspects; and Personal needs, and are respectively presented in the Table 5.44, 5.45 and 5.46 below.

Table 5.44: Identified IPD Needs Related to Teaching Strategies

Teaching Methods and Techniques	Testing	Use of technology
-Teaching mixed ability classes	-Item writing skills	-Aspects on Information, Communication and Technology relevant to the teaching of agriculture
-Teaching agric skills to students with special learning needs	-Assessment of students on practical work	-Use of computers
-Differentiated teaching method	-Exposure to the moderation exercise	-Exposure to computer programmes e.g. excel, data base etc
-Handling larger classes	-Exposure to marking final examination scripts	-Use of internet
-Planning educational tours or field trips with students	-Marking of students' research projects reports	-Use of instructional media (Audio /visual aids) e.g. projectors
-Effective use of conventional methods of teaching e.g. group discussions and demonstrations		
-Exposed to a variety of improved methods of teaching agriculture		

Table 5.45: Identified IPD Needs Related to the Agriculture Subject Matter

Practical Aspects	Syllabus Topics	
	Junior	Senior
Teachers raised a need to be: -Updated on general skills of effectively managing agriculture projects in a school setting -Helped on how to effectively grade students' agriculture projects to compile continuous assessment scores -Exposed to the moderation exercise of the practical examination -Exposed to some business skills	-Agricultural Economics -Artificial Insemination Bee Keeping -Government programmes -Know about business -Ornamentals -Ostrich production -Rabbit production -Range management -Farm management -Fish Farming	-Agricultural Technology -Biotechnology -Game farming -Government programmes -Know about business -Ornamentals

Table 5.46: Teachers' Personal Needs

Education Related Needs	Needs Associated with Life Skills	Needs on Governing Regulations	Other areas of Interest
-Administration & leadership skills -Acquisition of higher qualifications in the area of specialty -Research Skills -Acquisition of special education skills	-Guidance and Counselling skills -Handling HIV and Aids issues. -Interpersonal skills -Life skills e.g. conflict and stress management in the work place	-Familiarization with statutes governing the education system -Familiarization with education policy documents	-Resource management -Disaster management -Child development and psychology -Financial Management -Strategic planning -Investment in Agriculture

The discussions of the above needs are presented in the next chapter set for all the discussions in this report.

5.9. Chapter Summary

In this chapter, I presented the quantitative results for this study. Of key importance were the results that addressed research questions. Amongst the findings reported are that: the majority of the teachers were inexperienced assistant teachers; and many of them were in the middle aged group, suggesting a greater demand for the teachers' in-service support. Report continued to show that many of the teachers participated in most of the IPD activities, although relatively few teachers participated in the activities like seminars and conferences, for instance. It was also of interest to learn that the teachers' participation in about half of the activities was a long time ago and this creates a need for improving participation.

It appeared in the findings that all the studied IPD activities were perceived by the teachers to be relevant in helping them learn. The teachers also perceived some of the characteristics of IPD activities were satisfactory, whereas others were not. This creates a need to improve IPD characteristics that will in turn render all the activities satisfactory to the teachers.

In the next chapter, I present the synthesis and discussion of the joined findings of this study from which the overall conclusions, implications and recommendations will be drawn.

CHAPTER 6: SYNTHESIS OF FINDINGS, CONCLUSIONS, & IMPLICATIONS

6.1. Introduction

This Chapter reflects upon the qualitative and quantitative datasets presented in Chapters 4 and 5 respectively. The discussions and resulting conclusions pinpoint some implications of this study which culminated in my recommendation of an IPD model that could guide the provision of IPD initiatives in the Central region of Botswana. In the Chapter, I thread together the results from the two datasets in accordance with the original research questions. However, it will be noticed in Table 6.1 (See p.305) that some sections are informed by findings from only one dataset. This is the case since, as observed by Smith (1983) some kinds of data could only be sourced through the use of either one of the qualitative and the quantitative approaches.

Whilst I approached this study from an epistemological position consistent with that of realists, which endorses the adoption of approaches that best address the research questions (Robson, 2011), I made a deliberate choice to approach the joint interpretation of findings in this chapter more from the interpretivists' perspective. This was meant to go beyond asking ‘what’ questions when I interrogated the data and helped to consider all the data to be important. In the process the two datasets supplemented each other.

This approach of interpreting findings for mixed method research from one perspective is supported by researchers such as Howe (2004) and Holmes (2006) who

found it problematic to attempt to interpret from a mixed paradigm position. Although this idea has been described to be a purists' stance by Rossman and Wilson (1985), in this study the approach was adopted not because I endorsed a pure interpretivists' stance but to adequately answer the questions.

Furthermore, this chapter discusses the findings in relation to the study's conceptual and theoretical frameworks presented in Chapter 2 including knowledge on the ground. The chapter also will discuss the findings in relation to the rationale of the study. The study was undertaken on the premise that adequate knowledge of the teachers' thoughts and experiences of the IPD opportunities will guide the recent IPD developments in the Central Region. Furthermore, being the first study to explore IPD in the context of agriculture teachers in Botswana, it is expected that in the process of raising IPD awareness, this study will raise more questions than answers in several issues for future investigation.

The following are the research questions which will be answered during the discussions.

RQ1. What reasons do teachers give for participating in IPD?

RQ2. In what forms of IPD do teachers participate?

RQ3. What forms of IPD activities do teachers consider relevant in the context of teaching and learning agriculture?

RQ4. What are the characteristics of IPD activities in which teachers participate?

RQ5. What factors adversely influence teachers' participation in IPD?

RQ6. How much attention does IPD content give to aspects that contribute to teacher quality?

RQ7. What are the teachers' IPD content needs for the foreseeable future as defined by the teachers themselves?

RQ8. Are there differences in teachers' perceptions towards issues raised according to selected demographic characteristics and school attributes? (i.e. education phase or level; school location; school performance; sex; age; teachers' experience; and academic qualification)

The table below is set to show how the above questions were represented in the two datasets.

Table 6.1: Representation of Research Questions in the datasets

Research Question Number	Qualitative data (Interviews)	Quantitative data (Questionnaire)
1	✔	
2	✔	✔
3		✔
4	✔	✔
5	✔	
6		✔
7		✔
8	✔	✔

6.2. Structure of the Chapter

Given that several research questions are related, it was viewed wise to address them together. For that reason, I chose to discuss the findings from all the questions under five main headings below in the order shown:

- ❖ Composition of Sample
- ❖ Participation in IPD (RQ.1; RQ.2; RQ.4; RQ.5)
  - Reasons for participating

- Forms of IPD
- Characteristics of IPD
- Factors that adversely affected IPD

❖ Perceived Relevance of IPD (RQ.3)

❖ Content of IPD (RQ.6)

❖ IPD content needs for the future (RQ.7)

RQ.8 cuts across sections since it is concerned with identifying differences in perceptions of groups of respondents on issues explored. Readers will notice in the discussions that there are some areas where salient differences in research outcomes and the associated implications are reported.

6.3. Composition of sample

One of the most significant findings from this study is the statistical distribution of the teachers of agriculture in the Central Region of Botswana. Table 5.1 (See Appendix 11, p.482) shows actual figures.

Although the report by the Ministry of Education and Skills Development (2007) indicated an almost equal number of male and female teachers in the entire secondary school teaching force, this study showed male dominance in the teaching of agriculture. The male to female ratio was almost 2:1. Although there are equal numbers across the whole teaching force, this may not necessarily be true with individual subjects. Interestingly, the findings were consistent with the trends in some Sub-Saharan African countries where males dominate the teaching force (Mulkeen, et al., 2007).

The low number of female agriculture teachers could be explained by the stereotypic tendencies that exist in the Setswana culture. Being labour intensive by nature, the roles in agriculture are associated with men (Johannesson & Thamuku, 2009). Otherwise, there seems to be no reason to suspect that this disparity results from females finding it difficult to pursue career in Agricultural Education, because selection for teacher training is based on academic performance. Agriculture is not even emphasised as a requirement for entry as reflected in the prospectus of the local institutions (Botswana College of Agriculture, 2011: Tonota College of Education, 2011), thus making training in Agricultural Education accessible to a wider spectrum of candidates**.** As I said above, the challenge could be attitudinal: and for that reason, this could be addressed by inculcating positive attitudes towards the subject at an early stage; instilling confidence in the girl child; and showing her that she can make a good teacher. This could be achieved through talks during career fairs for instance. It might also be necessary to increase in-service support of female teachers to empower and motivate them and ensure their retention in the system.

Furthermore, the findings showed that the majority (about 61%) of the teachers were inexperienced and about 66% of them hold the ranks of 'Teacher' and 'assistant teachers'[5]. All these outcomes tend to increase the need for the teachers' in-service support. The majority of the teachers (about 88%) fall within the bottom two age groups[5], still hold diploma qualifications, and are mostly inexperienced. Therefore the government has good reasons to invest in their in-service training. The same might still be said with the most experienced teachers for they may have positions of

[5] Teachers' ranks and age groups are shown in Table 5.1 (See appendix 11 p.482).

responsibility that pose challenges to their knowledge and skills. As Day et al. (2006) have put it, teachers exhibit different professional needs at various stages of professional growth. As a result, there would always be a need for in-service training at all levels of the teachers' professional growth irrespective of years of experience.

With regard to the school attributes, the junior secondary schools are in the majority in the region, and this could be attributed to the commitment by the government to provide the 10 year basic education to all Batswana children (Republic of Botswana, 1994b: Republic of Botswana, 1997). The number of schools decreased with an increase in socio-economic status of the locations and this could be a reflection that the greater portion of the country's population is in the rural areas.

So if the distribution of resources is done according to population size, there would be no reason why rural schools, as opposed to those in more developed areas, have to experience budgetary constraints in funding IPD activities. Again there would be no reason for junior secondary schools to suffer more budgetary constraints than their senior counterparts.

The distribution could also be a reflection that the rate of rural-urban migration has been kept low as suggested by the sub-regional migration patterns based on the 2001 Botswana population census data (Gwebu, 2001). The patterns show that comparatively there is a lower rural-town migration ratio of 27.7% compared to both town-rural (31%) and rural-rural (33.8%) migration ratios.

6.4. Participation in IPD (Response to RQ's 1, 2, 4& 5)

This section will discuss the teachers' experiences of IPD and point at its implications for the future programmes. More issues relating to: reasons for teacher participation in IPD, IPD design and organisation as well as enhancement for teacher learning are addressed in here.

6.4.1. Reasons for participation in IPD (RQ.1)

Exploring the reasons could help to get insight of the possible professional development demands that might have served as motivation for teachers to participate in IPD. The reasons were also gathered to understand the teachers' beliefs and values about IPD, since I considered reasons for participating to be, in a way, attaching value on IPD.

It could be deduced from the rationale for teachers' PD advanced by a wider range of literature that, the teachers might participate in IPD activities for different reasons. For instance, the teachers may want to effect change in their practice, attitude and beliefs (Day, 1999) as well as student performance (Guskey, 2002). They may want to broaden the subject matter knowledge (Wellcome Trust, 2006) and increase professional competence (Good and Weaver, 2003). Some may want to increase the level of their confidence and capability to inspire (Nash, 2008).

According to qualitative data (Chapter 4, p.220) agriculture teachers participated in IPD for the reasons that IPD:

i) updates knowledge and skills;

ii) improves teachers' performance;

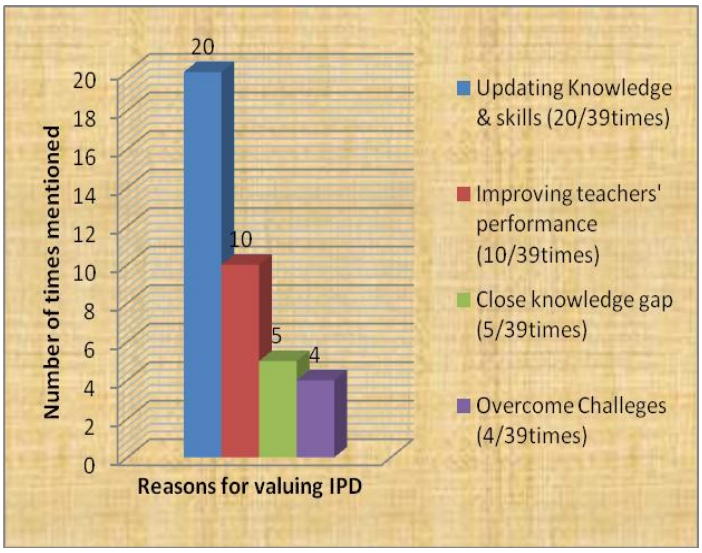
iii) closes gaps in knowledge left by teacher training institutions; and

iv) helps overcome challenges.

Most important to note here is that none of the reasons advanced implied that the teachers were forced to attend the activities.

Figure 6.1 below depicts the popularity of the reasons for teachers' participation in IPD. The figure was drawn based on the number of times the reasons were mentioned.

Figure 6.1: The popularity of the reasons for teachers' participation in IPD (Response to Q.1)



NB/ These reasons were elicited from the total of 31 teachers out of 36 who were interviewed. There were cases where some teachers gave more than one reason hence 39 occurrences.

The responses of the 5 teachers were either unclear or reserved by the respondents

It appears from Figure 6.1 that teachers participated in IPD mainly because they perceived it to update knowledge and skills. The improvement of performance of teachers was the second most popular reason for which teachers valued IPD, followed by its potential to close knowledge gaps left by the initial teacher training programmes. The least popular reason here is that of helping teachers overcome challenges in their career life. Giving credence to these findings is that about 86% (31/36) of the teachers responded in ways that indicate they attach value to IPD. This pattern may suggest that teachers feel their professional knowledge base has become obsolete, hence their need for IPD to update the knowledge base. This need might have served as the main motivation for the majority of the teachers to participate in IPD.

Understanding what teachers value may be useful to IPD providers who might need to plan towards meeting the teachers' needs and values, because teachers tend to be motivated to learn if they see utility value of what is offered (Knowles, 1970: Illeris, 2003).

Interestingly, the reasons given by the teachers are consistent with what past research in other settings found to be motivations for PD. For instance, the American study conducted in 1996 found that the teachers were motivated to undertake PD in order to improve student performance (73%); to improve teaching skills (55%) and to increase knowledge (34%) as popular reasons (Renyi, 1998: In Day, 1999, p.146). It follows therefore that the teachers then might have valued PD for these reasons.

I also find the beliefs of the teachers here, to be in line with what many academics have indicated to be the roles of IPD. As stated in Chapter 2, Cropley and

Dave (1978) found IPD to increase professional competence. Kirk and Glaister (1988) and Guskey and Huberman (1995) found it to close gap in knowledge. IPD opportunities were also found to generally support teachers to cope with their challenging work demands (Day, 1999: Nash, 2008). Flores (2005) and Ho and Yip (2003) shared the view that IPD improves the quality of teaching. Garet et al. (2001) found professional development leading to improvements in teaching and students' performance. IPD is seen to promote professional growth as well as relieve classroom monotony as teachers have the opportunity to refresh (Day, 1999).

A cross examination of data against literature revealed that teachers appeared to value IPD for the reasons that seemed to be common for PD provisions in other settings. This consistency between the theory and the teachers' beliefs may suggest not much difference in the demands for teachers' IPD in Botswana and elsewhere, giving the implication that IPD approaches used elsewhere to support teachers may as well be used to support agriculture teachers in Botswana.

Observed differences between theory and teachers' beliefs

Probably due to the teachers' narrow understanding of what IPD could offer they did not mention its possible impact on transforming them as professionals (i.e. addressing issues of conduct and emotions) as one of the values. But Nash (2008) maintained that the emotional wellbeing of teachers will improve if given support and time to implement strategies on how to overcome, probably, their professional difficulties. Again, Day (1999) described PD to be 'transformative' (p.131), implying that it changes beliefs, attitude and understanding of individual teachers over time.

Garet et al. (2001) also shares this understanding. On the contrary, the data did not reflect this important feature of PD.

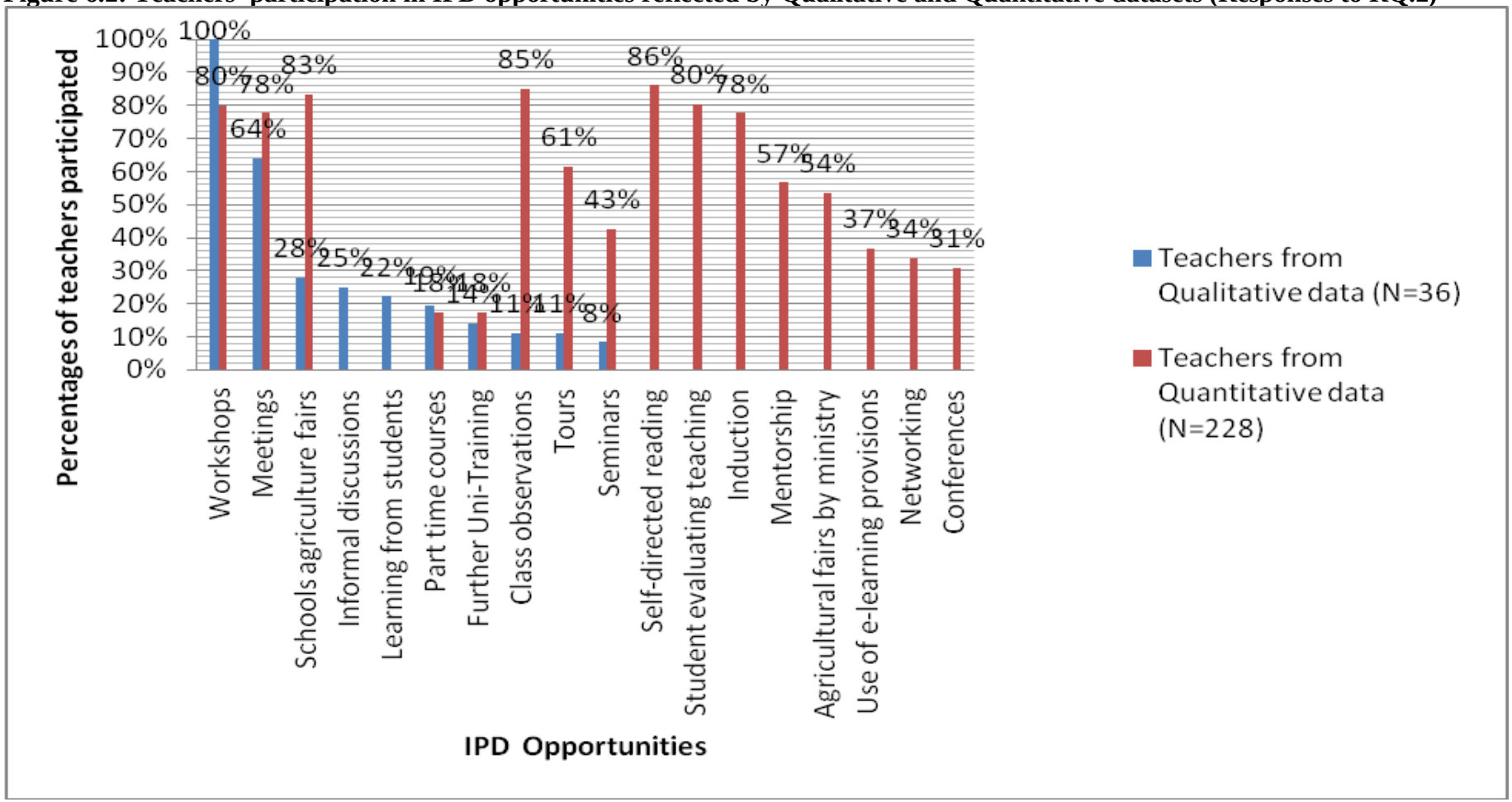
Again, the teachers here did not include 'improvement of student performance' as an ultimate reason for which IPD could be valued or attended. This seems to imply that they disregard 'improvement of student performance' as the primary outcome of IPD. Although it might be a matter of contextual difference, the American teachers (Renyi, 1998: In Day, 1999) advanced the need to improve student performance as a motivation for them to professionally grow. This might also be an issue of the priority given to students' outcomes. In an education system that focuses on high students' outcomes and targets, for teachers IPD may be seen as a tool towards achieving this. In any case, we could assume that improving students' performance is the goal for every teacher.

However, these findings suggest that teachers' understanding could be still developing hence the need for the IPD providers to make the teachers aware of the broad understanding of the possible outcomes of IPD and how they may relate to each other.

6.4.2. Forms of IPD in which teachers participated (RQ.2)

By forms of IPD here I refer to the kinds of initiatives teachers were actually involved in. Following the separate analysis of the qualitative and quantitative datasets, Figure 6.2 below presents the joint findings of these initiatives, for further interpretation and discussion.

Figure 6.2: Teachers' participation in IPD opportunities reflected by Qualitative and Quantitative datasets (Responses to RQ.2)



NB/ Qualitative data is based on the number of teachers who mentioned to have participated. Information extracted from Table 4.2 in Chapter 4 p.225).

Figure 6.2 (i.e. what the teachers mentioned and rated), shows a range of IPD activities in which agricultural science teachers in the Central Region had an opportunity to participate. Both datasets jointly suggest that many teachers participated in workshops and meetings. They further reveal that few teachers enrolled on part time courses and furthered University training to attain higher qualification.

The figure gives evidence of the two datasets supplementing each other, which is a strength for having used mixed methods. For instance, qualitative data highlights the initiatives such as 'informal discussions' and 'learning from students' which were not included in the questionnaire. Conversely, quantitative data reveals teacher participation in: self-directed reading, the use of students to evaluate teaching, induction, mentorship, agriculture fairs organised by the Ministry of Agriculture, e-learning provisions, and conferences, which the interviews did not capture.

However, Figure 6.2 shows some salient discrepancies in the way the two datasets reflected teacher participation in: Schools' agriculture fairs, class observations, and tours. In these provisions the quantitative data reflected larger proportions (i.e. more than 50%) of teachers to have participated than does the qualitative dataset. Where discrepancies existed, I chose to report the concerned pair of findings in parallel as suggested by Creswell and Plano-Clark (2007). But I based conclusions on the quantitative data because it was generated from the entire population while the qualitative data was drawn from a sample. Information from the sample might be less reliable than that from the entire population due to sampling error (Isaac and Michael, 1995).

The joint findings point to the conclusion that workshops, meetings, self-directed reading of books, students' evaluation of teaching, induction and mentorship form the IPD opportunities in which teachers participated in comparatively larger numbers. It is also **concluded** that workshops and meetings were the most popular as confirmed by both datasets. This suggests that the In-service providers might have confined the modes of providing in-service support in the region to the use of workshops and meetings. For this reason the teachers might have lacked experience of making good use of the many existing IPD strategies suggested in literature (Mulkeen et al., 2007: Anderson, 2002: Joyce and Calhoun , 2010). They may be aware of names, e.g. a 'study group' as a strategy but not knowing how best to learn through it.

However, I argue here that if we are to promote a culture that bestows trust to teachers (Knowles, 1970) and give them control (Bishop and Denley, 2006) over their own learning to develop a sense of ownership, we need to let them experience a wide range of activities to empower them. This empowerment is necessary since teachers might initiate IPD for themselves and they ought to be in a position to learn effectively and efficiently through the IPD strategies they choose. Again the teachers' exposure to a variety of opportunities will enhance choice of those that they may exploit to their advantage, if they happen to be available in their context. I therefore find the need to strengthen awareness campaign that would encourage exposure of teachers to a variety of activities, some of which are less costly. Where resources are limited to expose many teachers at once, priority ought to be accorded: female teachers, young teachers, and junior secondary school teachers, for they appeared to have participated less in relatively many activities (See Table 6.2, p.321).

Additionally, the quantitative dataset reflects larger proportions (x>50%) of teachers to have also participated in schools' agriculture fairs, class observations, and tours although the opposite is shown by the qualitative dataset. Few (x<50%) teachers participated in informal discussions, learning from interaction with students, enrolling on part time courses, further training to attain higher qualification, seminars, e-learning provisions, networking, and conferences. Most importantly, the very low percentages of teachers who furthered university training and enrolled on part time courses raise a concern, given that there are programmes in place to help teachers do part time courses as well as further their qualifications in areas of their specialisation. Whilst it is necessary for teachers to continue making use of all the mentioned IPD opportunities, these findings suggest a greater need to promote teacher participation in those activities where they happened to participate in small numbers.

It is evident from the list that many of the above activities constitute what literature (Flores, 2005; Guskey and Huberman, 1995; Garet et al., 2001) regards as formal professional development activities. Formal PD here means that which is planned (Day, 1999). However, some teachers mentioned to have learnt from interacting with students as well as informal academic discussions with their colleagues either at school or departmental level. I regard these to be the only means through which teachers might have learnt informally. Informal learning according to Turner (2006) is 'implicit, immediate, intuitive, unstructured and incidental' (p.302) and therefore, it may not be as costly as more formal measures.

Teachers' learning through cluster meetings might have been constrained by problems which, according to the qualitative findings, included lack of supervision by

EO's, shortage of transportation, inadequate time to meet regularly and lack of guidelines to regulate how clusters operate. So there is a need to address these concerns if teachers are to adequately benefit from cluster meetings

The popularity pattern of the activities or their prevalence is interesting because one would expect to see all the activities within reach, e.g. informal discussions and learning from students, being used more**.** But it is not the case here, thus indicating a need for teachers to be encouraged to make use of school based IPD opportunities which may be easy and less costly in terms of time and money to initiate. Well organised school-based staff development opportunities have been recently found to be very effective (Leu, 2004).

My concern here is that more often the acquaintance of teachers with basic knowledge such as familiarizing them with IPD activities they can embark upon is ignored. But I do argue here that assuming that every teacher knows what and how best to take advantage of IPD activities, may work against some teachers, especially those who are in isolated places. The presence of the many IPD activities and settings, cited in a wider body of literature (See Chapter 2, Table 2.3 p.91), poses demand for the organising departments to strengthen awareness campaign by exposing teachers to a variety of activities which are available and accessible in the teachers' context.

Patterns of teachers' participation

As part of their professional knowledge base, it is important for all teachers to be fairly familiar with a wider range of IPD activities from which they can choose those congruent to their values (Day, 1999) to effectively embark on to improve their

practice in their own context. I argue here that any disparity in exposing groups of teachers to the available IPD provision would advantage some groups and disadvantage others, especially those that are in isolated schools. Again, in the Botswana situation where teachers' participation in most formal out-of-school IPD opportunities is by selection not by choice, any participation disparity between groups of teachers in the available IPD provision could be deemed to have resulted from bias selection. So the knowledge of the teachers who received exposure and those who did not get the opportunity or those who were exposed less becomes important as it would guide a fair and targeted selection of teachers to be offered IPD in future.

The quantitative data (N=228) in this study reflected that some teachers' groups participated differently in some of the IPD provision. Chapter 5 presents these differences (Section 5.4)**.** In exploring and examining the differences I found some implications for IPD providers and policy makers. For instance:

1. Many teachers (84%) participated in school based workshops which were available for all the teachers in the school. However, veteran teachers (40-49yrs) (Figure 5.11) and teachers from the average performing schools (Figure 5.15) participated in smaller numbers in these workshops compared to their counterparts. And also fewer veteran teachers attended meetings (Figure 5.11).

2. The majority (77%) of the teachers participated in agriculture related workshops. Nonetheless, fewer younger teachers (Figure 5.11) and those teachers with degree qualification (Figure 5.12) appeared to have participated in this activity compared to their counterparts.

3. The majority (83%) of the teachers participated in schools' agriculture fairs. However, relatively smaller numbers of: young teachers (Figure 5.11), teachers with degree qualification (Figure 5.12), and those from urban centres (Figure 5.13) participated in the fairs. Some interviewees indicated to have participated in the schools agriculture fairs (pgs.226-227**)** and cited to have faced problems associated with lack of transport, supervision, feedback, and funds.

4. In general, about half (54%) of the teachers participated in the agriculture fairs organized by the Ministry of Agriculture. Nonetheless, the female teachers (Figure 5.10) and those from the junior schools (Figure 5.14) appeared to have participated in smaller numbers compared to the males and those teaching at senior level respectively.

5. Generally, the majority (86%) of the teachers considered themselves to have embraced the culture of self-directed reading to enrich themselves. However, considerably fewer female teachers (Figure 5.10) indicated to have taken advantage of reading widely.

6. Additionally, fewer teachers (about 18%) had a chance to advance their academic qualification in agricultural education from diploma to degree level during their tenure as teachers. But interestingly, significantly smaller proportions of the young groups of teachers (20-29yrs and 30-39yrs) (see Figure 5.11), teachers with diploma (Figure 5.12), and teachers of the junior secondary school (Figure 5.14) did not benefit compared to their counterparts.

Table 6.2 below summarises these patterns showing the teachers' groups alongside the activities in which they appeared to participate less. Also

Table 6.2: Groups of Teachers and Possible Reasons for low participation in IPD activities

Teachers' Group	Activity (s)	Possible Reason (s) for less participation
Older teachers (40 and above yrs)	School based workshops (all staff) Meetings (Fig. 5.11)	They might be facing time constraints as they possibly hold positions of responsibility (OB)
Those in average performing schools	School based workshops (all staff) (Fig. 5.15)	Administrators here might not have been pressured to provide workshops to their teachers to either maintain or improve performance than might be the case with the high and low performing schools respectively (OB)
Youngest group of teachers (20-29yrs)	Agriculture-related workshops (Subject specific) Schools' Agricultural fairs (Fig. 5.11)	There might have been a decline in organisation of workshops and conferences i.e. used to be common years ago (**Chpt 4 sect.4.6 p.230** + Chpt 5: Table 5.2) (DAT) or The frequency of the fairs has been reduced to once every two years (BATA, 2007), and might be making it harder for new teachers to get exposed to them.(DAT+LIT) or
Young groups of teachers (20-29 & 30-39yrs)	Conferences Acquisition of higher qualification in Agricultural Education (Fig. 5.11)	Number of all these activities could have been reduced in current years due to expenditure cuts introduced by the government (BFTU, 2007: MFDP, 2009).(LIT) Selection criteria favouring more mature teachers (OB)
Teachers with degree qualifications	-Agriculture-related workshops (Subject specific) (Fig. 5.12) -Schools' Agricultural fairs	Might have felt proficient with the skills offered, hence found little need to attend (OB). Might be a reflection of imbalance in the way teachers' groups of varying qualifications were catered for (OB).
Junior secondary school teachers	Networking with farmers Part time courses Agricultural fairs organised by Ministry of Agriculture Acquisition of higher qualification in Agricultural Education (Fig 5.14)	Since the majority are diploma holders, they might not have been enlightened to recognise the benefits of networking, fairs, and enrolling part-time.(OB) Could be due to slow nomination process based on first come -first served basis (see findings -Chpt 4 sect. **4.6, p.229**).(DAT) + Expenditure cuts by government as above (LIT)
Female teachers	Networking with farmers Agricultural fairs organised by Ministry of Agriculture Self-directed reading (Fig. 5.10)	Difficulty to balance time for stereotypic home chores and learning i.e. socio-cultural reason (Johannesson and Thamuku, 2009: Makgeng, 2000).(LIT+OB)
Teachers from urban areas	Schools' Agricultural fairs (Fig. 5.13)	Could be that they got occupied by busy town life hence obstructed to attend.(OB)
Teachers with diploma	Acquisition of higher qualification in Agricultural Education (Fig 5.12)	Same as those under junior secondary school teachers.

Sources of reasons: OB-My observation; LIT- from literature; DAT- from the data

reflected in the table are possible reasons that might have led to low participation. These reasons are based on my critical observation, careful analysis and connection of events and cultures on the ground, coupled with my wider readings. The reasons that emanate from the findings of this study are sign posted accordingly.

I find the variations in participation by the groups of teachers to have some practical implications for the future selection of teachers to attend IPD activities. The collated information tended to suggest a need for an attendance priority list that could guide a targeted selection of the groups of teachers. This priority list is an extract from Table 6.2 above, which simply pairs the teachers groups with the activities in which they tended to participate less. The list is presented in Chapter 7 (Section 7.2.2, p. 409), as an output of this piece of research and it is recommended for use by the In-service providers or any organiser of formal IPD activities. Targeted selection of teachers might be useful in various ways. It might ensure efficiency in terms of time and funds as only few and relevant people who will be intrinsically motivated would be catered for. Since adult learners, who are teachers in this case, are motivated by internal pressures (Knowles, 1970), it is more important to invite them to activities they may find interesting and challenging rather than to those they are familiar with.

Comparison of the study findings with what literature reflects to be the range of IPD activities available shows that the agriculture teachers participated in only few of the activities and this raised a concern. A wider body of literature reflects a wide range of PD activities which may include: seminars; conferences; workshops; PD activities that extend over time like networks; differing models of induction (like mentoring, peer observation, and coaching); study groups and networks; and inter-

school visitations (Garet et al., 2001: Van Driel et al., 2001: Day, 1999: Desimone et al., 2002). Guskey and Huberman (1995) regarded induction and internship programmes as forms of early PD experiences as well. They also talked of 'incidental learning' referring to 'learning that takes place in everyday experience and occurs without intention and plan' (p.100). But the fact that teachers, in this study, did not readily list informal activities they participated in, gives an implication that probably they did not regard them to be part of IPD. This therefore gives impression that they had narrow understanding of IPD, which implies a need for IPD awareness training among teachers as well as their supervisors.

In summary it is evident that both qualitative and quantitative findings managed to reveal the attention given, by the teachers or in-service providers, to the individual activities (which, for instance, saw workshops and meetings topping the list of activities in which teachers participated). Moreover, comparative analysis under quantitative dataset in Chapter 5 (Section 5.4 p.270-283**)** has identified some groups of teachers to have participated less in some of the IPD activities, compared to their counterparts. This implies the need for putting the teachers at the same wavelength of attendance to various activities to ensure equity, fairness and access to IPD by all teachers. As an interim measure to bridge the gap among teachers, this can be achieved through an informed targeted selection. Based on the comparative analysis of findings (Table 6.2, p.321) I suggested an attendance priority list that could guide the targeted selection of the teachers when need arises. The list is presented in Chapter 7 as a contribution to practice by this study (See Table 7.1 p.409).

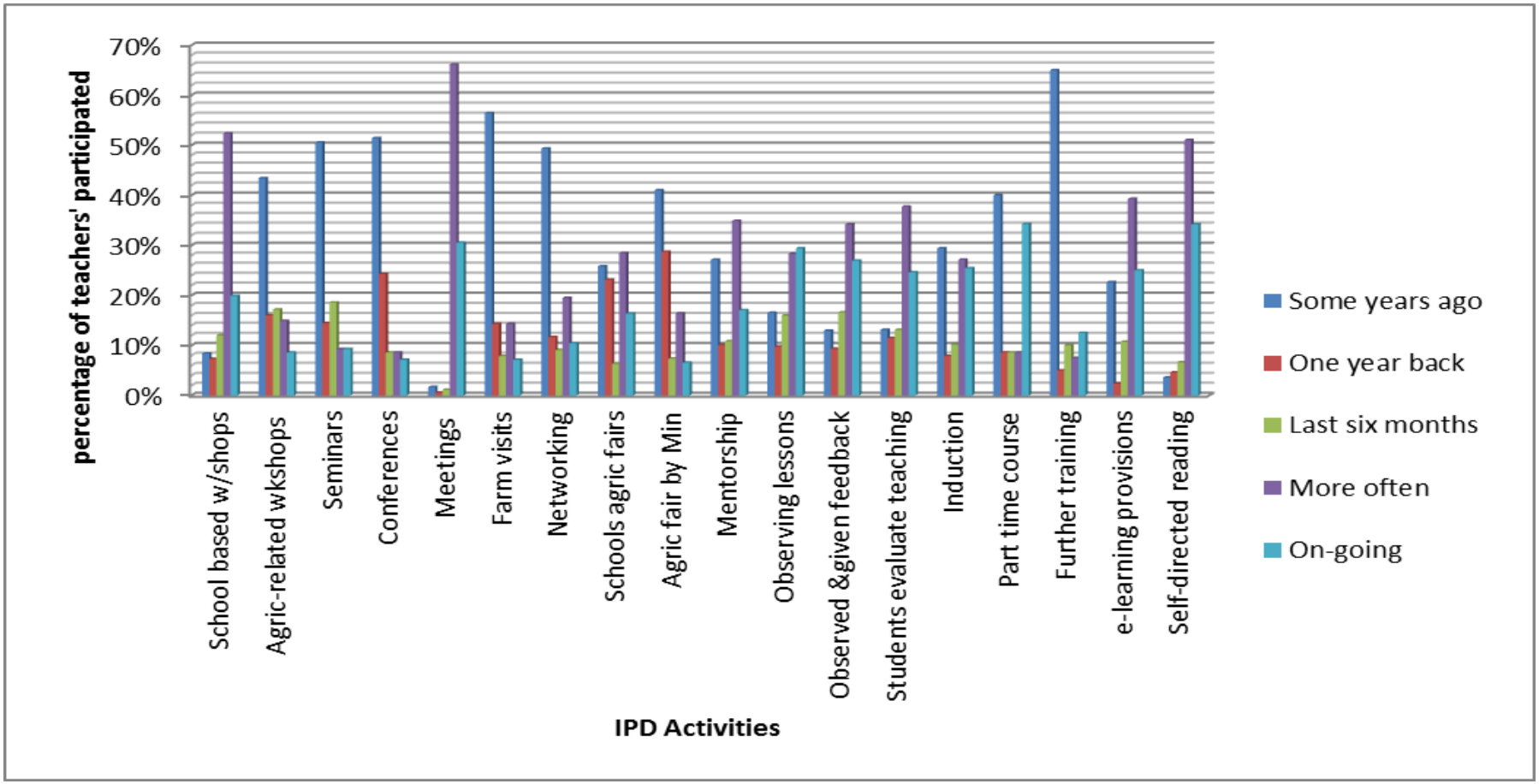
How recent were the IPD provisions?

This study was also interested in establishing a rough estimation of when the activities that teachers participated in were organised. The teachers were given the alternatives to indicate: 'Some years ago', 'One year back', 'Last six moths', 'More often', and 'Ongoing'. The findings for this question are presented in Table 5.2 (p.271) and are summarised by Figure 6.3 below. The figure shows percentages of teachers who participated in each activity at different times.

It is evident in Figure 6.3 that with about half of the activities (9/18), a comparatively larger proportion of teachers have rated to have undertaken them 'some years ago'. Some interviewed teachers raised this issue as a concern in Chapter 4 (Section 4.6, p.230). Of concern is that even those less costly activities that could be self-initiated at school, department or even individual level, e.g. farm visits, networking with farmers, and attending agriculture fairs organised by Ministry of Agriculture, seemed to have been undertaken by relatively larger proportions of teachers 'some years ago'.

Some of the activities seemingly undertaken by a large number of teachers some years ago include: agriculture content related workshops, seminars, conferences, induction programmes, enrolment on part time courses, and further training opportunities. This leads to the conclusion that the activities which used to be done in the past are no longer carried out or are currently carried out less frequently. This outcome raises the question of what has caused the shift.

Figure 6.3: Percentages of teachers who participated per IPD activity at different times (Contribute to RQ.2)



NB/Developed from numbers in Table 5.2 p.271 (Chpt. 5)

In the absence of reasons raised by this study, this remains a question for further investigation (See: p.421, recommendation four). Several reasons could be responsible for this outcome though.

This could be explained by the 'no-pay no work' position which is encouraged by the newly established teachers' unions as they felt their members were exploited for engaging in work-related tasks outside working hours without pay. Given that more often IPD activities are held outside school working hours, they are likely to have been also implicated. The unions have gone on record encouraging its members to shun doing activities for which they are not paid (Baputaki, 2011) and this was not the case some years ago. But I find this not appropriate because some teachers, currently, might have distanced themselves from activities that could help them grow professionally.

The cost saving and cost sharing policy (BFTU, 2007: MFDP, 2009: Matambo, 2011) that the government introduced following the economic recession might have reduced the financing of the activities, especially those attended outside the school. But given the importance of IPD to education quality, it may pay dividends if the programme can be exempted from financial cuts and fully financed to attain its mandate.

The other contributory factor could be that, currently, the teachers might have lost interest and morale to undertake the activities and this might be following the general pattern observed, in a larger scope, by the World Bank (2007). Besides the unsatisfactory work conditions that might be the cause of low morale, this could

happen with activities that are no longer attractive. It is important to maintain high quality IPD activities which are perceived as having a high comparative advantage, given advancement in technology, when compared to those of the past. I am of the view that IPD activities could retain their attractiveness if they meet the teachers' needs as well as keep pace with technological change. This position is supported by several scholars including Hustler et al. (2003), Gray (2005) and Burns, (2005).

Other contributing factors may include: the inability of the coordinating department to organise the content-based workshops; shortage of material resources; increase in competing factors, like inclusion of new subject in the curriculum; and increase in number of schools as was revealed by the former finance Minister Gaolathe (2009).

On a positive note, at least half of the activities are reflected to have been carried out 'more often or regularly' as shown by Figure 6.3 above. I find a need for this arrangement to be further promoted across the rest of the activities.

These findings suggest the need to: expose teachers to a variety of activities; attempt to expose all groups of teachers to activities on a fairly equal footing to avoid variations; and have the activities on an on-going or a regular basis to even cater for newly appointed teachers or teachers' turn over. The gesture that all teachers considered all the studied activities relevant (See Chapter 5, Figure 5.16 p.285) might motivate teachers to participate in them.

6.4.3. Characteristics of IPD activities (RQ.4)

The findings discussed here are made of both the teachers' views and my interpretations as the researcher on the characteristics of IPD as it relates to the organisation and nature of IPD.

The joint findings here were contributed by both quantitative (Section 5.6) and qualitative (Section 4.7) datasets. Their interpretation benefited more from the frameworks of effective PD espoused by Garet et al. (2001), Guskey and Sparks (2004), Loucks-Horsley et al. (2010),. I also drew from a wider body of literature (e.g. Hustler et al., 2003: Adey et al., 2004: Flores, 2005: Mulkeen et al., 2007: Joyce and Calhoun, 2010) which presents qualities used today as a yard stick to examine the effectiveness of any PD activity or programme. While literature suggests groups under which characteristics of effective PD could be explored and examined, I chose not to group them here but to retain details that I find necessary for policy development.

The study identified satisfactory and unsatisfactory sets of features that characterises IPD of Agriculture teachers in the Central Region of Botswana.

Satisfactory characteristics

Table 6.3 below presents an overview of the IPD characteristics that I interpreted to be satisfactory in the context of agriculture teachers. These formed the majority (12/18=67%) of the characteristics identified in the quantitative data.

Table 6.3: IPD Characteristics found to be satisfactory (RQ.5)

Quantitative findings

Teachers:

* agreed that activities had clearly stated objectives (process).

* slightly agreed that IPD activities:

1. addressed aspects for school–wide professional development (collective participation) (process);

2. were actively involving participants (participatory) (process);

3. offered time for participants to reflect upon what was learnt (process);

4. gave plenty of new, relevant information (content);

5. used resource persons who were experts in their fields (context);

6. had content delivered at the appropriate pace (process);

7. were practically oriented (providing hands-on activities) (process);

8. had handouts issued to participants for later referral (process);

9. had evaluation done at the end of the activity (ties) (process);

10. provided sustainable reforms in their practice (process); and

11. complemented well with other existing school initiatives (context).

NB/ Developed from Figure 5.19 p.289 (Chapter 5)

The two frameworks by Garet et al. (2001) and Guskey and Sparks (2004) together identify effective PD to be that which focuses on specific content (content characteristics), as well as promotes active learning, coherence, collective participation (process variables), and receives support from stakeholders and prevailing cultures (context characteristics).

Given that the teachers agreed with the above positively stated characteristics which are also consistent with those generally accepted to identify effective IPD

(Sparks and Loucks-Horsey, 1989: Guskey and Sparks, 2004: Adey et al., 2004: Loucks-Horsley et al., 2010), I interpreted the outcome to be a reflection that IPD activities experienced by the teachers were generally satisfactory with respect to these characteristics.

These findings suggest that the teachers perceived IPD activities they experienced to have encouraged, to some degree: collective participation, active learning, reflection, proper pacing of instructions, hands-on learning, and evaluation of proceedings and use of hand-outs for later referral. Furthermore, it may suggest that experienced IPD activities had: clearly stated objectives, relevant content, and knowledgeable individuals leading the instructions.

Closer examination of all the characteristics in the table in relation to the framework for effective PD by Guskey and Sparks (2004) reveals that the majority are those that could be classified as 'process variables'. These exclude those that characterise experienced IPD to have: given plenty of new knowledge (content feature); used experts as resource persons (context feature) and complemented well with other existing school initiatives (context feature). And having been identified to be satisfactory could imply that these issues of organisation, implementation, and evaluation may not be of a major concern in the current IPD for agriculture teachers.

However, the fact that these characteristics were not highly scored (See Figure 5.19, p.289**)** gives the implication that not all is right with IPD activities with respect to the above characteristics. Given that the teachers' ratings gave us the average picture of the characteristics of IPD activities they experienced, it is possible that

some characteristics were not consistently maintained. And this might be a possible explanation that led them not to be highly scored. This slight agreement coupled with the importance of the cited characteristics as shown in Chapter 2, exerts some need for some attention to be given to the above features to make them more favourable in the future programmes.

Again, the significant differences detected (Chapter 5, Section 5.6) between the perceptions of some groups of teachers that the activities: 'had handouts issued to participants for later referral', 'used resource persons who were experts in their fields', and 'had content delivered at the appropriate pace' suggest revision of these characteristics, with the aim of ensuring that they are perceived as satisfactory at the same scale by all groups of teachers.

The qualitative phase of this study also contributed some favourable features that appeared to characterise IPD activities experienced by the teachers. Below I continue discussing these features.

It appeared from the qualitative findings under 'Respect offered to teachers' (Section 4.7.3.2, (p.238)**,** that teachers felt they were generally given the respect they deserved during IPD activities. And the gesture of giving learners respect is said to be making them feel positive about themselves (Wall, 2011), thus motivating them to learn. This implies that the teachers in this case might have been motivated to learn, especially since, by nature, adult learners do not accept situations in which they are treated like children, as pointed out by Knowles (1970). In fact a wider body of literature (Dewey, 1938: Freire, 1997) supports the idea to accord adult learners (i.e. teachers in this case) a democratic learning environment where every learner is allowed to contribute freely and every opinion is respected (Guskey and Huberman,

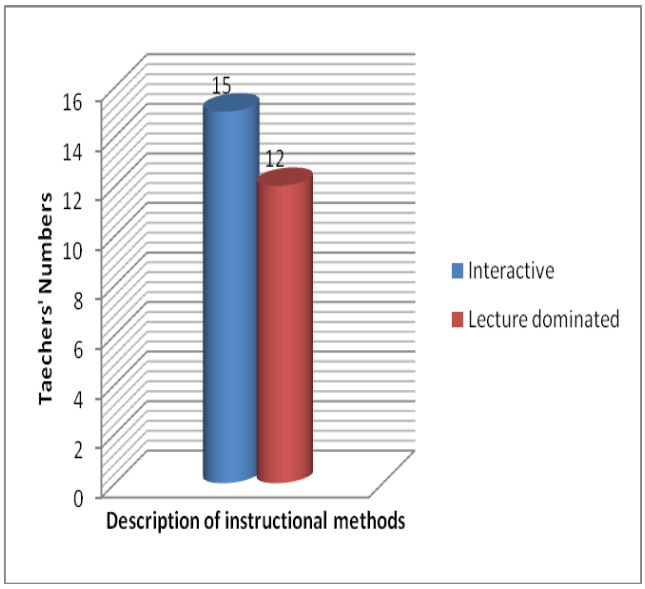
1995) and where they exercise the power of choice (Rogers and Horrocks, 2010). Teachers also reported being given breaks between training sessions to rest. This arrangement is consistent with the idea of avoiding overloading the working memory pronounced by Winne and Nesbit (2010).

It is evident then that the motivational features of giving teachers respect as learners and that of avoiding mental overload also formed part of the IPD characteristics that could be said to be satisfactory. However, given the importance of these features it is advisable for IPD providers in future to ensure that they are exhibited by future IPD activities.

The use of interactive methods during IPD provisions is one feature yielded by the qualitative findings that might have benefited teachers to learn effectively, hence it is considered here to be a satisfactory characteristic. Figure 6.4 below provides an overview of the findings presented in Chapter 4 (Sub-section 4.7.3.1, p.236) regarding the type of instructional methods used during formal IPD activities. The figure depicts the difference in the numbers of teachers who felt they were either lectured to or interactively involved during IPD provisions they attended.

The majority of the teachers, as reflected by Figure 6.4 below, reported IPD methods to have encouraged interactive and participatory learning whereas a slight minority thought of them as having been lecture dominated. This distribution implies that IPD might have been dominated by interactive instructions. The dominance of interactive

Figure 6.4: Numbers of teachers who felt lectured to or subjected to interactive methods



approaches in IPD is generally appreciated in the field because of their learner centeredness. The approaches that give learners opportunity to freely participate, interact and engage with one another were reported by research literature (e.g. Guskey and Huberman, 1995: Vavrus et al. 2011) to have cognitive and psychological benefits.

It could be because of realising these benefits that a considerable number of teachers in this study called for the continued use of interactive methods in future **(**see Section 4.7.3.1, p.237). The call for interactive methods has implications for In-service providers who ought to be ready to support and raise teachers' awareness about their use for they have been identified to be challenging (Brophy, 2002). The call for interactive methods also has implications for resource persons who have to promote active learning when addressing teacher learners.

Furthermore, the desire for IPD to employ interactive approaches could be influenced by the teachers' need to embrace, in their own teaching, the more liberal practices of teaching and learning that seem to be increasingly couched in most current educational reforms in Botswana (See Republic of Botswana, 2010: Republic of Botswana, 1994b) and worldwide (See United Nations, 2005: UNESCO, 2005). So, they may need IPD to demonstrate how to employ the learner-centred approaches (LCA) in their classrooms. In other words they may want to teach the way they were taught (Crookes, 1997), whereby they use resource persons as 'models or referents' (Guskey and Huberman, 1995, p.98). This is referred to as vicarious learning by Bandura (1977) under his social learning theory.

Conversely, the use of instructor-centred approaches (e.g. lecturing) might have been influenced by the need to disseminate information to many teachers at the same time. The use of any of the instructor–centred approaches, which are known to be time-saving (UNESCO, 2005), could have been the strategy to offset the shortage of in-service providers or EOs who could not efficiently address all the teachers in the region. (Republic of Botswana, 2013b). So, it is likely that in some cases the department might have been compelled to adopt the approaches that allowed EO's to address as many teachers as possible at a given time.

The call for LCA also has implications for resource persons who may work to promote active learning and reduce transmission of information when addressing teacher learners. Furthermore, given that there are benefits associated with both the learner-centred and instructor-centred instructional methods, it calls for in-service

providers as well as the teachers to be familiar with a repertoire of instructional methods so that they appropriately employ them.

Unsatisfactory characteristics

Table 6.4 below presents a summarised overview of the characteristics of IPD which according to both the teachers' views and interpretations left the teachers dissatisfied due to their unfavourability. The first six characteristics were scored low by the teachers in the quantitative phase of the study and are coloured red in Chapter 5, Figure 5.19 (p.289).

In addition to supporting the low ratings of quantitative data with respect to the four of the six characteristics, qualitative data contributed other characteristics that teachers seemed to be concerned about as evidenced in the table. In some cases, the data also reveals what teachers desire to characterise future IPD activities and these are indicated in the table as suggestions.

The discussion of the characteristics shown in Table 6.4 continues below, with the contributions from both datasets taken into account. The discussions offer some possible explanations that could have led to the unsatisfactory state of the characteristics and highlight some implications for improvement.

Table 6.4: An overview of characteristics with which teachers were dissatisfied and teachers' suggestions (RQ.4)

IPD Characteristics	**Quantitative findings** (from Fig. 5.19)	**Qualitative findings**	
	Experiences	**Experiences**	**Suggestions**
With respect to:	Teachers **slightly disagreed** that the activities they participated in:	**Teachers enlightened or it was established that:**	**Teachers suggested**:
1. Adopted IPD Framework	-had all teachers in a department invited	-framework adopted addressed few teachers at a time	all invited to get first hand information
2.Period taken by IPD activities (short or long term)	-were of reform type (offered over an extended period of time to ensure mastery of what is learnt);	period ranged from two weeks to few hours after school	
3.Contact hours	-offered participants a reasonable number of contact hours;		
4.Content delivery rate	-had appropriate amount of content delivered at a time;		
5.Follow up & support	-offered scope for later follow up and support by resource persons or authorities;	Follow up rarely done	
6.Scope for feedback	-offered the opportunity for them to give feedback on how the implementation, of whatever is leant, progressed	Teachers did not give implementation report after learning	-Need for more support
7.Needs Assessment (NA)		-NA was inadequate or none at all -NA lacked defined approach Some teachers resisted requests to contribute areas of Need	-need for continued NA

IPD framework used to reach teachers

The findings in Table 6.4 above show that respondents disagreed that all teachers in a department were invited to attend IPD opportunities. The qualitative data

also confirmed that the framework adopted was the one through which some teachers were trained in and thereafter they were used as [6]teacher trainers to resource others in their respective clusters or schools. This framework seems to resemble the PD framework described in literature (Kennedy, 2005) as the Cascade framework. While it might have been adopted for being economic in terms of money and time (Kennedy, 2005), the framework seemed to have dissatisfied teachers because of the following shortfalls:

- few teachers allowed to get first-hand information;
- distortion of content as it was relayed down the levels;
- teacher trainers not allowed adequate time to resource others at their respective schools or clusters ; and
- lack of scope for follow up, feedback and evaluation. (Section 4.7.1 p.232)

When closely interpreting these shortfalls I saw in them the potential to have some setbacks. Distortions may make teachers develop lack of trust of IPD content learnt. In the absence of follow ups, teachers may lack encouragement to implement the ideas learnt. Lack of time may lead to rushed instructions which might have constrained learning by teachers, whose pace of learning has been found to be slow (Knowles, 1970). IPD opportunities need to offer adequate contact hours so that appropriate learning pace is ensured (Garet et al., 2001). Additionally, adequate time allows teachers to reflect (Day, 1999), and allows for the change process expected of the teachers' beliefs to be complete according to the PD Model of Teacher Change by Guskey (1986:2002). So, the importance of time in IPD makes worthwhile to take the

[6]Explained in definition section

efforts to create time and I suggest strategies for creating time later under the section on implications for specific stakeholders (see p.373). It is for the above shortcomings that the Cascade framework is considered here as an unsatisfactory feature that characterised IPD arrangement in the Central Region of Botswana.

However, the idea of inviting few teachers could have been borne by logistical complications such as limited facilities as well as the need to ensure that students are not left unsupervised, which I find valid. But the need to ensure that teachers receive undistorted information is a matter that needs to be addressed. It remains a matter that even teachers strongly emphasised and actually suggested to be all afforded opportunity to attend and receive first-hand information (See Section 4.7.1 p.232).

The shortfalls indicated above point to the implications for In-service providers who are challenged here to work towards ensuring that teachers receive authentic, undistorted, useful information that will rejuvenate their knowledge base and ultimately help improve teachers' practice.

The questions of whether or not the In-service providers made follow ups and teachers provided feedback of how they progressed in implementing whatever they learnt were amongst those specifically addressed by this study given their importance in IPD.

Follow up and Feedback (No's 5&6 in Table 6.4):

Literature reveals that follow up support and supervision fosters teacher change (Guskey and Huberman, 1995) and it could be for this reason that monitoring

of PD process is emphasised by the Backward Planning Model for teachers' PD (Steiner, 2004). But I contend here that if monitoring is done with the purpose of providing support and clinical supervision, it should encourage effective communication between the IPD providers and teachers. Creation of scope for follow up and feedback when planning IPD will strengthen this communication link.

Although, the teachers slightly agreed that proceedings of IPD activities are normally evaluated (see Table 6.3, p.329), both quantitative and qualitative datasets, as summarised in Table 6.4 above, point out that follow-up by IPD providers (EO's) to evaluate application and impact was rarely done. This finding is consistent with the lack of regular follow up of PD activities that was reported in the work of Ramatlapana (2009). This consistency between the theory and the teachers' beliefs may suggest that similar strategies used to improve IPD follow up mechanisms with the case of maths and science could be relevant for agriculture. Furthermore, in this study the teachers also rarely reported implementation progress (or gave feedback) of what was meant to be put into practice after attending IPD activities. Consequently, I interpreted this lack of follow up by EOs and feedback by teachers to be a reflection of lack of communication between the two, which might have adversely affected the effectiveness of IPD in the region.

Data in Section 4.8.1, (p.243) shows teachers attributing the lack of feedback and follow up to:

- failure by IPD organizers to provide adequate time for follow-up and feedback;
- limited supervision as EOs are few in number; and
- the absence of clear guidelines for making it mandatory for teachers to report progress of whatever is implemented. Apparently, some teachers claimed to be ignorant of the need to report progress of the implementation of whatever they

learnt and this might have prevented the teachers from playing a significant role in evaluating IPD initiatives.

These reasons suggest an increase in the number of EOs as well as availing time in the school programme for IPD. There is also a need to encourage teachers to report back progress of their application of whatever they learnt. Time for follow up and feedback purposes need to be reserved during planning for any IPD opportunity.

Time-related characteristics (Numbers' 2,3,4,5&6 in Table 6.4)

Since time is scarce, it is an important commodity that has to be spent wisely and economically. The amount of time becomes even more critical for IPD activities since teachers need more time 'to reflect, work things out and think things through' (Steadman et al. 1995: cited in Day, 1999, p.141). As observed by Garet et al. (2001) professional development is likely to be more effective if it is 'sustained over time and involves a substantial number of hours' (p.933). The need for providing more time for teachers to learn and change is strongly emphasised by the 'Model of Teacher Change' espoused by Guskey (1986:2002). The model sees effective PD to be that which allows teachers opportunity to learn, try out new ideas, and get feedback of the new practice.

Interestingly, it appears that five of the characteristics I interpreted to have dissatisfied teachers, in Table 6.4 above, are time-related (i.e. No's 2,3,4,5&6). This implies that time might have been unfavourable for IPD opportunities. Qualitative findings (Chapter 4 sect 4.8.1, p.243) also reveal that IPD activities in which teachers participated could not offer teachers ample time to develop and change practice. Consistent to these findings are the findings of the study by Gray (2005) which also

pointed to time as a resource to have affected schools' ability to render effective CPD to teachers. Given that the study was conducted in the UK (England and Wales) it shows that the problem of time is consistent across different contexts.

These findings suggest that the time allowed by the IPD provisions might not have been adequate for any noticeable change to be realised in the teachers and their practice. Rather, the limited time might have led to rushed pace of instructions, which might have constrained learning by teachers whose learning pace has been found to be low. For instance, the work of Irving Lorge found that although the intellectual power of adults may not reduce with increase in age, their learning speed declines with age (Knowles, 1970). These findings therefore suggest that more time should be created in future to avoid rushing of instructions which might be counterproductive in the process.

Needs Assessment

The qualitative findings in Chapter 4 (Section 4.7.2) seem to show mixed feelings about the conduct of needs assessment (NA). Some teachers reported that NA was either inadequately done or not done at all. It might not have raised questions of 'why', 'how' and those contextual related issues which I consider necessary for guiding the IPD instructional methods for putting across information, of such topics, to teachers. Proponents of pedagogical content knowledge (e.g. Van Driel et al., 2001: Shulman, 2004) hold that it is not only the knowledge of facts and concepts that help achieve effective instructions but also a wide range of information including the substantive structures and information about learners. This therefore means NA that raises only 'what' questions would cause IPD failing to address a wider range of the

teachers' needs, hence becoming less meaningful in helping teachers improve their roles.

The involvement of teachers only in enlisting topic areas might not have revealed learning outcomes or goals that were intended to be achieved as is supposed to be the case with an effective NA (Steiner (2004). Also it might not have accorded the teachers such opportunity to have their concerns about IPD expressed and be addressed as is supposed to be the case with an effective NA (Taylor, 1997). Gathering less of the teachers' needs, I argue, may lead to a situation where IPD would emphasise the institutional needs more than those of the teachers, which may be inconsistent with the growing recognition of teachers as the key players in the overall success of education (Hustler et al., 2003: DFES, 2003: Edmonds and Lee, 2002). The recognition of teachers' needs has been found to motivate teachers to learn (Burns, 2005).

Furthermore, some shortcomings associated with needs assessment exercise were revealed by data (Section 4.7.2, p.234) to include:

- Resistance by some teachers to forward areas of needs when requested to do so.
- Limited number of EOs made it hard for all teachers to be reached.
- The process of NA lacked a well-defined approach that could ensure that all teachers are reached in the exercise. As indicated in the backward planning model, NA has to be systematic with views gathered from an encompassing range of stakeholders including teachers, students, parents and administrators (Steiner, 2004).

- Where NA was carried out it might not have been regular as the majority of the teachers (who raised this issue) called for a continued NA to be carried out in future.

These shortcomings and the reported limited involvement of some teachers as well as the view of inadequate NA raised by some teachers form evidence that supports the conclusion reached here, of an IPD experience characterised by inadequate NA. Consequently, inadequate NA is taken here to be one of the features that left teachers dissatisfied.

These findings have implications for In-service providers who ought to design an approach to help future NA processes become accessible to all the teachers regularly and gather information that will render it meaningful to the teachers. Teachers also need to respond to requests that call for their involvement. The findings have implications for the Ministry to address the issue of increasing the number of EOs in order to reach out to all the teachers.

6.4.4. Factors that adversely affected participation in IPD (RQ.5)

Stainer (2004) notes that teacher learning, of whatever kind, is always embedded within context which, according to Leu and Price-Rom (2006), has complex mediating factors. It is also reflected in a wider body of literature (See Chapter 2, Section 2.10) that various personal, contextual and political factors influence teacher PD. Against this background this study explored the views of teachers and EOs on the factors that might have negatively influenced IPD in the

context of agriculture teachers. The discussion of these factors will raise awareness of conditions that need to be attended to in an effort to improve IPD in the future.

During the interviews the teachers and EOs were given the opportunity to share, in their own words, factors that influenced their involvement in IPD. The question was asked as follows:

> *In your opinion, what are the things that influence your participation in IPD activities? And in what way do they influence your participation in the activities? (RQ. 6)*

A related question was asked EOs to provide supporting information. Chapter 4 shows details of these findings from p.241. Table 6.5 (next page) summarises these findings which, for the purposes of presentation, I chose to group them as shown in the table.

Discussion of individual factors

Access to IPD:

It appears from Table 6.5 that the issue of the teachers' inability to pay for part time training has a negative influence on the teachers' access to some IPD opportunities. This finding confirms the general concern raised in literature (Ho and Yip, 2003: Wellcome Trust, 2006) that financial constraints may deny some teachers the chance to receive PD. But besides pointing out this challenge, literature has indicated that college courses (Findlay, 1992) and distance education programmes (Anderson, 2002: Mulkeen et al. 2007) are some of the useful opportunities that teachers can undertake for their PD. In Botswana, some teachers enrol with institutions like BOCODOL and these, according to findings in Section 4.8.5, are located far from the teachers' place of work. Therefore, distance might make access to institutions difficult and it might also increase learning costs due to travelling.

Table 6.5: Factors adversely influenced IPD drawn from Quantitative and Qualitative findings (Response to RQ.5)

Factors perceived to be hindering IPD	**Qualitative findings**	
	Experiences Teachers reported:	**Desired state of affairs** Teachers suggested:
Factors influencing access to IPD	-inability to fund their part time training (Sect: 4.7) -inability to access learning institutions to enrol part time (might increase costs)	
Organisational or logistic related factors	-late and inconsistent invitations **venues** -some teachers uncomfortable with the use of school facilities -some lack facilities to provide training in situ **Transport** -lack of transport was cited by teachers in rural areas	-need to be invited in advance -need to be offered equal chance -venues relevant to topic and which make learning enjoyable -need for school to organise transport
Policy related factors (To be handled by school & Ministry)	-Increased workload with less time to learn. Possible contributors: Large class size, increased teaching periods, lengthy syllabus, & lack of farm assistants -shortage of In-service Education Officers	-reduced load -increment of EO's
Motivational factor (interpreted)	-low teacher morale	Need to address frustrating conditions (e.g. inadequate support and supervision, lack of incentives, etc.) (See under Section 4.8.3)
Material and financial resources	-limited material and financial resources	Need to address shortage of resources (implied)
System's politics and tensions (interpreted)	-collusion between departments having interest in teachers' PD -collusion involving timing of IPD versus that of teaching & teachers' personal obligations	

The inability to meet the training costs could be following the government's introduction of payments of fees at all of its training institutions as part of its cost recovery and reduction measure reflected in various documents (Republic of Botswana, 1994b: BFTU, 2007: MFDP, 2009). Furthermore, the restricted policy by the government (Makhandlela, 2005) to confine funding of part time courses to only those linked to the teachers' areas of speciality could also contribute to teachers failing to access some part time courses of their interest.

It could therefore be concluded from these findings that higher training fees and distance from training institutions might have constrained access to part time courses by the teachers. These findings therefore suggest the need for strategies that could assist teachers to gain access to courses with ease and at the reduced costs. The strategies may include reversal of the two government policies of introducing payments of training levies as well as that of restricting funding to selected group of courses.

Organisational-related factors

It is evident in Table 6.5 (p.345) that the teachers identified the inconsistency in their invitations to participate in IPD which I interpreted here as a factor that might have negatively affected some teachers' involvement in IPD. This could be that some teachers might have been unjustifiably given priority over others. Findings presented in Chapter 4, Section 4.8.6 (pgs.250-251**)** are evidence to this. For instance, it appears in the findings that some teachers who held positions of responsibility seemed to have been preferred rather than those without special roles. Efforts to find out whether there were any guidelines followed to invite teachers proved that none existed. For that reason, I blame the inconsistency here on the lack of guidelines for inviting teachers for IPD. In order to boost and maintain high morale for learning amongst the teachers, more transparent and consistent selection criteria ought to be adopted.

Sending invitations late seems to have also adversely affected teacher participation in IPD. This perception that invitations were sent late suggests that teachers of agriculture value time for preparing for IPD. In other words they seem to bring a dimension of emphasising time prior the activities. This becomes an

interesting observation here because theory on IPD (Garet et al., 2001: Guskey and Sparks, 2004) emphasise time during IPD. For instance, Guskey's (1986) model of teacher change emphasises provision of time during IPD to cater for the process of teacher change. Taking the two contributions together means that ample time need to be ensured for teachers to prepare for IPD and learn during IPD.

These findings therefore point to the need for an invitation procedure that would prevent inconsistencies that seem to disadvantage some teachers. The findings also suggest invitations that are issued in time to give teachers opportunity to prepare for effective participation during instructions.

Transport

It appeared that teachers were satisfied with meals and accommodation offered. However, there were mixed responses about the transportation issues. Interesting here are the teachers who found transport problematic. The data suggests that teachers from rural schools were more dissatisfied with the provision of transport than their counterparts in peri-urban and urban areas (See Section 4.8.7 pp.253-254). This could be a reflection of the fact that schools in rural areas did not have adequate transport for teachers to attend IPD opportunities which, in most cases, were held in the Education Centres located in peri-urban and urban centres. The rural schools therefore might have experienced budgetary constraints, since their transportation costs are relatively higher. Where schools could not provide transport for teachers to attend IPD, some teachers reported challenges associated with having to use public transport and later be refunded the travel cost. This might have limited some teachers' access to IPD opportunities.

Interestingly, as reflected in Section 4.8.7 (p.254), none of the teachers from the urban schools cited a problem of transport, and this could reflect the imbalance in the way resources are made available to teachers from locations that vary in socio-economic status. It appears that access to professional development opportunities is not only a problem to developing countries. For instance, the study by Gray (2005) found that teachers based outside London also described difficulties in finding the time and funding for travel costs to attend PD courses in the capital, and they expressed a preference for locally based training.

Teachers in this study suggested:

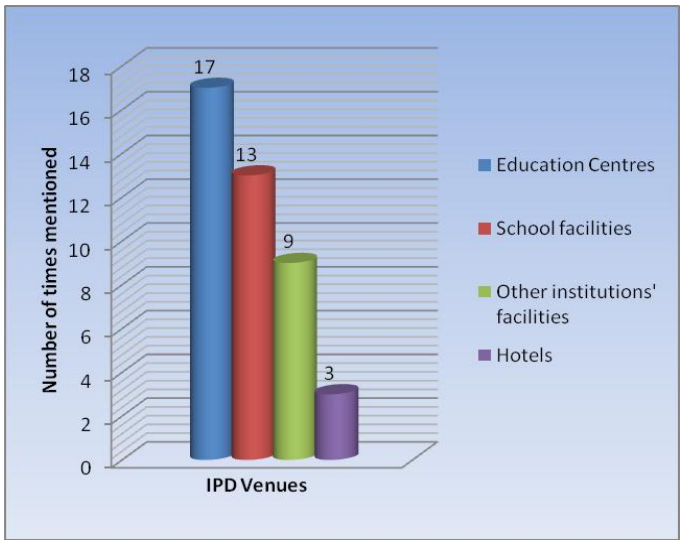
- that school administrators must continue organising transport to encourage teacher participation in IPD provisions.
- meals and accommodation must continue to be provided.

It will be also worthwhile for the Ministry to improve the process of refunding teachers which has been described to be stressful.

Venues

The venues where the activities were held were included in the teachers' lists of IPD characteristics. The venues were of interest to this study because the facilities available at the venue could determine whether or not teachers could actively learn agricultural skills 'in situ' and be effectively exposed to real life situations. Figure 6.5 below depicts the popularity of venues used for IPD. The figure is based on the number of times venues were mentioned by the interviewed teachers as presented in Section 4.8.8, (p.256).

Figure 6.5: Popular venues used for IPD activities



Education Centres, school facilities, facilities of other institutions, and hotels appeared to be the common IPD venues used in the Central Region. The most and the least popular venues were education centres and hotels respectively. The dominance of Education Centres as IPD venues suggests that the eleven (11) Education Centres established by the government in the country (Ministry of Education, 1998) for IPD purposes might be serving the intended purpose. The Education Centres might be preferred because they have conference rooms designed for IPD as well as facilities to accommodate and prepare meals for teachers at reasonable cost (Ministry of Education, 1998).

However, based on my knowledge of the architectural layouts of Education Centres in Botswana, they lack agriculture structures which resemble those in the school farms where teachers could demonstrate skills, and this limits Education Centres in offering a real teaching environment to which teachers' learning could be related. A wider body of literature including Brown et al. (1989) and Tennant (1997) emphasise the need to contextualise learning to make it meaningful to learners. This

line of thinking is consistent with Lave's situated learning theory which also assumes that learning occurs best if made active and related to real life situations (Lave and Wenger, 1991: Guskey and Huberman, 1995).

The implication is that school facilities would be most appropriate as venues because the school farm and students would be available for use if required. However, some teachers felt that the use of school facilities lower their (teachers) status, thus suggesting the use of out-of-school venues to raise their status. The use of out-of-school venues may also reduce classroom monotony and boost reflective processes (Day, 1999). It is important therefore that in-service providers consider venues that would ensure realisation of effective instruction and make learning an enjoyable exercise.

Finally, I conclude that the organisational related factors that have been identified to have hampered teachers' participation in IPD opportunities in the region include:

- late and inconsistent invitations
- shortage of transport (especially in the rural areas)
- inappropriate venues

Policy-related factors at school level

Table 6.5 above reflects that the teachers identified the increased workload that characterises the teaching of agriculture to be a hindering factor to their learning through IPD. This finding is consistent to what literature points out about the nature of agriculture as a subject in schools. Harper et al. (1990) and Roberts et al. (2006)

contributed that agriculture poses a heavy load on the teachers. Likewise, the finding above suggest that the teaching of agriculture might have been burdensome and caused teachers to work beyond official hours (Harper, et al. (1990), thus utilising time they could use for learning. This finding points to the need for schools and departments to make time available for IPD opportunities.

Policy-related factors at Ministerial level

The issue of shortage of EOs has run through most sections in this thesis and this tells how likely it might have hindered IPD of agriculture teachers. As reflected in Table 6.5, the factor has been identified by both datasets. It has been evident right across the discussions that limited supervision has been cited as the possible immediate explanation for whatever aspect that failed to meet the expected standards. For instance, it was cited to have led to lack of follow up and monitoring of IPD activities and inadequate needs assessment. But according to the RNPE (Republic of Botswana, 1994b) the number of In-service Education Officers has never coped with IPD demand since the inception of the In-service Unit in the Ministry. This could imply that the education authorities do not consider IPD to be the integral part of the education system and therefore does not deserve maximum attention. If this is not the case why then it takes a long time to improve the supervisory capacity of the In-service unit of the Ministry, I argue? But theory, which I endorse, cautions that teachers' PD which is treated as an additional component of educational policy often fails to make a positive impact on the teachers' professional growth and students' academic achievement (Day, 1999: Guskey and Huberman, 1995). It is therefore against this background that I suggest an increase in the number of In-service Education Officers in the Central Region.

Motivational factors: Teacher morale

From the teachers' comments and expressions as presented in Section 4.8.3 it is evident that some teachers might have lacked motivation to apply themselves and ensure that they grow professionally. These teachers talked as people who seemed not to believe that they could professionally advance through involvement in IPD activities. But according to the concept of self-efficacy beliefs in Bandura's social cognitive theory (1986:1997), unless people believe they can achieve, they will have no motivation to help them apply themselves (Bandura, 1986). This view is also shared by Hutchison et al. (2006). And this line of thinking is applicable in this case because without the teachers believing that IPD could benefit them to achieve professional advancement they would remain lacking in motivation to participate in the opportunities. Unless they have strengthened their self-efficacy beliefs their chance to self-regulate, hence take a proactive stance and work towards benefiting from IPD, would remain low.

The data in Chapter 4 (Section 4.8.3) further reflect several reasons raised by the teachers that could explain why they appeared demotivated from participating in IPD opportunities. These include unfavourable work conditions like inadequate support and supervision by school administrators and EOs for teachers to implement and try out new ideas, lack of incentives, lack of recognition of the teachers' learning efforts by the authorities, slow or no progression in career path, incidences of favouritism, and slow processes.

Taking together the tone of expression shown by teachers as well as the revealed factors that might have demoralised them, I concluded that the teachers' participation in IPD might have been adversely affected by low morale.

The discussion above suggests a need to raise teachers' morale to participate in IPD opportunities. The reasons raised have implications for the Ministry, EOs, teachers and school administrators to ensure IPD that fulfils the teachers' ideals. As to what exactly is expected from each of these stakeholders is couched in the implications of the findings I presented under Section 6.8 (See p.370).

Material and financial resources

Inadequate material and financial resources might have frustrated the efforts by teachers to learn. Literature reveals that the effectiveness of IPD is influenced by several factors, amongst them, the material and financial support it receives (Day, 1999: Gray, 2005). Stainer (2004) posits 'available resources ...determine what type of activity is best suited to a particular school' (p.1). These contributions therefore show the necessity to provide for IPD.

The government is said to have provided computers in all secondary schools in Botswana (Isaacs, 2007). However, according to the data in Chapter 4, (Section 4.8.4**)** the teachers have cited lack of access to the computers as well as unreliable internet connection to have posed hindrance to their learning. The use of old books as well as dilapidated agriculture structures where they could conduct field trials to learn more with their students were also cited as hindrance to learning by teachers. Data also reflected incidences of disruptions in cascading information due to budget constraints.

In conclusion, the inadequacy of material and financial resources played a role in making IPD unfavourable to the teachers. These findings suggest a need to improve on the material and financial support accorded IPD of agriculture teachers and their teaching. This is significant since many teachers learn as they teach. For instance, the field trials they conduct reveal new knowledge that benefits both teachers and students. So, the renovation of agriculture structures in schools could ensure successful trials and offer a conducive environment for learning by both students and teachers.

The discussion here has implications for the Ministry and the school administration. As the main financer the Ministry of Education is challenged to look into the issue of renovation of structures. The school administrators are challenged since they prioritise activities that need financing at school level. The extent to which IPD opportunities would receive material and financial support would depend on the value they attach to IPD.

System politics and tensions

In their work Guskey and Huberman (1995) cautioned that 'systems politics severely limits the likelihood of success of...any educational endeavour' (p.119) and I concur with them, especially if they are not accordingly addressed.

It is evident in the findings presented in Chapter 4 (Sub-section 4.8.9) that some collusion amongst the stakeholders might have also stifled IPD progress. The stakeholders that have interest in the teachers' IPD seem to blame one another for the sub-standard IPD support offered to teachers. In the research it was mainly the EOs

who voiced the tension. The stakeholders concerned here include the departments of Teacher Training and Development (TT&D), Curriculum Design Development & Evaluation (CDD&E) and that of Secondary Education (DSE) as well as the Botswana Examination Council (BEC). The data seems to reveal the existence of an uncoordinated overlap of the departments' roles which I consider to be the possible cause of the tensions. This could be alleviated by clearly spelling out roles of the departments in relation to the IPD support they offer teachers in order to avoid confusion. There is also a need for these departments to embrace a culture of willingness to take risks and accept blame for faults as well as a culture of collaborating and working towards attainment of shared goals.

From the data (Sub-section 4.8.9 p. 259) an issue that also emerged was the clash between the timing of IPD events, teaching aspects and teachers' personal obligations. The arrangement of organising IPD events during school holidays is viewed by teachers to be inconsiderate given that their terms of employment only allow them to apply and take leaves to attend to their personal obligations during that time (Ministry of Education, 1994). On the other hand, holding IPD opportunities during term time is viewed in other quarters to be an unnecessary use of teaching time (Cook and Fine, 1997). Given that both reasons are valid, I am of the view that teachers and their employer need to collectively devise the best possible times during which formal IPD opportunities could be arranged: catering for both institution needs and the teachers' welfare. This would circumvent the development of a culture that may discourage teacher learning and even course disruptions in teaching. For instance, forcing teachers to learn at times they view inappropriate may cause them to resist learning. Gall and Strenchler (1985) encourage scheduling in-service sessions at

times that do not interfere with teachers' own obligations. I find the tensions discussed here to have implications for the Ministry, in-service providers, school administrators, and teachers to take appropriate actions as implied in the suggested model.

In conclusion, it can be said that generally agriculture teachers perceive the factors that adversely affect their own IPD to include issues of: access to IPD, IPD organisation as well as those of policy at school and ministerial level, unsupportive systems' cultures and tensions. The findings suggest a necessity to attend to all the discussed factors.

6.5. Relevance of the activities (Response to RQ.3)

The teachers rated all the activities they had participated in as relevant for their IPD. These findings strengthen the belief that the opportunities concerned will benefit the teachers in their context if made available, for the relevant PD opportunities are seen to have potential of positively impacting practice (Williams, 2005). The said opportunities include: conferences, seminars, tours, university course for higher qualification, informal discussions, agriculture fairs, short courses, part-time training, workshops (especially subject school-based workshops), meetings, mentoring, self-directed reading, class observations, and distance learning through BOCODOL.

However, Chapter 5 (Section 5.5) presents some significant differences in the way some groups of teachers perceived the relevance of some IPD activities. Given this background I offer a suggestion as I conclude that, while the teachers perceived all the activities to be relevant and hence appropriate for future use, the varying degrees of relevance expressed by the different groups of teachers in relation to 'networking with farmers', 'the use of electronic learning facilities' and 'Further

training to attain higher qualification', ought to be given the attention they deserve. The Groups of teachers which found these activities relevant more than the others, ought to be given preference to attend them considering the fact that adult learners tend to learn better through means they find relevant and fitting their learning styles (Rogers and Horrocks, 2010). In this instance, female teachers, male teachers, teachers aged 30-39years, respectively found networking, use of e-learning facilities, and further training relevant more than expressed by their counterparts.

By considering the activities relevant could imply that teachers would support their use in future. It also suggests that teachers believe in the activities and have set their minds ready to embrace them, and this mind-set as observed by Illeris (2003) would serve as an intrinsic motivation for the teachers to participate in the activities. The findings therefore point to the need for policy makers to capitalise on this outcome and double up efforts to timely avail and support more opportunities for teachers to learn. There is also a need for continued arousal of interest to learn among teachers in order to maintain their quest for learning and professional development.

6.6. Content of IPD (Response to RQ.6)

The quantitative findings in Chapter 5 indicate that teachers perceived IPD to have given-

i). little attention to:

- ✓ address teachers' personal needs e.g. coping with life stress
- ✓ self-empower teachers to render them to become multi-skilled
- ✓ develop teachers' general professional or teaching skills
- ✓ help teachers teach mixed ability classes

- ✓ update teachers subject matter knowledge
- ✓ help teachers implement change in the curriculum
- ✓ familiarise teachers with policies and orders governing teaching
- ✓ help teachers understand themselves
- ✓ help teacher approach agriculture as a business
- ✓ help teachers teach agriculture by example
- ✓ help teachers realise the importance of translating agriculture content to reality
- ✓ improve teachers' ability to manage a group of agriculture enterprises in a school setting
- ✓ help teachers allocate marks to students' practical work
- ✓ improve teachers' research skills
- ✓ help teachers incorporate ICT aspects into their teaching

ii). very little attention to:

- ✓ help teachers involve students with disabilities in learning agriculture skills

The low rating of these topics areas, which form the majority (i.e.16/19= 84%) of the content areas studied, raises a concern that the current IPD might not have adequately helped teachers in areas that helped them to develop as individuals, enrich their professional knowledge and improve their practice.

The 'little attention' given to address teachers' personal needs and self-empowering them to be multi-skilled is contrary to what is advocated for by literature today. Recent research has emphasised a need to take into account the motivating factors associated with teacher learning such as teachers' personal and professional

needs when deciding on IPD opportunities (Flores, 2005: Rogers and Horrocks, 2010). This suggests that the needs of agriculture teachers should be taken into consideration when planning their IPD provisions and they should be given the opportunity to learn a variety of skills.

Similarly, in this world of changing technology it is short-sighted to give little attention to updating teachers' Subject Matter Knowledge (SMK). Literature cited in Chapter 2 (e.g. Ho and Yip, 2003: Wellcome Trust, 2006) has pointed out the need to update the teachers' SMK through IPD. So, the need for updating the teachers' subject matter knowledge cannot be ignored, since their knowledge base has been described to have deepened (Coolahan, 2002).

The highlighted importance of SMK points to the need for future IPD provisions to focus on addressing teachers on subject matter areas and most preferably those needed to deliver the curriculum they implement in their classrooms. Besides that the idea is consistent with the notion of 'content focussed PD' shared by the models of effective PD espoused by Garet et al. (2001) , Guskey and Sparks (2004) and Loucks-Horsly et al. (2010), it will give the teachers opportunity to master subject matter and become efficient in getting it across to the students. Given that SMK involves familiarity with the correctness of facts, procedures and concepts as well as the underlying principles (Grossman et al., 1989), IPD ought to help teachers to master subject matter in agriculture at a level where they could explain why they teach it the way they do and could relate its nature with the instructional practices.

Giving little attention to help teachers teach mixed ability classes and involve students with special needs in learning agriculture skills appear to be yet another move which goes against the government agenda of ensuring inclusive education (Republic of Botswana, 1994b: UNESCO 2010/11). The central tenet of Botswana's vision that by 2016 Batswana should be a tolerant and compassionate nation (Republic of Botswana, 1997) could only be realised if an inclusive agenda can be enforced by all sectors of the economy, including the education sector. Efforts that intend to help teachers improve skills in working with learners with varying needs would contribute to this national objective. So, to be consistent with the government goal of ensuring inclusive education IPD has to acquaint agriculture teachers with skills to teach mixed ability students as well as those with learning difficulties.

Interestingly, data in Chapter 5 shows that the teachers in the junior schools more so than those in the senior schools, indicated receiving help in teaching mixed ability students (p.297). This could be because the junior secondary school teachers were somehow assisted following the demand for mixed ability teaching which results from the automatic promotion of children from primary to junior secondary. The initiative was introduced by the government to meet its targets of affording every child the ten year basic education (Republic of Botswana, 1994b), and to meet the expectations of the international conventions (e.g. MDG's and EFA) to which Botswana is a signatory (MFDP, 2009).

For teachers to be able to effectively dispense their professional roles with a greater degree of efficiency, they ought to feel safe and protected and be convinced that they are working within the parameters of the rules and regulations governing

them as professionals. And they can achieve this state only if they have a clear understanding of the policies and rules governing their work. To this end, I would say, it would have been wise if IPD activities had fully exposed the teachers to these policies and regulations. This therefore becomes yet another priority area that future IPD has to emphasise.

IPD activities were also perceived to have given little attention in helping teachers approach agriculture as a business as well as improving the teachers' ability to manage a group of agriculture enterprises in a school setting. This neglect has the potential of frustrating the current government efforts of commercialising agriculture in the bid to diversify the economy. Teaching agriculture as a business could increase the long term chances of having future farmers commercialising in agriculture. Furthermore, one would expect the teachers of agriculture to have been refreshed frequently on the management skills more than just being helped to assess or mark students' work on finished products. This suggests the need for future IPD opportunities to address teachers on husbandry skills so that teachers can be able to demonstrate effective management skills to students.

An outcry by the Botswana Examinations Council (BEC, 2011) over inconsistent continuous assessment scores compiled annually by teachers from practical work, might be explained by the little support that teachers receive from IPD activities on grading or allocating marks to the practical work of students. A similar complaint by BEC is extended to the marking of research projects which seem not properly done by the teachers (BEC, 2011). For teachers to be effective in marking the research projects they first have to be competent in research skills, thus making in-

service support in this area necessary. This suggests that future IPD opportunities ought to ensure that teachers are proficient in both marking field work of students and supervising their research projects. Interestingly, data in Chapter 5 shows that the veteran teachers perceived 'much attention' to have been given to help them allocate marks for students' practical work whereas the younger groups of teachers perceived that 'little attention' had been given (pp.297-298). The reason could be that this area had been better addressed in the past, before the young teachers joined the field. This reflects the necessity for keeping track of groups of teachers who receive IPD support to monitor the disparities that may result due to teacher turn over.

It is also surprising to have found little attention given by IPD activities in helping teachers to incorporate ICT into their teaching. But the importance of incorporating ICT in teaching has been recognised by the RNPE in Botswana (Republic of Botswana. 1994b) as well as some most recent literature (Isaacs, 2007). Srinutapong et al. (2005, 23.1) even went to the extent of suggesting the need for teachers to have access to continuous support in order to 'integrate dynamic technology into their curriculum' (p. 23.1). The fact that the area has been identified by the teachers to have been given little attention suggests that in future IPD has to help teachers exploit technology advancements to their advantage in teaching agriculture.

In general, I find these findings depicted by Figure 5.25 **(**p.296**)** to be enlightening and would help reformulate effective IPD activities that would strive to attend to most of these aspects. It is also important to take cognisant of what could

have led to the little attention given to most of these areas by IPD activities with the intention to improve the situation.

Of all the potential IPD content areas presented in Figure 5.25 (p.296); teachers indicated that the areas that IPD activities gave 'Much attention' to, were: the familiarisation of teachers with government initiatives for improving performance (e.g. PMS); helping teachers to understand their job requirements; and helping teachers to keep records. I found these aspects to emphasise the institution's needs rather than individual teachers' needs. This trend is similar to that discovered by other related studies conducted from other contexts. Key findings in a recent survey of teachers' perception of CPD (Hustler et al, 2003; and DFES, 2003, Brief No. 429) and the National Foundation for Educational Research Survey (Edmonds and Lee, 2002) indicated teachers' recognition that school development and national priorities have taken precedence over their individual needs in driving CPD activities. But I, as does Burns (2005), observe that teachers also have individual professional needs that ought to be met so that their work morale is boosted, thus making them stay long in their work**.**

Furthermore, as revealed by the qualitative findings (Table 4.2, p.225), the teachers raised a concern that more time was spent in performance management system (PMS) workshops at the expense of other areas. But the literature warns against these systems, for they are seen to prevent teachers from becoming flexible (Day, 1999) and they 'stifle innovation and creativity' (Ibid. p.x), both of which are expected for self-directed learning. I therefore argue here that too much enforcement of the use of these systems, would be tantamount to de-professionalising the teachers.

I therefore conclude here that the IPD experienced by teachers might not have adequately helped teachers in areas that matter most for their professional growth and improvement in their practice. These findings have implications for the content of future IPD programme which has to address this long list of important areas left by the current IPD.

Furthermore, experienced IPD might have emphasised institution' needs rather than the teachers'. This conclusion points to the implications for IPD providers who, in their plans for future IPD, ought to ensure optimum balance in addressing the institutions' and teachers' needs, since both are important for success in education (Guskey and Huberman, 1995).

6.7. IPD needs for the future (Response to RQ.7)

Areas of IPD need identified by the teachers, presented in Chapter 5 (pages 300-301) are further discussed here. As stated earlier, data analysis yielded three main categories of IPD needs, each with sub-categories. These were:

Main Categories of Needs	**Sub-categories**
Teaching Strategies (Table 5.44)	Teaching methods and techniques; Testing; Use of technology
Subject Matter Aspects (Table 5,45)	Practical Aspects; Syllabus topics
Teachers' Personal Needs (Table 5,46)	Education related; Needs associated with life skills; Needs on governing regulations; others

The brief discussion of these needs will proceed according to the sub-categories.

Teaching Methods and Techniques: The findings in Table 5.44 (p.300) show that, amongst others, teachers expressed IPD needs on teaching methods and techniques. Perhaps unsurprisingly, this is evidence that some agriculture teachers feel strongly that such training helps to maintain their identity as teachers. For these teachers, the possession of effective strategies to teach large classes, mixed ability students, and students with special learning needs, becomes necessary.

Testing: Table 5.44 reveals that teachers expressed IPD needs related to testing students on theoretical aspects and practical skills. For practical assessment, it could be that the assigning of students to projects and grading their management capabilities became problematic due to a large number of students. The large classes might be due to the government's policy to increase enrolments in schools in line with its long term Vision 2016 (Republic of Botswana, 1997) as well as the expectations of the international conventions like MDGs, EFA, Jomtien Declaration and Darker Framework of Action, all of which recommends free and accessible education by all. It could also be that the teachers need clarification on the use of assessment guides (Ministry of Education, 2000:2010). This suggests IPD opportunities that can demonstrate in situ how the assigning of students to specific projects and grading of skills could be best achieved. Table 5.44 further show that teachers expressed a desire to be exposed to the assessment standards for marking moderated projects. All agriculture teachers grade students' practical work and their marking is cross-checked by moderators. It makes sense for teachers to want to share with the moderators similar marking standards for consistency.

Use of Technology: Professional development needs in the area of Information Communication and Technology (ICT) were also raised by the teachers as revealed by Table 5.44. The teachers singled out: the use of computers, audio/ visual aids and use of internet as areas they want to be exposed to. There was also no apparent impact of age, experience and phase of education on the teachers' responses under this section. This makes it necessary for all the teachers in the region to be exposed to ICT. Having ICT as an area of IPD need could have been encouraged by the government's move of having computer laboratories in 'all junior and senior secondary schools' fully equipped with computers with internet connection (Isaacs, 2007, p.7).

Table 5.45 (p.301**)** displays needs relating to a broad category labelled 'Agriculture Subject Matter'. This category further divides into two sub-categories of: Practical Aspects and Syllabus topics.

Practical Aspects: Teachers indicated a need for IPD to help sharpen their skills in: managing agriculture projects in schools; grading students' agriculture projects and compiling continuous assessment (CA) scores; moderating practical examination; and approaching agriculture as a business. It could be that, with limited teaching time, the teacher training institutions are constrained in what they can provide. The time factor becomes even more limiting where skills are to be taught, because according to Cryer and Elton (1993, p.17) 'skills cannot be learned without practice …… with feedback on performance'. The institutions also do not offer tailor-made programme(s) to purely meet the requirements of Botswana secondary school

agriculture programme (Botswana College of Agriculture, 2011). As a result, gaps are bound to exist that require in-service training provision for teachers.

Syllabus topics: Table 5.45 further shows that teachers identified several syllabus topics as areas of development need. The list is long and it may have implications for the content and quality of the initial teacher training programmes. It could be that the agriculture teacher training programmes partially address the topics, thus resulting in the teachers feeling that they were lacking the required knowledge.

Personal needs: Teachers further expressed the need to train on some aspects which are not necessarily linked to the teaching of agriculture per se, but which benefited them as individuals. I therefore chose to categorise them as 'Personal Needs'. Table 5.46 (p.301**)** further grouped these needs into:

a. Education related skills;
b. Life skills;
c. Raising awareness on governing regulations; and
d. Other areas of interest (which could not fit in any of the above groups).

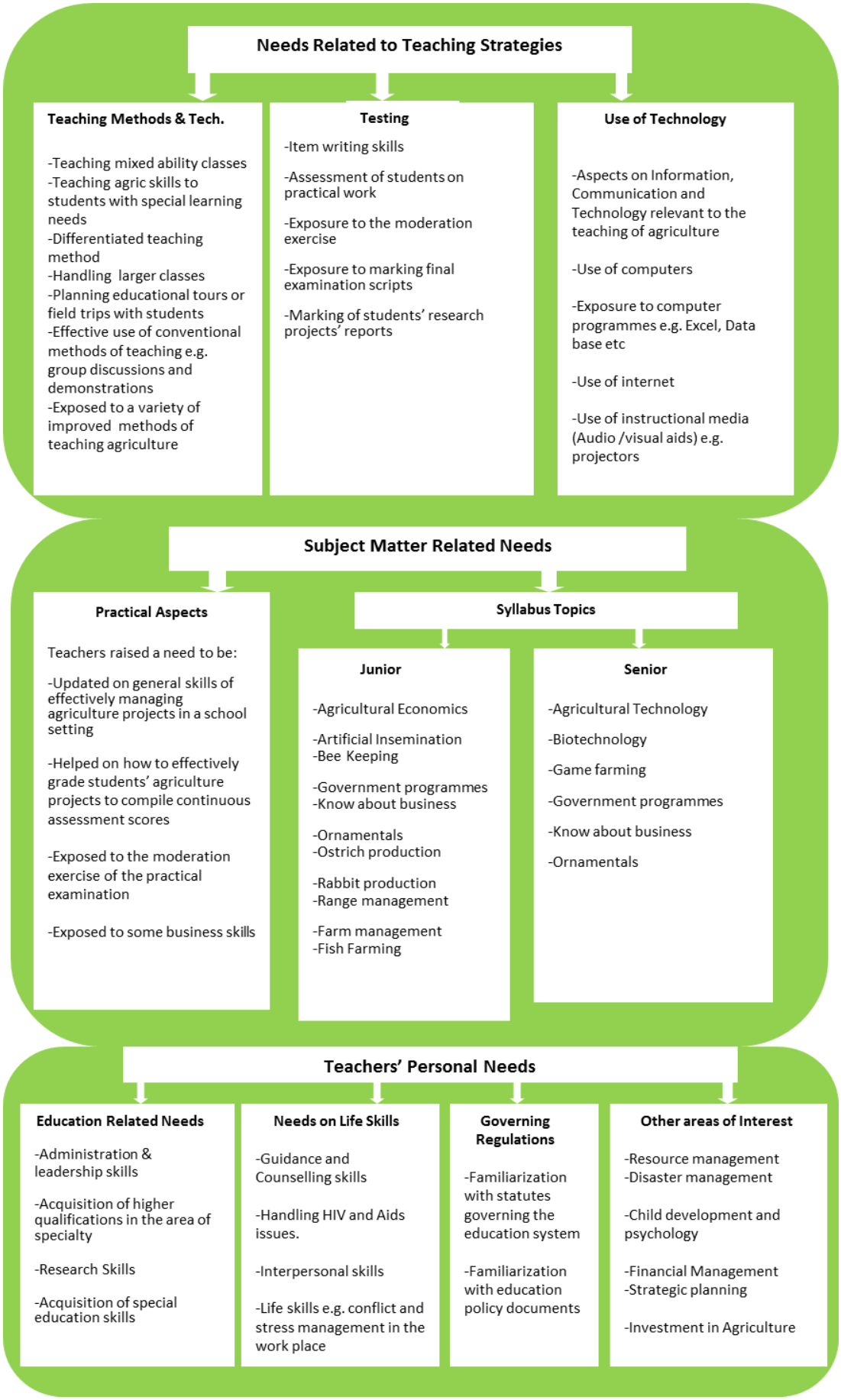
Among other reasons, these needs could be prompted by the fact that agriculture teachers are finding the progression prospects in their field to be getting limited and therefore they are preparing to change to other roles in future. It could also be that they merely want career progression and the financial rewards that often come with extra responsibility. The other reason could be that the teachers see the need to be multi-skilled to be able to cope with varying demands of life.

On the basis of the findings discussed, I conclude that generally, the teachers of agriculture expressed as their IPD needs, areas under Teaching strategies, Subject matter and Personal needs categories. Figure 6.6 below presents an overview of these needs.

The long list of identified IPD needs increases the demand for the future IPD programme and point to implications for various stakeholders. For instance, a long list of identified subject matter needs has implications for content and quality of initial teacher training programmes which, probably due to lack of time, could not adequately address them (Kirk and Glaister, 1988: Guskey and Huberman, 1995). Given that it may not be easily affordable to address a long list of identified IPD needs, it would be helpful for the Ministry of Education through the Regional Education Office to increase the budget for teachers' IPD as well as the capacity of the supervisors. The needs also have implications for In-service providers who ought to strategically plan to ensure that all needs are addressed. It is advisable that school administrators in conjunction with the agriculture departments devise the best way teachers of agriculture could be released to attend the opportunities whenever need arises.

Regarding the syllabus topics, where topics identified as needs are not part of the current agriculture syllabuses, they could be recommended for incorporation into the curriculum to meet their possible demand in the local context.

Figure 6.6: An overview of identified IPD needs



6.8. Implications that conclusions have for improving future IPD provisions

On the basis of the discussions and conclusions reached under each section above, I present the implications that findings have for improving the nature and organisation of agriculture teachers' IPD in the region. The implications here are those found to be pointing at important courses of action to be taken to ensure that the future IPD programme remains effective and meaningful to teachers. This section recognises the fact that there are different players for the IPD process to be accomplished and all need to be effective for it to be successful. For that reason, I present in this section the implications and associated courses of action according to particular stakeholders expected to take charge of the proposed actions.

6.8.1. Implications for IPD providers (EOs in particular)

1. The conclusion that female agriculture teachers are fewer in number compared to their male counterparts point to the implication for In-service providers to offer female teachers positive reinforcement to strengthen their positive self-efficacy beliefs and self-regulatory processes about their continued learning and teaching of agriculture. The support could lead to their success in the field, which will motivate them to maintain their job and avoid further reduction of their numbers.

2. The conclusion that the teachers might have lacked exposure to a variety of IPD opportunities point to the implication for in-service providers to make teachers aware of a variety of IPD opportunities and help them to make good use of them. Where resources are limited to expose many teachers at once, priority ought to be accorded to: female teachers, young teachers, and junior secondary school teachers, for they

appeared to have participated less in relatively many activities (See Table 6.2, p.321). Alternating the IPD strategies or adopting the use of their combination when offering PD to teachers could on its own help teachers become familiar with a variety of activities.

2. Given that the teachers' groups varied in the way they participated in IPD opportunities (See Table 6.2, p.321), I deem it wise for IPD providers to ensure equity and fairness and work towards bringing teachers to the same wavelength of participation across different activities. The fact that participation, with most of the out-of-school activities, is by selection not by teachers' choice, it may not be fair to those who never get invited. So, for the purpose of promoting the participation of groups of teachers in activities in which they appeared to participate less, I generated a selection priority list from the data. Table 7.1 (p.409**)** presents this list which could help identify groups of teachers to be given priority for exposure to a given IPD activity.

3. There is need to encourage teachers to make good use of school based IPD opportunities which are said to be meaningful and relevant to addressing local problems (Leu, 2004). Teachers appear to have made little use of these opportunities.

4. Plans to work towards maintaining and improving features that will render future IPD effective are necessary, given that the effectiveness of IPD is determined by its characteristics as reflected by the frameworks for effective PD espoused by Garet et al. (2001) and Guskey and Sparks (2004*)*. The conclusions on the IPD characteristics

suggested some important considerations, hence courses of action to be taken by the In-service providers. For instance:

i). Data revealed the importance of IPD providers to emphasise features of collective participation, active learning, reflection, proper pacing of instructions, hands-on learning, and evaluation of proceedings, use of handouts for later referral, clearly stated objectives, relevant content and knowledgeable individuals leading the instructions, to render future IPD activities effective.

ii), The fact that teachers called for the use of the interactive approaches during IPD instructions could be a suggestion that teachers want to learn how to employ the learner centred approaches in their own classrooms thereafter. This therefore creates a need for In-service providers to be ready to support the teachers as well as resource persons on the use of learner-centred approaches, the employment of which is said to be challenging (Brophy, 2002).

iii). Measures need to be taken to avoid the reported distortions of information offered through IPD, since they may demotivate teachers to learn and implement new ideas in practice. It is important to improve the authenticity of the information and prevent negative beliefs that may manifest about its quality. I suggest this may be achieved through:

- reducing the number of cascading levels along which information is relayed.

- supporting teacher trainers (resource persons) by offering them the skills to present, given that presentation skills are learnt (Cameron, 2005).
- strategically planning to ensure that the IPD programme fits in the time available without compromising information at any level,

iv). The importance of time for teacher learning makes it necessary for time to be created for IPD. Some of the options that I suggest could be explored to create time for teachers' IPD include the use of [7]Reform-type IPD activities (Flores, 2005), the use of some days during school holidays, and instituting in-service statutory days in the school calendar year as is the case with the systems in the UK (Wellcome Trust, 2006) and Hong Kong (Ho and Yip, 2003). Given that the teaching roles are suspended during INSET days, the idea will be worthwhile for agriculture teachers whose workload seems not to be giving them a chance to learn. Furthermore, scheduling time in the school programme for IPD will ensure that IPD is treated as an integral part of the school programme as called for by Guskey and Huberman (1995) and Day (1999). This arrangement would let IPD be given the attention and support it deserves by all stakeholders.

However, when thinking of creating time for IPD opportunities, caution need to be taken since the practice has been criticized for holding IPD as an event not a process as observed by Guskey (2000). It would be appropriate to ensure coherence in scheduling the opportunities so that they are experienced continuously by teachers.

[7]see definition section for explanation

v). Given the importance of making follow ups and feedback in IPD, there is need for their provision to be planned as part of the design of IPD. Time for follow up and feedback purposes needs to be reserved during planning for any IPD opportunity. Again guidelines need to be developed to make it mandatory for teachers to report back how they progress in applying the new ideas. Both positive and negative experiences, if made known, will form useful information for guiding plans for future provisions.

vi). An identification of an inadequate needs assessment (NA) exercise with the current IPD programme, suggests a development of a well-defined and comprehensive needs assessment programme. For it to be effective, I suggest that the programme has to ensure that all teachers are regularly reached to have their ideals fulfilled (Evans, 2010b), and their needs and interests both in IPD content and process taken into account right from the design stage. Again, approaching NA from the angle of consulting teachers will change the direction of decision power, thus promoting learner-centred IPD as opposed to instructor-centred IPD. Following their contributions, teachers will remain motivated even to implement new ideas (Guskey, 2002).

Teacher involvement in matters that concern their learning has been emphasised, by Knowles (1970) through his theory of Andragogy, to be an important motivating factor for adult learners who are teachers in this case. A wide range of literature provides evidence to this (See under Section 2.4).

5. Given that the teachers perceived little attention to have been given to the majority of the important areas studied, there is need for the In-service providers to plan to address the identified areas in future. The respondents identified very little IPD help offered teachers to involve students with disabilities in learning agriculture skills, and this suggests that this area should be given priority over others in the future.

6. The IPD experienced by teachers might have emphasised institution's needs rather than the teachers'. This conclusion points to the implications for IPD providers who, in their plans for future IPD, ought to ensure optimum balance in addressing the institutions' and teachers' needs, since both are important for success in education.

7. Other considerations needing attention of IPD providers:

- There is a need to address the problems facing cluster meetings in order to render them effective for teacher learning.
- Given that some IPD opportunities have been identified to have been carried out 'some years ago', there is need to look into and revive them to increase the opportunities from which teachers can benefit.
- Guidelines for inviting teachers to attend the out of school IPD opportunities need to be developed to ensure that invitations are consistent and timely.
- There is need to select IPD venues having facilities that could make learning in agriculture authentic.
- A strategy ought to be put in place to help address the long lists of identified IPD needs.
- There is need to shift orientation of regarding IPD for teachers as an event to that viewing it as a life-long process. That way IPD opportunities would no longer be 'one-off' isolated activities provided only when need arises. They would be concerned with teachers' growth overtime and arranged such that IPD strategies are employed to complement each other in working towards achieving a common goal. I proposed, under Section 6.9 below, an Integrated

IPD model that could encourage the existence of sustained IPD opportunities in the Central Region of Botswana.

6.8.2. Implications for policy makers at Ministry and Regional Education Office

In light of the conclusions stated earlier, the following practical recommendations are suggested for policy makers and education authorities for consideration and development:

Given that there are many schools in the rural areas, it could be ideal and appropriate for allocation of resources to schools, across different geographical locations, to be proportionate to the number of schools in such locations. This could avoid imbalances in resource allocation which seem to have been suggested by the findings of this study, especially with the transport issue. I suggest that factors such as distance between schools which form a cluster for in-service purposes, for instance, could be taken into account as they may lead to differences in resource demand between schools. A similar recommendation applies to resourcing junior and senior schools.

Efforts could be made to encourage teachers to enrol in part-time courses as well as utilise the opportunities made available for them by the government to achieve high qualification in agricultural education. Incorporating this message in the campaigns by the Ministry to inform teachers on issues that affect their welfare at the work place could be an added advantage because an assumption that all are aware would be inappropriate. But given that the teachers' access to part time courses might be limited by high training cost as revealed by data (Chapter 4, p.228), government

could devise strategies to reduce training costs. The strategies may include, I suggest, considering reversal of the two policies of introducing payments of training levies as well as that of restricting funding to selected group of courses.

To address the issue of low morale amongst teachers, the government through the Ministry of Education could provide a conducive environment for teacher learning in the form of improving conditions of service. This could involve efforts to let teachers for instance, have increased personal time for learning, earn points for attending IPD activities which contribute to their progression, get study leave of absence without having to worry about losing their jobs, and many more motivating aspects.

The shortfalls associated with the adopted Cascade IPD framework suggest the need to opt for a different framework that may pose fewer challenges. Given that changes come with costs, the Ministry through the Regional Education Office could increase the IPD budget to provide for such a change or come up with any option that could ensure acquisition of undistorted information by all teachers. An increased budget would help ensure that several sessions of the same IPD activities -resourced by experts (in the case of technical topics)- are accessible by different cohorts of teachers, thus increasing the opportunity for many teachers to receive first-hand information.

Given that in the findings teachers seemed dissatisfied with several aspects (e.g. lack of follow up and monitoring of IPD activities and inadequate needs assessment) that had limited supervision as the possible immediate explanation; I

suggest that the number of Education Officers be increased. These could ensure that all teachers receive adequate IPD support to improve teachers' practice. Furthermore, increasing the number of EOs is necessitated by the increased demand for IPD support reflected by a long list of IPD needs (Figure 6.6, p.369) coupled with a long list of IPD areas (Section 6.6, p.357-358) that teachers identified as those for which they did not receive assistance despite their importance to their professional knowledge base.

An increase in the number of In-service Education Officers, who are experts in Agricultural Education, is further necessitated by the need for them to cope with the demand for demonstrating skills in schools. Expression of practical related needs by teachers suggest the need for experts to visit schools and showcase or demonstrate how skills are to be carried out in the contexts that teachers work in. This could be possible if there is an adequate number of EOs.

The conclusion that the teachers' workload has been unfavourable suggests the need for policy makers to revise the teachers' workload policy and ensure that it takes into account the nature of the subjects. This would mean teachers who teach subjects that have heavy work like agriculture, could either have a small number of students per class or fewer classes to teach.

Financing of IPD of teachers is very critical as it influences the nature, amount and type of teacher professional development. The findings in this study revealed that most factors which adversely affected IPD had limitation of funds as the root cause. For instance, respondents raised the issues of shortage of Education Officers, the need to renovate agriculture project structures in schools, shortage of material resources e.g.

internet connectivity, transport problems, adoption of cascade model, all of which had financial implications. It is against this background that I suggest that more funds be allocated for improving the standards of IPD.

Finally, I suggest here that creation of time for IPD is an issue that needs to be addressed by the Ministry at national level and for all subjects to benefit. Earlier on (p. 373) I suggested possible ways that could be adopted to create time for IPD. There is also a need for the Ministry to harmonise the roles of departments or stakeholders having vested interest in teacher IPD to avoid further counterproductive tensions.

6.8.3. Implications for School administrators

There is need for school administrators to be aware of the in- and out- of-school IPD opportunities that are made available to teachers as well as the new ideas gained so that they could offer an appropriate and timely support needed for the application of these ideas or new inovations. Immediate support is necessary since the teaching and learning in agriculture involves plants and animals, the existence of which is highly dependent on the timely husbandry practices (Ngugi et al.,1978: Elliot et al., 1985) expected of teachers and students in this case. But data under Section 4.8.3 (p.246) showed that the inadequate support by school administrators sometimes delay processes, which I consider likely to result in incurring losses. In agriculture, the delays may lead to the collapse of research projects undertaken by teachers and their students for learning purposes.

Some of the aspects that schools need to keep improving include: Provision for transport, meals and accommodation for teachers attending IPD, timely undertaking

IPD needs assessment and addressing them at school level to avoid reacting to crises. There is also a need to ensure that learning materials in the agriculture department support effective learning by both teachers and their students. There is need to renovate structures and replace worn out and out-dated materials like reference books.

Given that teachers' workload in agriculture is high, reduction in assigning them extra tasks of the day to day running of the school could be helpful.

6.8.4. Implications for teachers

If at all the teachers desire to receive effective in-service support, it is advisable that they remain willing to share their experiences of applying the new ideas to practice with the in-service providers. Communicating the successes and failures as a way of providing feedback could benefit the preparations for future IPD provisions and help gauge the impact of IPD in practice.

Learning is an individualised activity (Day, 1999) and for that reason one would expect teachers whose continued learning is to be supported to cooperate with the In-service providers. They ought to remain willing to accordingly respond to requests aimed at helping them. Data revealed incidences of resistance by some teachers when requested to, for instance, list their IPD needs in which they are to be assisted. This development is considered here as counterproductive, since it is through a comprehensive needs assessment (NA) that IPD could be made meaningful to teachers.

Furthermore, given the centralised structure of Botswana education system where teachers may not be granted complete autonomy in IPD, teachers could use the

NA process to adequately present their professional interests and needs. Failure to take heed of this could lead to a situation where IPD provisions would seem to emphasise institutional needs more than the teachers'. Teachers ought to take NA seriously and go beyond just listing subject matter topics. I suggest that they consider IPD needs across the wider spectrum of their professional knowledge base reflected by a wide body of literature (See Section 2.9)

6.8.5. Implications for teacher training institutions

The long list of subject matter needs identified by participants have implications for content and quality of initial teacher training institutions, since most agriculture content is learnt by teachers at that stage (Findlay, 1992). The list suggests that the institutions ought to examine their programmes to identify areas they may need to improve in order to address the possible knowledge gaps in the content they offer. Sometimes it could be lack of emphasis on certain topic areas which leads to gaps in knowledge of student teachers. As I noted earlier, an inadequate address of some aspects could be due to several factors including lack of time and resources.

6.9. Proposed IPD Model for Agriculture teachers in the Central Region of Botswana

In this section I discuss an 'Integrated' IPD Model that could guide the planning, implementation and evaluation of IPD initiatives either arranged for or by teachers of agriculture in the Central Region of Botswana. I propose this model to mainly address the IPD short comings identified by this study.

The model's integratedness takes cognisance of the fact that the current education demands fix teachers firmly in place with guided syllabuses, periods,

schedules, extra-curricular activities, cross-grades exams and a full load of other obligations carried within 'somehow' ridged cultures (Ministry of Education, 1994). For this reason, the model attempts to offer guidance on how the EOs, schools and agriculture teachers themselves could effectively organise sustained IPD provisions despite the many obligations faced by the teachers.

I conceived the model to be in two folds. First it provides a guiding process of how sustained effective IPD provisions, of any magnitude, could be organised to serve the needs of the government through the regional office, the teachers as a group, or teachers as individuals at school and classroom level. This includes guidance of IPD provisions that could be offered in faces. Second, the model depicts an IPD organisational structure that shows how and where stakeholders implicated by the findings of this study (see Section 6.8) fit and relate in the system that aims to improve the agriculture teachers' IPD in the region.

Basis of the model

I coined the name 'Integrated' from the premise that IPD provisions are undertaken by teachers for different reasons thus making it necessary for the model to encompass various features to suit such reasons under varying circumstances. Literature (Section 2.3) and data from this study (Section 6.4.1.) provides evidence of these reasons. This Integrated IPD Model benefits from incorporating the ventures of the different PD models and associated components presented in literature (Section 2.7.1) to achieve sustained teachers' professional growth. Specifically, it draws from the work of Sparks and Loucks-Horseley (1989) to suggest a need for well-planned

peer observations and feedback as crucial components for teachers' professional growth. It draws the idea of encouraging teachers' engagement in some development processes from the Development Improvement model by Sparks and Loucks-Horsley (1989).

It is from the Standardised Model's idea (Gaible and Burns (2005:25) that this Integrated IPD model observes the importance of centralised IPD hence couches the ideals of training and cascading where deemed fit. It is taken here that with the improvements suggested under Section 6.8.1 taken heed of, training through cascading could quickly and effectively roll out formal IPD interventions to all agriculture teachers despite the vastness of the Central Region. Again, the model's focus on situational problems with individual initiativeness and collaborative approaches encouraged, is drawn from the Site-based model (Gaible and Burns, 2005). The models' emphasis on the need for effective clinical supervision, monitoring, coaching for the effectiveness of IPD, is drawn from the work by Joyce and Calhoun's (2010).

Furthermore, from the notion of Cognitive Acceleration by Adey et al. (2004), the model emphasises a two dimensional IPD that could introduce new aspects to teachers as well as 'let the teachers' minds experience cognitive conflict' (p.21). Its argument for IPD that could, among others, disseminate curriculums through workshops and courses, is drawn from the ideas by Joyce and Calhoun (2010). It is from the ideals by the Deficit model of professional development discussed by Guskey and Huberman (1995), that the model considers the necessity to support IPD provisions which intend to render corrective measures to situations. Given that the teaching of agriculture may include working with community at one stage, the model

also encourages teachers' involvement in the local learning community activities by groups of teachers which may foster school-wide development changes.

The model's gesture of supporting self-directed PD activities is not only enriched by the work of Gaible and Burns (2005), but also by the Individually guided model (Sparks and Loucks-Horsley, 1989) as well as the model supporting individuals by Joyce and Calhoun (2010). The model also draws from the PD design framework espoused by Loucks-Horsley et al. (2010) by suggesting 'the employment of unique combination of PD strategies whose choice is influenced by the professional learning goals and the particular context' (p.10) in which agriculture teachers may find themselves.

Over and above, in Chapter 2 (Section 2.13) I proposed characteristics for effective IPD for agriculture teachers in the Central Region of Botswana with ideas from a wider body of literature, old (e.g. Sparks and Loucks-Horsley, 1989: Day, 1999: Joyce and Showers, 2002: Hustler et al., 2003: Adey et al., 2004) and current (Moswela, 2006: Ramatlapana, 2009: Loucks-Horsley, 2010). It is also these characteristics that underpin this Integrated IPD Model I propose in here.

In addition to taking into account the aforementioned characteristics, the design process of this model considered the IPD purpose (Republic of Botswana, 1994b: Ministry of Education,1998), nature of agriculture as a subject (Harper et al., 1990: Ministry of Education, 2000: 2010) as well as the local context (Ministry of Education, 1998: Republic of Botswana, 2006:2010: Maedza, 2010) under which the model will be implemented to render it relevant for agriculture teachers. Other ideas

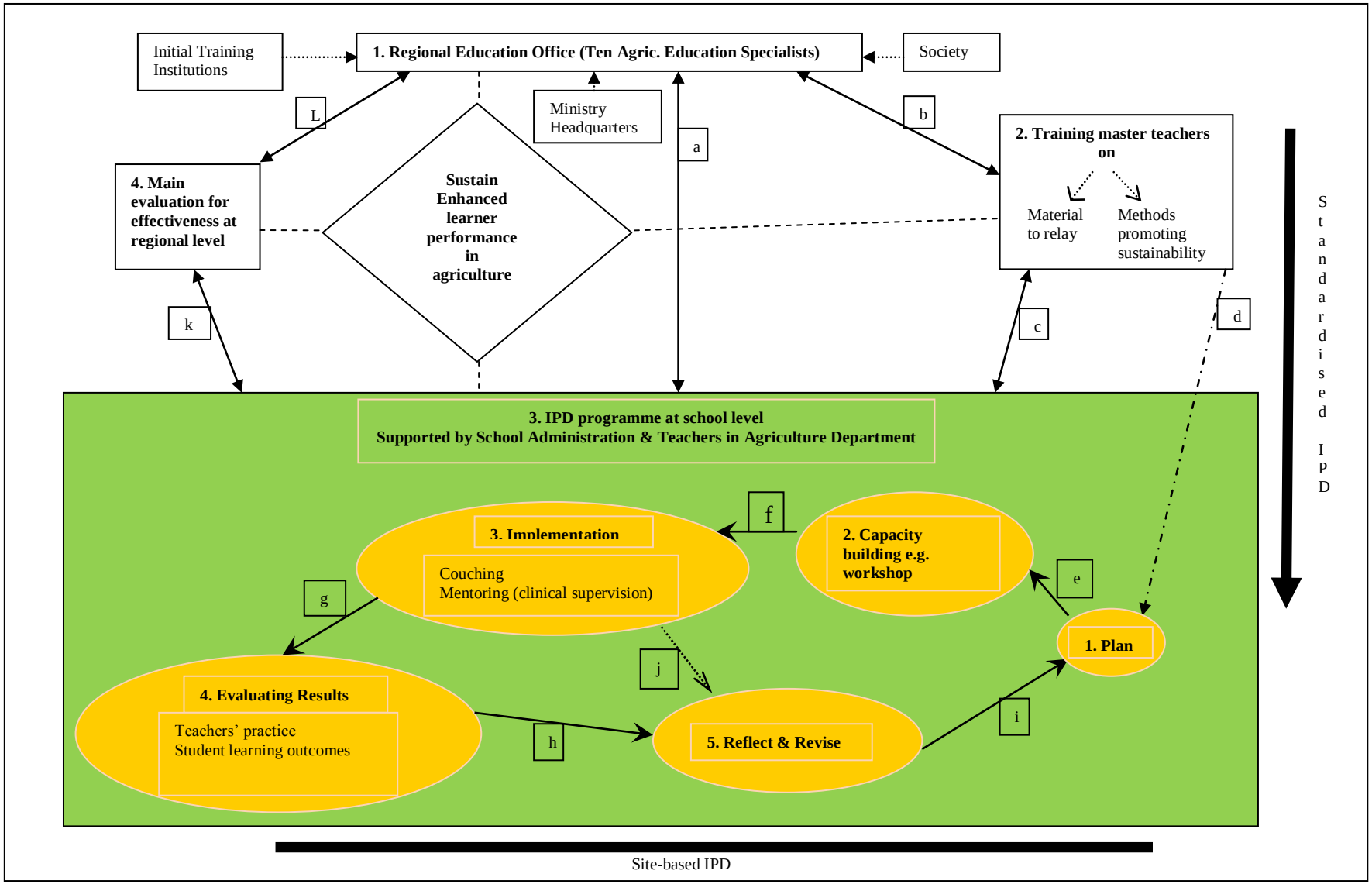
were contributed by the recommendations from some related local studies including those of Mokgatle and Acker (2002) and Hulela and Oladele (2009). So, it is from this background that I have no doubt that if the model could be well received, adequately resourced and adapted accordingly, it could lead to improved and sustained IPD for agriculture teachers in the region.

Figure 6.7 below shows the proposed Integrated IPD model. Accompanying the illustration, I offer some detailed explanations to aid the model's conceptualisation by readers. Apart from just articulating the organisational structure, the explanations carries with them suggestions on what implied stakeholders ought to do (Drawing from Section 6.8 above) for the betterment of the future IPD for agriculture teachers in the region.

Step by step explanation of the model

Diamond: Reflected by the diamond at the heart of the model is the ultimate goal for IPD which is to enhance the academic performance of learners in agriculture and most importantly ensure sustainability of such an enhanced performance. This brings the understanding that teachers' IPD is not offered just for the sake of it: it is purposeful and worth investing on it. The dotted lines from the diamond reflect that all stakeholders at the various phases in the model have this goal serving as the ultimate reason for wanting to employ some improvements in the teaching and learning of

Figure 6.7: An Integrated In-service Professional Development model for agriculture teachers in the Central Region of Botswana



agricultural science in schools. Being the centre of attraction, the student performance (in both theory and practical aspects of the subject) would ultimately become a measure of the effectiveness of any IPD intervention for agriculture teachers in the region.

Rectangle One, in the model positions the Regional Education Office headed by the Regional Education Director to oversee all formal IPD operations for agriculture teachers in the entire region. To reduce shortage of manpower found to be a problem and improve efficiency in monitoring the IPD activities in this large region consisting of 92 secondary schools (Republic of Botswana, 2015a), it is proposed here that, at least, ten Education Officers (EOs)- Agricultural Education specialists be employed to work under the supervision of the director. Under this arrangement each EO will be assigned to oversee IPD provisions in about 9 schools in the region.

The double-pointed arrow '**a**' reflects the expected linkage between the EOs at the regional office and each school in the region. Through the downwards direction of arrow '**a**', it is expected that the EOs in charge of agriculture:

- Familiarise themselves with the uniqueness of the overall context of the entire region and individual schools through school visits. They ought to be familiar with the factors and issues that may influence the success and impact of IPD in each school and the entire region. Such familiarity with the environment would help EOs offer relevant IPD support to schools and teachers as individuals or groups. For instance, the officers' awareness of the varied soil and climatic factors, that influence the quality of crops and animal enterprises in schools,

may influence them to choose IPD venues that would promote learning through seeing and doing (i.e. where IPD is to be provided outside school). The familiarisation with the local context is encouraged by most professional development writers including Leu and Price-Rom (2006) and Loucks-Horsley et al., (2010).

- conduct an encompassing needs assessment from students and teachers to guide the selection of IPD strategies and content, given that effective IPD ought to be content focus (Loucks-Horsley et al., 2010). Needs assessment approach suggested in the backward planning model point to the importance of considering the needs of teachers and students, and the society to guide IPD (Steiner, 2004). Regular school visits and surveys could be of assistance in this exercise. But given that this study has identified a list of areas that teachers felt they have been given little attention (Section 6.6) as well as a long list of IPD needs for agriculture teachers (Section 6.7), it will be worthwhile for the EOs to start arranging IPD opportunities to address them before gathering some more.

On the other hand, the model through the upward direction of arrow '**a**' expects the School Administrators, as immediate supervisors of agriculture teachers, to inform the EOs about the IPD needs of the teachers they might have identified during their supervision exercise. The School Administrators may, in addition, inform EOs of their own administrative needs that may need an in-service support. Arrow '**a**' could point at the possibility that EOs and agriculture teachers in the schools could

liaise and have agriculture teachers receive prompt technical support, without having to go through some bureaucratic delays associated with the current arrangement.

Arrow '**b**' indicates the need for constant communication between the Regional Directors' office and the EOs at the Education Centres. The suggestion takes cognisance of the fact that the Regional Education office and the Education Centres may not be in the same location. The constant communication would ensure that the IPD challenges in the region are attended to in time. Given that this study found the facilities at the Education Centres out-dated, I suggest that facilities in the Education Centres should be replaced to render them conducive for learning. Again, to render the centres offer authentic venues where agricultural skills could be demonstrated to teachers by experts, the structures for housing crops and animals are to be constructed within each Centre's premises.

Rectangle Two, represents the existing Education Centres built to host a group of teachers while on IPD training (Ministry of Education, 1998). The inclusion of this rectangle recognises occasions where the EOs might need to roll out IPD interventions quickly throughout the region through the assistance of teacher trainers. In this case the model suggest that the master teachers (teacher trainers) could be identified by the EOs from each school and are taken to the central point where they would be provided with the required information dictated by the identified needs of the leaners, teachers or even the government. I proposed under Section 6.8.1 how IPD provisions organised by EOs could be improved to render them beneficial for teachers.

The downward direction of arrow **'c'** represents invitation of, at least, two agriculture teacher trainers by EOs from each school to attend an out of school IPD opportunity held at the Education Centre, for instance. Given that this study revealed an outcry of late invitations, I suggest that the invitations should be made in time for the teacher trainers to consult the rest of the teachers and prepare for the IPD activity. The upward direction of arrow '**c**' suggests that teacher trainers may contribute to the IPD content to make it relevant to their context. However, the double arrowed '**c'** may also suggest free usage of the Education Centres' facilities by teachers as and when they feel a professional need to meet.

The exposure to the learning experiences at this stage (Rectangle Two) is intensive and of short term thus couching the qualities of the standardised IPD (Gaible and Burns, 2005) discussed in Chapter Two. As part of the IPD content received from the Centres, teacher trainers ought to acquire both the material to relay to other teachers as well as the dissemination methods to apply. Failure to acquaint teacher trainers with dissemination methods was found by this study to have constrained effective dissemination of material to the rest of the teachers in schools or region at large. Upon the successful completion of capacity building training at the central point, the teacher trainers go back, as shown by dotted-line '**d**', to their respective schools where they would plan and disseminate the information together to reduce the distortion of content commonly associated with cascading. In extension, I proposed under Section 6.8.1 (pgs.372-373) ways that could improve the effectiveness of cascading model.

Rectangle Three, reflects a site-based IPD with the school administration, agriculture department and the individual agriculture teachers playing a crucial role for the success of IPD provisions. I explained in Chapter Two that the phrase 'site-based' suggests IPD that is held within the school: within a real life situation. At school level, the IPD programmes are driven by the school administration with assistance of Staff Development Coordinator through the department of agriculture down to the individual teachers.

However, the IPD activities here could be either generated by the teachers themselves, the school administration after identifying gaps or those suggested by the Regional Office to have some government policies effectively implemented. Under this arrangement, School Administrators may find themselves having to solicit material and funds to support the school-based IPD opportunities or the implementation of the interventions that come along with them. The administrators may get assistance from the regional office to achieve this. Note that the five circles represent the step by step guide on how any IPD ought to be organised. I will explain this process later on, though.

Still at **Rectangle Three**, the School Administrators may also be expected to instil cultures that promote learning by teachers. The encouragement of sharing resources, and promotion of collaboration amongst the teachers (Day, 1999) may be some of the cultures that might be nutured within the school. As the other way of promoting sustained learning by teachers, the School Administration could initiate school IPD policy that may recognise the importance of time in learning by teachers: given that different subjects vary in terms of time they demand from teachers to teach.

This suggests that the heavy teaching load found to be experienced by agriculture teachers would qualify them exemption from being allocated roles to play during extra-curricular activities. This move may augment the little time teachers have for their professional development. In fact promoting the teachers' morale to learn requires joint efforts from both within the school, regional office and by the Ministry as my suggestions reveal under Sections 6.8.1 and 6.8.2 above. But specific suggestions are provided for school administrators to observe under Section 6.8.3.

As indicated earlier, the proposed model couched the qualities of the standardised and the site-based IPD models discussed in Chapter Two. In the model, the bold vertical arrow illustrates the qualities for the standardised IPD and the bold horizontal line represents the site-based IPD at school level. The portion that is said to be standardised in this model represents a centralised approach which cascades information to quickly reach out to many teachers. It advocates a top down approach which is also shared by the training model described by Sparks and Loucks-Horsley (1989) and Joyce and Showers (2002) (See Chapter Two).

In this model, I recognise this central approach to be the first layer of this proposed model. At this phase the model suggests that two teachers (labelled 'master teachers') from each school in the region be invited to a central place (Education Centre for instance) and trained to later jointly disseminate the information they leant to their agriculture colleagues in their respective schools. The site-based IPD represent the intensive learning by group of agriculture teachers at school level (own context) over extended period of time. I regard this intensive learning phase to be the

second layer of this proposed model with the case where the IPD was initiated from outside the school by EOs, for instance.

The intensive phase could also guide IPD initiated by the teachers themselves. The circles connected by arrows within **Rectangle Three** illustrate the organisational process for designing the on-going agriculture teachers' IPD activities at school or departmental level. This process is shown with IPD provisions held within school because that is where teachers could easily undertake IPD over a period as the integral part of their work. These on-going provisions would afford the teachers chance to plan, implement and evaluate the associated interventions in the relevant context. The process could still be adopted at **Rectangle Two** by the designers of IPD programmes for teacher trainers when taken through tasks. However, short time may limit the effective accomplishment of all the proposed stages. Below I continue to explain the IPD organisational process suggested by the circles in model.

Circle 1: At planning stage the model recognises the need for IPD designers to consider a wide range of IPD strategies or their possible combinations and choose the strategy or strategies that could together address teachers' PD need(s) at any given time and situation without clashing. In a way, the model considers the importance of combining the virtues of the PD models discussed in literature including the works of Sparks and Loucks-Horsley, 1989; Kennedy, 2005; and Joyce and Showers, 2002. Furthermore, as Loucks-Horsley et al. (2010) suggest, the chosen IPD content ought to be relevant to the needs of teachers and students. Of-course, the choice of the IPD strategies would rely on the IPD objectives which ought to clearly show attributes that need changing with respect to either the teachers' themselves, their practice, or student

academic achievement. Clearly stated IPD objectives which reflect intended specific outcomes would ease IPD evaluation exercise (Evans, 2010a).

Proper planning would align the intervention with the local context so that the intervention is rendered meaningful to the teachers. Also, planning at school level takes place for the effective execution of the IPD provisions and associated interventions. The planning has to consider the teachers' interests with respect to the choice of IPD methods used and content given that teachers have preferences (Knowles, 1970:1980). Planning ought to consider other contextual factors that may influence IPD provisions and the associated interventions. These may include issues of time, resources, leadership and school culture as suggested in literature (e.g. Loucks-Horsley et al., 2010). One may need to check if there would be requirement for prior learning by teachers to increase capacity before engaging in the proposed IPD undertaking. If so, one has to plan for such prior learning. In short an encompassing needs assessment proposed in the work of Steiner (2004) is as well encouraged at school level.

Circle 2 represents a capacity building stage, at which teachers are subjected to learning experiences or receive information or skills to be applied in practice. Capacity building could still be done at school level and could take any strategy deemed relevant. Many of these IPD strategies such as workshops, video shows etc are suggested in literature (Section 2.5, p.90). Once the capacity has been built amongst teachers, the implementation process within the school continues.

Circle 3: During the implementation stage this model emphasises the need to foster, in the design process, a sequence of learning outcomes that could help effectively change the teachers' believes and behaviours. This is a sequence whereby after experiencing IPD teachers are given chance to try out and put to use what they leant. Thereafter, teachers evaluate the impact of the innovation on students' performance to help decide whether to change the behaviour/attitude or not as the last outcome. As pointed out by Guskey (1986), such a sequence is based on the understanding that teachers' believes and behaviours could not simply be changed by just exposing teachers to IPD experiences. They must first realise a convincing reason for them to change, which is a function of their self-regulatory structures that influence the decisions they make (Bandura, 1986), hence the need for time. This suggest that availing adequate time for agriculture teachers to acquire skills, is of paramount importance because according to Cryer and Elton (1993, p.17) 'skills cannot be learned without practice …[and]… without feedback on performance'. This requirement is represented by arrow 'j' between circle 3 and 5 in the model.

During implementation, teachers are supported through strategies deemed necessary such as coughing, mentoring as well as observations accompanied by prompt feedback. Clinical supervision could also be offered by School Heads or EOs, for instance, to scaffold struggling teachers so that everybody is taken on board to ensure a departmental wide change. At this stage collegiality ought to be inculcated so that agriculture teachers in the department feel free to interact and embrace the spirit of teamwork or collaboration.

It is here when the School Administrators or EOs ought to ascertain whether or not the set operation standards are met by the teachers. Where deficits are identified, the necessary measures ought to be taken. Constant follow- ups become necessary as well to monitor the teachers' progress either in implementing the interventions or in their personal growth. That way the monitoring mechanism would be effective,

As shown by broken arrow **'j'**, running concurrently with the implementation would be the continuous reflection and revision done by the teachers (part of monitoring exercise- formative evaluation). Thereafter , as shown by **Circle 4 Evaluating Results**, summative evaluation of results could be done which may lead to some more reflections and revision **(Circle 5)** as well as more planning, thus starting the circle again as shown by arrows '**h**' and '**i**'.

Circle 5: Reflect and Revise: Here the model considers agriculture teachers to be reflective practitioners (Adey et al., 2004), who ought to be given ample time to reflect on their practice and revise the operations where necessary as part of both formative and summative evaluations. As a result they need not to be rushed to conclusions.

On conclusion, let me state here that at summative evaluation stage (**Circle 4**), the agriculture teachers would reflect on the learning outcomes to see whether they meet the predetermined baseline. The EOs are expected to keep on making regular school visits to monitor progress of the implementation process at each school to ensure that these programmes are rolled out as per initial agreement or revised schedule agreed upon. During the same process, the EOs may gather information to

benefit the overall evaluation later at **Rectangle 4**. This monitoring expectation is extended to the school administrators who also are mandated to offer some clinical supervisory support as instructional leaders (Ministry of Education, 1994). The process may continue over a period of time which may take weeks, months, or years until noticeable change either in the teachers themselves (e.g. attitudes), the teachers' practice or students' academic performance is shown.

Once this on-going IPD process at each school is done, then the EOs-Agriculture could round up all the schools to compile a comprehensive report of the effectiveness of the agriculture teachers' IPD in the region and this feedback ought to be safely kept at the Regional Office for future reference. This move is represented by arrow **'L**' which also suggests that the Regional Director could demand such a report. Among other things to include in the report, is the impact that IPD would have done at school and regional levels. There should be a noticeable change in student performance to attest the effectiveness of the IPD programme. And the region could still continue to further identify more IPD needs and roll out more interventions through the model. It is proposed that the ten EOs devise a team-work mechanism to help them achieve the common goal. For instance, ensuring collaborative planning among themselves could benefit them, for they may share limited resources as they endeavour to reach out to schools.

Reflecting on the implied organisational structure

Just to give an overview of the IPD organisational structure suggested by this model, at the top, the model positions the Regional Education Director who is

expected to supervise 10 In-service Education Officers (Agricultural Education specialists).

Other stakeholders in the structure include the teachers, students and the society for it is their needs, in the final analysis, which ought to be met. Initial teacher training institutions are yet other important stakeholders given that IPD might close the gaps in the teachers left by the teachers training institutions. This link has implications for the content of both Initial Teacher Training and the teachers' IPD. The Education Ministry as the main sponsor of IPD opportunities is yet another stakeholder. Probably, as I stated in Chapter One, the government ought to encourage the private sector to also play a role in sponsoring especially subject specific IPD opportunities, for the government alone may not afford this expensive exercise.

Relevance of the model

I find this Integrated IPD model relevant for addressing the numerous short-comings identified with the current IPD for agriculture teachers which I found to be of structural and operational in nature. For instance, the current provisions are revealed by the findings to be lacking scope for monitoring and feedback. Time availed is inadequate for giving teachers opportunity to think through and put to use the intervention. Various IPD opportunities are offered in isolation hence lack coherence and consistency. They are also sporadic as they aim at solving particular problems as and when they arise. Although this may be also necessary at times, it appears the current IPD do not focus at supporting teachers to grow in their profession by striving to change their practices and behaviours overtime. The cascading approach used in the

region has been found, amongst other shortcomings, to be distorting information relayed. The IPD provided also appeared to have been inadequately supported.

The model may offer opportunity to fit various purposes for which IPD might be provided for agriculture teachers in the Central Region. This model may not be a ridged programme hovering on a 'one fit for all' principle for developing teachers denounced by literature (e.g. Adey et al., 2004: Loucks-Horsley et al., 2010). For instance, the model considers three broad scenarios for formal IPD organisation. First it considers IPD that could be initiated from the regional office by the Education Officers –In-service (EOs) (e.g. region-wide interventions). Second it considers that which could be initiated at school level either by the administration or department head. Third to be considered is that which could be initiated at classroom level by individual agriculture teachers which could follow the same organisational process shown by circles. In fact, for the success of school-wide IPD interventions, teachers as individuals ought to be successful first in managing the interventions as individuals. It is for this reason that the model of active learning espoused by Frost and Youen (2005) (See Chapter Two, Section 2.7.1), could effectively guide individual teachers to manage their own learning with the support they receive from knowledgeable others, of course.

I consider this Integrated IPD model appropriate to support both short-term and long term IPD provisions. By short term provisions I mean those targeting to solve specific problem at a given point in time. Usually these adopt the top-down approach where in most cases they focus on achieving the needs of the system: giving little focus on the teachers' needs: the tendency which is queried in literature (Hustler

et al., 2003: DFES, 2003). The long term IPD provisions are those that are said to be of 'reform-type' (Garet et al. 2001) for they become part of the day to day events of the school and thus sustained overtime. They are unique to particular schools and stand a greater chance of changing the believes, behaviours and cultures of teachers (Day, 1999: Adey et al., 2004)

Possible challenges of the Model

The model may prove expensive for it demands expanded human and material resources to be provided in order to match the current agriculture teachers IPD demand in the region. Of course, quality goes with expense. Again, given that the model drew ideas from various models developed elsewhere, it might be perceived to be not relevant to the local context. However, given that the context issues were considered (see pp.383-385) to underpin the design of the model, I have no reason to doubt the models' relevance for agriculture IPD at the Central Region of Botswana.

6.10. Chapter summary

In the chapter I opted to pull together related issues in order to reach main conclusions of the study. The discussions in this chapter were presented according to the objectives of this study and they were carried out in light of the theoretical framework that underpinned this study. All presented conclusions and implications in this chapter are considered necessary since they represent the voices of agricultural science teachers in the Central Region of Botswana. The suggestions developed in this chapter are ready to guide the on-going IPD reforms in the Central Region.

Furthermore, in an attempt to address the identified IPD shortcomings revealed in the discussed findings, the chapter presented an Integrated IPD model I proposed to guide planning, implementation and evaluation of IPD provisions for agriculture teachers in the Central Region of Botswana.

The data discussion, conclusions, implications and recommendations presented thus far invite me, in the next chapter, to critically evaluate and reflect upon this study's outcomes, and reappraise why I consider the study necessary.

CHAPTER 7: REFLECTIONS, CONCLUDING REMARKS & RECOMMENDATIONS

7.1. Introduction

This chapter draws my thesis to a close by presenting critical reflections and overall concluding statements. Sharing my reflections on this piece of research, I start by reflecting on my roles as a researcher and any other possible influences I might have brought at various stages of the study. Thereafter I reflect on the significance and contribution of the study to knowledge, as well as to IPD policy and practice in the context of agriculture teachers in Botswana. The chapter will then offer a statement on the originality of the study as well as an appraisal of the identified limitations of the study and their implication for future research. Thereafter I report on how I perceive my development as a researcher during my PhD research journey. Finally, I close the report by sharing focused overall conclusions and recommendations for action and further research.

7.2. Reflections

7.2.1. Critical Self-Reflexive account of my methodological decisions and possible influences

Given the background that I am currently a teacher educator, a former teacher of agriculture and EO it is clear that, to some degree, I have inside information about the system of in-service training of agriculture teachers in Botswana.

This inside information proved useful to this study because my established links with some officials in the education system helped me to permeate through

blocks of the bureaucracy and get access to the subjects of this study. However, the insider perspective created an ethical challenge as well. Fortunately, I took heed of the cautious advice by literature on qualitative research (Strauss and Corbin, 1990 and Patton, 2002) that I must be aware that the assumptions that I may bring to this research situation, intentional or unintentional, may bias the findings. Specifically, Patton (2002) cautioned that I must avoid assuming that I 'have all the questions, much less the answers, right' (p.337). It is acknowledged that in qualitative research, the subjectivity of the researcher plays a role in the entire research process (Silverman, 2001). But this should not be misconstrued to mean the researchers' values altogether do not intrude quantitative research, since no social research could be totally free from the intrusion of values of researchers as observed by Lincoln and Guba (1985) and Bryman (2008).

So, in order to address my personal influence, I put measures in place. First, I had to restrain my assumptions from biasing the choices I made by always advancing justification for making them. Second, I had to rely on robust procedures so that bias is kept at minimum. Third, I ensured that claims I made were supported by evidence. Fourth, I kept reflexive account of how I understood myself throughout the stages of the research process (See Chapter 3 sections 3.8.4 p.189; 3.10.1.5 p.205; and 3.10.2.3 p.213). This was particularly necessary during the processes of qualitative data generation where there was a greater chance of personal influence. Fifth, I strived to ensure that my own voice did not become the most authoritative by undertaking constant reflexive examination of my own social, cultural and philosophic location each time I made a contribution. Lastly, I ensured that the study was directed by clear purpose, research questions and rationale.

The whole exercise of constantly monitoring my possible influences became a learning process to me because I ultimately experienced enrichment in research knowledge and skills as section 7.2.5 will further reveal.

7.2.2. Significance and Contribution of the study

Contribution to theory

A large body of literature has been written about the field of teachers' professional development (See Chapter 2). Some of the literature presented findings of a wide range of studies about PD in both developed and developing countries.

Although the area of professional development has been widely explored, I argue that it does not make the concept beyond reproach. The need to close the gaps in the knowledge base of the subject has long been indicated in literature. For instance, Bransford et al. (1999) argue that:

> Research studies are needed to determine the efficacy of various types of professional development activities ... Studies should include professional development activities ... across broad teacher learning communities in order to identify the processes and mechanisms that contribute to the development of teachers' learning communities (p.240).

This brings the understanding that there is need to understand the PD phenomenon from the different specific contexts. Desimone et al. (2002) share the view that generation of information from different contexts is necessary for it expands the knowledge base. Leu and Price-Rom (2006) also pointed out the need to strive to accumulate information about IPD from different contexts to enrich the understanding of the phenomenon. Although some of the issues raised by this study might be generally known in the body of literature, this study strengthens the knowledge base on what works and prevails for the specific context of agricultural science teachers in Botswana.

Currently, no other study has been conducted to address professional development in the context of teachers of agriculture in Botswana. This study therefore adds to the work in the disciplines of both Agricultural Education and Teacher Professional Development, the new knowledge on the views of agricultural science teachers towards their own IPD in Botswana as a setting. As it will be reflected in the next section, this unique combination of information serves as basis for claiming the originality of the findings contributed by this study.

Again, in the absence of research of this nature, this study would contribute by forming a basis for any future studies on IPD either in Botswana or other contexts. The study also contributes by raising questions to be addressed by future studies (See Section 7.4 'Recommendations for future research'). Many questions resulted from the fact that the study has been spread thinly, i.e. addressed many questions which in turn compromised the depth of the inquiry - this calls for follow up studies. The study has been interested in providing understanding of IPD for agriculture teachers in a way that would provoke thoughts of readers who are likely to make several interpretations and open new horizons for discussions and further research.

Furthermore, several examples show that this study contributed by confirming theory from the context of agriculture teachers in Botswana. For instance, the teachers believed that IPD could: update their knowledge and skills, improve their performance, close gaps in knowledge, and help overcome challenges. These findings confirm what is generally accepted as reasons for participating in PD provisions as

reflected by existing theory presented under the section on 'Rationales of teacher PD' (Chapter 2., Section 2.3).

The conclusion that teachers might not have been helped in areas that matter most to their professional roles (see Section 6.6, p.357) suggests that IPD they experienced might have focussed more on institutional needs rather than the teachers' needs as professionals. This confirms the findings of previous research conducted elsewhere (e.g. Garet et al., 2001: Burns, 2005) that the institution needs seem to take preference over teachers' needs.

The factors found by this study to have hindered IPD of agriculture teachers (See Chapter 6, pp. 343-356) seemed to fall within the categories of factors outlined by existing literature to be mediating teacher PD (See Chapter 2, Section 2.10). For instance, Leu and Price-Rom (2006) indicates that IPD is mediated by administrative, organisational, and cultural factors which need monitoring. Furthermore, as with the study by Garet et al (2001) conducted in California, it appeared in this study that the majority of the activities in which teachers participated could be said to be traditional form. The outcome demonstrates how this study contributes to building a traceable trend of the forms of IPD in which teachers participate (i.e either reform or traditional types).

Furthermore, this study confirmed some strengths and challenges of mixed method design reflected in literature (See Chapter 3). For instance, the challenge of interpreting mixed method findings from the mixed paradigm position acknowledged by Greene (2007) was experienced. The discrepancies between the two datasets were

also experienced. I explained in Chapter 6 (Section 6.4.2) how I addressed these challenges. The benefits of the two datasets supplementing each other were also realised. I can therefore confidently attest that these challenges and strengths are real.

The study also contributed by showing some differences in the way agriculture teachers in Botswana see as reasons for participating in IPD as opposed to what theory states as possible outcomes of teacher PD and this remains a record that this study reveals in the field. Unlike theory (Chapter 2, Section 2.3) agriculture teachers in this study did not identify impact on their emotions (i.e. enhancing positive feelings and growth in them as individuals) as one of the reasons (or values) for which they participate in IPD. Secondly, unlike theory the teachers did not identify 'improvement to student performance' as an outcome or reason for which they participate in IPD opportunities. In this thesis I regarded the two differences to be a shortcoming on the part of agriculture teachers studied and I suggested (Section 6.4.1) that they should be supported and made aware of the importance of the mentioned IPD outcomes to them as professionals.

Contribution to practice

Locally, this study provides empirically supported findings that could strengthen the knowledge base of the appropriateness of IPD opportunities for agricultural science teachers in Botswana. The study has been successful in gathering the views of agriculture teachers on the nature and organisation of their own IPD and on how IPD influences their practice. Consequently, the findings and their associated implications pointing at courses of action (See Chapter 6) coupled with literature helped the study to recommend an Integrated IPD model (see Section 6.9) expected to

significantly guide the provision of effective IPD to secondary agriculture teachers in the Central Region of Botswana.

As a result of the local relevance of this study, the ultimate usage of its findings in guiding policy reforms would prevent policy makers in Botswana from falling into a trap of transplanting the in-service professional development practices or models based on theories and concepts derived from research done elsewhere: in different cultures, especially in developed countries. Literature has criticised unguided transplanting of theories. For instance, Nguyen at al. (2009) cautioned that:

> .... [there is a potential] for mismatch when educational approaches are transferred across cultures without sufficient consideration of the norms and values of the host society ....[and].. may result in academic ineffectiveness (p. 124).

Again, given that some teachers' groups appeared to have participated less in some identified IPD activities (See section on "Patterns of teachers' participation", p.317), this study contributed an attendance priority list that could help to bridge the existing attendance gap amongst the teachers' groups and ensure that they are equally exposed to IPD activities. I pointed out earlier (Chapters 6) that proposal of targeted selection is not only a matter of ensuring access to IPD opportunities by all but also of exercising equity and fairness, especially since attendance to official out of school IPD activities in Botswana is not by choice but by selection. It is therefore possible that disparities in participation could be due to biased selection which may disadvantage some teachers.

I proposed in this study that targeted selection of teachers be adopted, where only teachers who either never participated or participated less in certain activities can be given priority to attend and so get exposed to those activities. Therefore to provide

for the targeted selection when need arises, I generated an attendance priority list, basing on the comparative analysis findings discussed in Chapter 6. Table 7.1 below shows the said list.

Table 7.1: The Proposed Attendance Priority List

Activity to attend	**Group to give Priority or Encourage**
School based workshops (general staff)	1. Older teachers (40 an above yrs) 2. Average performing schools
Agriculture-related workshops (Subject specific)	1. Young teachers (20-29yrs) 2. Teachers with degree qualifications
Conferences	1. Young teachers (20-29yrs)
Meetings	1. Older teachers (40 an above yrs)
Networking with farmers	1. Junior secondary school teachers 2. Female teachers
Schools' Agricultural fairs	1. Young teachers (20-29yrs) 2. Teachers with degree qualifications 3. Teachers from urban areas
Agricultural fairs organised by the Minitry of Agriculture	1. Female teachers 2. Junior secondary school teachers
Part time courses	1. Junior secondary school teachers
Acquisition of higher qualification in Agricultural Education	1. Young teachers 2. Teachers with diploma 3. Junior secondary school teachers (NB/ Note here that it also appeared that young teachers and older teachers found higher qualification less relevant to them.)
Self-directed reading	1. Female teachers

The other important contribution to practice emerges from the identified patterns of content needs (see Figure 6.6, p.369). In-service providers can take advantage of the patterns discussed to guide their course of action of identifying the groups of teachers to target at any time on particular topic areas.

7.2.3. Originality of the study

This study claims its originality from the fact that it is the first study that explored agriculture teachers' perceptions towards their in-service professional development in the context of Botswana. This view is supported by the explanation by Phillips and Pugh (2000) that doctoral research originality can be achieved through 'carrying out empirical work that hasn't been done before ... being cross-disciplinary and using different methodologies ...' (p.63). Cryer (1996) also suggests that research can be original in tools used, exploring the unknown, the use of data, outcomes, and by-products. Many studies about teacher PD have been carried out in other parts of the world mostly in mathematics and science (see Chapter 2) but not about IPD of agriculture teachers in Botswana. They do not address the specific IPD issues of teachers of a unique (Harper et al., 1990) out-door practically oriented subject like agriculture. This study therefore added new strands of information to the body of knowledge both on teachers' professional development as well as agricultural education, thus expanding the knowledge base. Locally, this study is also the first subject-targeted study to inform the on-going IPD policy reforms in Botswana with reference to IPD for agricultural science teachers in the Central Region.

Secondly, of the body of research literature that I read on teachers' professional development, none of them adopted the convergence model (See Chapter 3, Section 3.7.2) for mixing qualitative and quantitative datasets as it was transparently done in this study. In this study data from the structured questionnaire and structured face to face interviews, which were administered at the same period, were analysed separately and merged at the interpretation stage to supplement each other. The majority of related studies which adopted mixed method design were either

not transparent with the procedure of mixing datasets, used a different sequence of mixing, or they sourced data through other methods. For instance, the study by Hustlers et al. (2003) used 'CPD pen-portraits' and questionnaires.

Furthermore, the study claims originality from the fact that, unlike the related studies from which it drew, it benefited from the use of NVivo software that made it easy for qualitative data to be analysed. The Nvivo software, through its option of running 'queries' (Bazeley, 2007, p.143) facilitated the exploration of the patterns of teachers' qualitative responses (comparative analysis) that pointed to useful implication for in-service providers. However, since I compared groups with few members I treated the comparative analysis findings from the qualitative phase of the study as suggestive rather than conclusive.

7.2.4. Limitations and their implications for future research

I include this section for the purpose of acknowledging the limitations I encountered in carrying out this study and their associated implications for future research.

This study lacked reference from locally generated research literature because it is the first of its own type to solicit agricultural science teachers' views about their professional development in the context of Botswana. As I stated earlier, it gained insights from related teacher PD research mostly conducted elsewhere on other subjects, especially mathematics and science (e.g. Garet et al., 2001: Desimone et al., 2002). However, although not so adequate, the works of Mokgatle and Acker (2002), Moswela (2006), Ramatlapana (2009), as well as Hulela and Oladele (2009)

contributed some general IPD ideas from the context of Botswana. I therefore took a long time scouting for related literature from elsewhere to gain adequate insights of how best I could approach this study.

Limitations associated with the interviews: Striking a balance between ensuring that the responses were not influenced and that all questions were answered to the fullest could not be equally achieved with all respondents. This was discovered during data analysis that some responses lacked strength to be counted as useful data. This limited the systematic analysis to be carried out with the case of some aspects due to limited responses. This had been evident when attempting to compare teachers' views according to background information reflected in Table 4.1 p.219. This limitation suggests that future researchers on this subject ought to pay particular attention and use probes to ensure that all responses to every question count as useful. This limitation, which is very difficult to deal with, has also been acknowledged by Kvale and Brinkmann (2009).

Whilst I managed to return transcripts and confirm meaning with about 95% of the teachers, I could not reach some teachers because they got transferred to schools where they could not be easily traceable. I blame this on the extended period I took for transcribing due to sickness. This suggests the need for future researchers to shorten the period between data collection and completion of transcribing so that transcripts are returned quickly to the informants when they can still be easily located. However, due to the fact that I had also adopted an "on-the-spot" confirmation or dis-confirmation of my interpretations of meanings from the responses during the

interview (see Chapter 3, section 3.8.2 interviews), I remained convinced that teachers' voices were fairly represented.

Although there were questions prepared to guide the interview process, interviewees were allowed the freedom to answer them not following a specific order. Although the procedure is allowed (See section 3.8.2), it might have posed bias to the way different subjects responded to the items. It could be that certain order helped some subjects to respond to items the way they did as opposed to those that followed a different order. I therefore suggest that future researchers should strive to maintain the order of answering questions amongst all interviewees to reduce possible bias.

'Threat of memory' (Fielding and Gilbert, 2006, p.11) or Imperfect Recalling: The interviewees were subjected to having to recall IPD events that happened in the past, which they could easily remember. It might be possible that the answers depended more on respondents' capacity to remember, thus running a risk of omitting details which could have been useful in informing the on-going IPD reforms. This threat was inevitable with some issues because of the difficulty to get proof. In most cases I relied on making some cross examination between EO's and teachers' responses to establish accuracy. Again with some questions (e.g. RQ 3) the employment of triangulated methods helped to reduce bias.

Practical limitations (time and costs): While it is accepted that large samples give a better estimate of the population from which they are drawn, they are costly (Oppenheim, 2000). In this study, I experienced a dilemma in striking a balance between theoretical sampling requirements (e.g. need for big sample size and random

sampling (Isaac and Michael, 1995) and practical limitations such as time and costs. I also had to choose between increased sample size and sacrificing some details elicited from the interviews (Creswell and Plano-Clark, 2007). However, I consequently found a solution to the dilemma by making use of the extreme case sampling technique (Patton, 1990) to purposively draw a fairly representative sample of thirty six teachers for the interview phase of the study. This sample size fell within the thirty to forty range suggested for the interviews by Oppenheim (2000).

The other limitation is associated with generalisability of findings, especially those of comparative analysis carried out with qualitative data where the compared groups had few members (Chapter 4). In this case I chose to treat the findings and their implications as suggestive rather than conclusive.

Although the adoption of the convergence model of mixing datasets saved time and costs, it posed limitations in this study as well. Due to the fact that the two datasets were collected concurrently I could not have the opportunity to follow up certain issues that arose from either one of the datasets. Even though, I recommended issues raised for future research, I find that the process of knowledge generation was delayed since I could not manage to follow up the concerned issues, during the same study.

Locating the 'neutral or not sure' option in the middle of the Likert-type scale was found to have constrained the interpretations of the generated mean scores. This limitation has been also reflected in literature (e.g. Coolican, 1999). I therefore

suggest that future researchers should consider having the option outside the scale and report its findings accordingly.

7.2.5. PhD research journey

This section gives me an opportunity to discuss what I have learnt during my research journey. The section also enables me to reflect on what I would do if I were to do this study again.

During my research journey I experienced the benefits and challenges associated with conducting a PhD research. I experienced the benefits of doing this research in a number of ways. For instance, I

- accumulated knowledge and technical skills of conducting research which ranges from the stage of conceiving the IPD phenomenon to the stage of disseminating findings.
- learnt how to monitor my possible influences of research findings (see Section 7.2.1).
- improved on time management as well as changed my habit of procrastinating tasks.
- experienced how to work and interact with other researchers. For instance, in addition to interacting with my peer student researchers and supervisors I had the opportunity to present some of my findings at the 2011 international conference of the National Association for Research in Science Teaching (NARST) in Orlando, Florida, USA. This opportunity offered me a chance to present an article before an academic community from different parts of the world.

The key challenges that formed part of my learning experiences during my PhD research journey are those concerning issues of collecting, analysing, and presenting findings in a mixed methods study. I also count the limitations for the study (see Section 7.2.4 above) to have served as my learning experiences as well. Suggestions about how to address the limitations (see Section 7.2.4) actually point to how I would do this study again if given a chance or advise future researchers. I acknowledge that some of the challenges and limitations encountered could have been borne by the decisions I made which I now see could have been made in other ways.

While reflecting on the entire study, I identified other information that would possibly have added value to the study had I sourced it. For instance, the data in this study lacked evidence to show the extent to which teachers made good use of the IPD activities they participated in. The study only asked if teachers were aware of their existence and participated in them. It would be useful if the data could have gone further and addressed how best the teachers had made good use of these activities.

An approach could have been observing the proceedings of IPD sessions and followed the process up to the classroom to see how teachers implement ideas learnt. I probably could have adopted a participant observer approach so that I would collect data while interacting with teachers and the in-service providers. I assume this approach could help to source and raise more issues if tried out in the future.

Incorporating the views of EOs helped to keep the claims of the teachers in check and I find them to have played the role for which they were meant. The fact that each time the views of EOs tended to support that of the teachers in almost all the

issues in which the views of both parties were sought, could be said to have added credibility to what teachers advanced as responses to the questions addressed. Probably, it could have added more weight to the findings had I included school administrators, as well as the Staff Development Coordinators amongst the informants of the study.

It is for the aforementioned learning experiences that I claim my PhD research to have developed me personally and professionally as a researcher.

7.3. Overall Concluding Remarks and Recommendations for Action

Prior this study there has been lack of information about the views of agricultural science teachers in Botswana regarding their own IPD. The findings of this study are expected to close this gap and point to issues, from the perspective of the teachers themselves, that need considering to improve the positive impact of IPD in the teachers' practice.

In this study data were sourced from respondents through questionnaires and interviews as described in Chapter 3. Chapter 6 jointly interpreted and discussed findings and the overall conclusions under every section were drawn to benefit the design of an Integrated IPD model proposed to support professional growth of agriculture teachers in the Central Region of Botswana.

Conclusions at a glance

I summarise in Table 7.2 the conclusions reached by this study. These conclusions also illustrate answers to the research questions set for this study.

Table 7.2: Summarised conclusions in relation to research questions

Teachers and school attributes

- Male teachers dominate their female counterparts.
- Majority of the teachers are relatively inexperienced and fall to the ranks of 'teacher' and 'assist teacher'
- Majority of the teachers hold diploma qualification.
- Junior secondary schools are the majority.
- Many schools are in the rural areas than in the urban centres.

RQ.1: Why participate in IPD?

Teachers gave reasons that IPD:

1. Updates knowledge and skills;
2. Improves their performance in their practice;
3. Closes gaps in knowledge left by teacher training institutions; and
4. Helps overcome challenges.

Reasons are consistent with those advanced by other teachers elsewhere.

RQ.2: IPD forms in which teachers participated

Larger numbers participated in:

1. Workshops (most popular),
2. Meetings (most popular),
3. Self-directed reading of books,
4. Student evaluation of teaching,
5. Induction,
6. Mentorship,
7. Schools agriculture fairs,*
8. Class observations,* and
9. Tours.*

Few teachers participated in:

1. Informal discussions,
2. Learning from interaction with students,
3. Enrolling on part time courses (Least popular.),
4. Further training to attain higher qualification (Least pop.),
5. Seminars,
6. e-learning provisions,
7. Networking, and
8. Conferences.

Other useful findings:

1. Cluster meetings emphasised work-related issues than professional aspects.
2. Less of informal IPD activities
3. **(RQ.8)** Patterns of teachers' participation in IPD activities. Table 6.2 provides summary of teachers' groups which participated significantly less in given IPD activities.
4. Fifty percent of the activities studied have been undertaken by the majority of the teachers some years ago.
5. **(RQ.3)** All the above were considered relevant for IPD of Agriculture teachers. Workshops appeared to be most preferred.

Table 7.2: Continues

RQ.4: Identified Characteristics of IPD Activities

Satisfactory Characteristics

Perceived to have been characterised by:

a. Collective participation, active learning, reflection, proper pacing of instructions, hands-on learning, and evaluation of proceedings, use of handout for later referral, clearly stated objectives, relevant content and knowledgeable individuals leading the instructions. However, the fact that these areas were not highly scored indicates that there are some concerns with them, hence still needing attention in future.

b. Ensuring respect of adult learners and avoiding mental overload.

c. Use of interactive methods of instructions which have cognitive and psychological benefits. More desire for interactive approaches has implications for more IPD support in future.

Unsatisfactory Characteristics

Perceived to have been characterised by:

a. Cascade framework which seemed to deny all teachers to receive first hand undistorted information.

b. Inadequate time for any noticeable change to be realised in the teachers and their practice.

c. Curtailed follow-up, evaluation, and feedback mechanisms. This could be attributed to limited time and supervision as well as absence of guidelines.

d. Inadequate need assessment.

e. Lack of relevant agriculture structures at Education Centres where most IPD activities were held

RQ.6: Amount of attention that IPD gave to aspects contributing to teacher quality?

i. Little to very little attention seem to have been given to the majority(i.e.16/19= 84%) of the content areas which could help teachers develop as individuals, enrich their professional knowledge base, improve their practice which in turn would improve student performance.

ii. 'Very little attention' was given to help teachers involve students with disabilities in learning agriculture skills.

iii. Surprisingly, 'Much Attended' aspects were those that emphasised institutional needs than the teachers'.

Table 7.2: Continues

RQ.5: Factors Adversely Influencing Participation in IPD?

i. Higher training fees for part-time courses and distance from training institutions might have constrained access of IPD by some teachers.

ii. Inconsistency in availing transport for teachers to attend IPD, with teachers in the rural areas disadvantaged more.

iii. Late and inconsistent invitations of teachers to participate in IPD.

iv. Limited supervisors, inadequate material and financial support, low teacher morale, and tensions amongst stakeholders add to a long list of factors perceived to have adversely affected IPD

RQ.7: IPD content needs defined by the teachers themselves

Findings yielded needs under categories of:

i. Teaching Strategies, Subject Matter Aspects, and Personal needs and these have sub-categories. Details of these groups of needs are detailed in Tables 5.44 to 5.46 in Chapter 5.

These conclusions have implications for IPD policy and agriculture teachers' practice in the Central Region of Botswana. However, inferences can still be drawn to

inform situations in other parts of the country or give insights elsewhere. However, the extent of generalisation would be limited by the fact that only teachers from the Central Region of Botswana were studied and also that qualitative findings are involved, which by nature of involving small sample size, may not be generalised to other settings (Thomas, 2009).

In Chapter 6 (Section 6.8) I presented the findings' implications for specific stakeholders which I find to have pointed at courses of actions to be taken for the improvement of agriculture teachers' IPD provisions in the Central Region. The suggested courses actions are therefore considered to have adequately ushered the recommendations for action by this study. The process of designing the proposed Integrated IPD model to guide agriculture teachers' IPD in the region also couched these recommended courses of actions.

7.4. Recommendations for further research

I recommend that research to measure the impact of the overall IPD programme on teaching and student achievement in agriculture be conducted to add to the existing body of knowledge. I concur with other scholars like Garet, et al. (2001) that although there is a large body of literature, describing best practices in professional development, there is still little research conducted on the effects of PD in general. In order to guide this evaluation study, it would be necessary to first establish the measurable properties of change either in practice or in the teachers themselves that are expected to be impacted by the knowledge or skills attained (Evans, 2010a).

There is also a need for a series of further studies to identify the extent to which the teachers apply IPD output (knowledge and skills attained) in their practice. The information gathered would contribute to monitoring the process of change expected from the impact of IPD. The proposed studies are expected to suggest corrective measures to be put in place, in time, by In-service providers to assist teachers who encounter problems of application. In order to generate useful data to guide IPD policy, the proposed studies may even quantitatively reveal the patterns of knowledge and skill application according to the teachers' background information.

Further research is needed to explore the extent to which the design of each IPD opportunity fosters application of the new ideas by teachers as well as the change in practice. The question of interest here would be: does the IPD activity concerned cater for the change process? This becomes important because it is through catering for the change process in the teachers' beliefs that an IPD opportunity can lead to sustained change in practice (Guskey, 1986). The information will help fine tune the designs of IPD opportunities provided.

Research is also needed to further seek explanations as to why some of the IPD activities studied in this research were identified to have been mostly undertaken some years back. The information will enlighten efforts to revive their provision, more so that teachers found them relevant for their context (see Section 6.5).

Follow up research is needed to explore reasons why some groups of teachers appeared to have participated less in some IPD opportunities studied. Table 7.1 (p.409) presents such groups. The generated information will help In-service providers

work towards minimizing the disparities in participation among the teachers in future. This takes into account that in most cases participation is by selection not by teachers' choice, hence the need to exercise fairness.

In recognition of the long list of identified IPD needs, I recommend a study that would involve the same population of teachers in prioritizing the identified IPD needs so that IPD providers can establish priorities for training teachers. The needs assessment model by Borich (1980) can be helpful in this exercise. The model uses the discrepancy scores that ranks identified needs in order of priority.

As this study has implications at regional and national levels in Botswana, I recommend that a national study on this topic be conducted so that the agriculture teachers' perceptions on the nature and organisation of their own IPD are better understood nationwide.

7.5. Chapter Summary

This chapter closed the study report by presenting reflections, concluding remarks, and recommendations of this study in light of the findings discussed in the previous chapter.

7.6 Final Word

I found it fascinating to explore and understand the IPD concept in a contextual sphere. Avoidance of blanket conclusions in policy issues is applauded:

for contextualised conclusions are more meaningful

Amen !!!!

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APPENDICES

Appendix 1a: Research permit allowing conduction of study

TELEPHONE: 3655408
TELEX: 2944 THUTO BD
FAX: 3655408
REFERENCE E 11/ 17 XXXXVI (12)

MINISTRY OF EDUCATION
PRIVATE BAG 005
GABORONE
BOTSWANA

REPUBLIC OF BOTSWANA

13th Jan. 2009

To Mr. Kgomotso Mabusa
Botswana College of Agriculture
Private Bag 0027
Gaborone

RE: REQUEST FOR A PERMIT TO CONDUCT A RESEARCH STUDY ON: AN EXPLORATION OF BOTSWANA AGRICULTURAL SCIENCE TEACHERS DISPOSITIONS TOWARDS IN-SERVICE PROFESSIONAL DEVELOPMENT

We acknowledge receipt of your application to conduct a research on the topic mentioned above.

This serves to grant you permission to conduct your study at Community Junior Secondary Schools and Senior Secondary Schools in the South Central Region and North-Central Region to address the following research objectives/questions:

1. *To what extent do agricultural science teachers see relevance of In-service Professional Development activities to their teaching?*
2. *How is the concept of In-service Professional Development understood?*
3. *What is the level of stakeholders' commitment in engagement with In-service Professional development activities?*
4. *What opportunities are there for In-Service Professional development?*
5. *What would be the relevant In-service Professional Development activity in terms of its focus/ purpose, content and methods?*

It is of paramount importance to seek Consent from the Chief Education Officers, School Heads and Teachers you are going to interview before conducting the study. We hope and trust that you will conduct the study as stated in your Proposal and to strictly adhere to the Research Ethics.

Please note that this permit is valid for a period of one year effective from 13h January 2009 to 13th January 2010.

You are furthermore requested to submit a copy of your final report of the study to the Division of Planning, Statistics and Research, Ministry of Education, Botswana.

Thank you.

Yours faithfully

Fernando T. Siamisang
For / Permanent Secretary

Appendix 1b: Letter informing the South Central Region Schools of the study

SAVINGRAM

I.S. Lubinda

FROM: Chief Education Officer
South Central Region

TEL. NO: 3901263
FAX. NO: 3975899

TO; All School Heads
PEOs II
South Central Region

REF. NO: SCR 1/15 III (17) 23 September 2009

RESEARCH: EXPLORING OF BOTSWANA AGRICULTURAL SCIENCE TEACHERS' DISPOSITION TOWARDS INSERVICE PROFESSIONAL DEVELOPMENT (IPD) MR. KGOMOTSO MABUSA

Mr. Mabusa seeks to carryout research on the topic cited above. This involves interviewing teachers and Education Officers. He has already been granted permission by Ministry of Education – Headquarters to do so.

Please assist him as far as you can in his endeavours.

Thank you.

Appendix 1c: Letter informing the Central Region Schools of the study

SAVINGRAM

FROM: Director, Regional Operations
Central

R M Kedikilwe
For/ Director

TEL: 4631820
FAX: 4632324

TO: All School Heads
PEOs II
Central Region

REF: CREOS 4/3/15 I (18) 27 January 2010

RESEARCH: EXPLORING OF BOTSWANA AGRICULTURAL SCIENCE TEACHERS' DISPOSITION TOWARDS INSERVICE PROFESSIONAL DEVELOPMENT (IPD) MR KGOMOTSO MABUSA

Mr Mabusa seeks to carryout research on the topic cited above. This involves interviewing teachers and Education Officers as well as administering a questionnaire to agriculture teachers. He has already been granted permission by Ministry of Education - Headquarters to do so.

Please assist him as far as you can in his endeavours.

Thank you.

Appendix 2: Letter by supervisor introducing the researcher

0115 951 4480
len.newton@nottingham.ac.uk

The University of Nottingham

School of Education
The Dearing Building
Jubilee Campus
Wollaton Road
Nottingham
NG8 1BB
Tel +44 (0)115 951 4543
Fax +44 (0)115 846 6600
www.nottingham.ac.uk/education
Head of School:
Professor Christine Hall

16 September 2009

TO WHOM IT MAY CONCERN

Dear Sir/ Madam

Re: Letter of Introduction- Kgomotso Mabusa

The above named candidate is a registered third year PhD student at The University of Nottingham, working under my supervision. His research project is entitled: 'Exploration of Botswana Agricultural Science Teachers' Dispositions Towards In-service Professional Development'.

Mr Mabusa has fully discussed the nature of his research with his supervisors, including the potential research instruments, and ethical issues involved in research of this kind. I would like to request your support in facilitating Mr Mabusa's research. Should you require further clarification or information, I can be contacted at the e-mail shown above. Thanking you in advance.

Yours Faithfully

Dr Len Newton
Associate Professor
Director of Postgraduate Taught Courses

Appendix 3.2: Letter inviting teachers for interview

The University of Nottingham
School of Education
Jubilee Campus
Nottingham, UK
NG8 1BB

04/01/2010

_____
_____
_____
_____

Dear Sir / Madam

RE: INVITATION FOR PARTICIPATION IN THE STUDY

This serves to invite you to participate in the study entitled "Exploration of Botswana Agricultural Science Teachers' Dispositions towards In-service Professional Development (IPD)". The research is conducted to fulfil the requirements for a doctoral thesis at The University of Nottingham, UK. It is also intended by the research to make recommendations that would encourage teachers' engagement in IPD activities and improve practice

You were selected to be part of the sample of secondary agricultural science teachers who will serve as the interviewees of the study. All principal education officers (agriculture) were also chosen to be respondents in the study. Your selection was based on your experience as a teacher which puts you in a better place to critically examine and advise on issues relating to agricultural science teachers' learning.

May I therefore, request you to fix a date and time during which you will like to be interviewed. The date should be between 20/02/10 and 10/03/10. Through your permission the interview session will be taped with photos taken where possible. It is estimated that each interview session will last for 45 minutes. I also request you to read the attached participant's information and also give your consent to participation in the study by reading and signing the attached consent form.

Accompanying this letter is a letter from Ministry of Education (Botswana) granting me a permission to conduct this research as well as introductory letter from my supervisor indicating my undertaking of the research.

I conclude by thanking you in advance for your anticipated cooperation in this regard.

Yours Sincerely,

K. Mabusa

Kgomotso Mabusa (Doctoral student)

(Researcher)

Appendix 3.3: Letter Accompanied Questionnaire

The University of Nottingham
School of Education
Jubilee Campus
Nottingham, UK
NG8 1BB

04/01/2010

Dear Sir / Madam

RE: INVITATION FOR PARTICIPATION IN THE STUDY

This letter serves to invite you to take part in the study entitled "Exploration of Botswana Agricultural Science Teachers' Dispositions towards In-service Professional Development". The research is being conducted to fulfil the requirements for a doctoral thesis at The University of Nottingham, UK. It is also intended by the research to make recommendations that would encourage teachers' engagement in IPD activities and improve practice

You were selected on the bases of your experience in teaching agricultural science at secondary school level in Botswana. Your experience puts you in a better place to advise in issues relating to the subject and its teaching. However, prior your involvement in this study, may I request you to read the attached participant's information and also give your consent to participation in the study by reading and signing the attached consent form.

Having given your consent to participate, may I humbly request you to use 30 minutes of your time to complete the attached questionnaire. After completion, handover the completed questionnaire in a sealed envelope to Agriculture Coordinator from whom the questionnaires will be collected.

Accompanying this letter is a letter from Ministry of Education (Botswana) granting me a permission to conduct this research as well as introductory letter from my supervisor indicating my undertaking of the research.

I conclude by thanking you in advance for your anticipated cooperation.

Yours Sincerely,
K Mabusa
Kgomotso Mabusa (Doctoral student)
(Researcher)

Appendix 3.4: Participant Information (Teachers)

Participant Information (Teachers)

Please read the following information prior to your involvement in this study.

The aim of this research is to explore agricultural science teachers' dispositions towards In-service Professional Development (IPD).

Participation in this research is completely voluntary, and you may withdraw at any stage without prejudice or negative consequences. Withdrawal or non-participation will not affect you now or in the future.

Data provided by you, in any form, will be solely used for the purposes of this research and will be treated with complete anonymity. Treating information with strictest confidentiality is not guaranteed for the information will be used in a doctoral thesis, which will ultimately be made available for public consumption.

Where necessary, and with agreement, some of your work or students' work (e.g. output from workshops, scheme of work, students' written work, teachers' written work, and agriculture enterprises) may be looked at and used to support information given.

Data collected for the study will be stored securely in a locked cabinet by the researcher, with only the researcher and his supervisors having access to it for the sole purpose of this study. After successful completion of the thesis, all material containing data will be safely destroyed.

Every effort will be made to prevent the identification of participants and their direct inputs in any published material without their consent.

You may contact the researcher or his supervisors if you require further information about the research, and may also contact any one of the Research Ethics Coordinators of the School of Education, University of Nottingham, if you wish to make a complaint relating to your involvement in the research.

Contact details:

Researcher: Kgomotso Mabusa, ttxkm11@nottingham.ac.uk
Mobiles: 00447853354411 (UK)
0026771676773 or 0026771545945 (BOTS)

Supervisors: Associate Professor L. Newton (len.newton@nottingham.ac.uk); & Associate Professor C. Atkin (chris.atkin@nottingham.ac.uk)

School of Education Research Ethics Coordinators are: Professor John Holford and Dr Alison Kington (educationresearchethics@nottingham.ac.uk)

K. Mabusa

Appendix 3.5: Participant Consent (Teachers)

Participant Consent (Teachers)

Please read the following information carefully prior involvement in the study.

- I have read the Participant Information on the previous page.
- I understand the purpose of the research and my involvement in it.
- I understand that if I decide to participate in this research, that participation will be completely voluntary.
- I understand that I may withdraw from the research at any stage and that this will not affect my status now or in the future.
- I understand that I am not guaranteed strictest confidentiality of the information that I will provide, for it will be used in a doctoral thesis which will ultimately be made available for public consumption.
- I understand that, where necessary and with my consent, some of my work or students' work (e.g. output from workshops, scheme of work, students' written work, and agriculture enterprises) may be looked at and used to provide support for claims made.
- I understand that my data will be stored securely by the researcher, with only the researcher and his supervisors to have access to it for the use of this study.
- I understand that while information gained during the study may be published, I will not be identified. Publication of my identity and direct inputs can only be made through my consent.
- I have been given the opportunity to gather more information and any clarification I may so need about this research by contacting either the researcher or his supervisors. I have been also given opportunity to contact any of the Research Ethics Coordinators to lodge any compliant relating to my involvement in this study.
- By signing this form, I signify that I understand the terms associated with this study and therefore declare that I willingly consent to participate in the study.

Signature of Participant: _____ Date: _____

Signature of Researcher: _____ Date: _____

K. Makoya

Appendix 4: Interview Schedule for Teachers

Interview Schedule for Teachers

Demographic information

School name: _____ Name of the interviewee: _____ Gender: F or M

How long have you been a teacher of Agriculture: _____

Qualification level: _____ Teaching position: _____

1. What does the term In-service Professional Development mean to you? or What do you understand about In-service Professional Development?

2. Why do you participate in IPD Activities?

3. (a). In what IPD activity(s) have you participated in the past as a teacher? (List)
   (b). Tell me more about any in-service professional development activity(s) you have taken part in, since becoming a qualified teacher.

(c). Did you apply any of the concepts or skills you leant in your teaching?

4. Describe the characteristics of the in-service activities you would like to see made available? Why do you think the characteristics you proposed might be important?

5. (a) Team work or networking in the region: In what way do you and other agriculture teachers from other schools in your region work together? (F*orm of network and its mandate /If none, why?)*

(b). Is a local network of teachers contributing to your professional development? In what way(s) does it contribute?

(c). Did you apply ideas gained from networking into your practice of teaching agriculture? If yes, supply evidence/ if no, why?.

6. In your opinion, what are the things that influence your participation in IPD activities? And in what way do they influence your participation in the activities?

7. Is there any other comment you may like to add?

Appendix 5: Interview Schedule for Officers

Interview Schedule for Officers

Demographic information

Name of the interviewee: _____ Gender: M OR F

How long have you been an Officer: _____ Qualification level: _____

Office location: _____

1. What does the term IPD mean to you? (*Led or self driven)*

2. (a) *Why do you think teachers participate in IPD* activities?

3. (a). In what IPD activity(s) have you observed teachers participating in the past whilst you are serving as an officer? (List)
   (b). Tell me a bit more about any professional development activity(s) you have taken part in, as an observer or organiser, for the in-service teachers since becoming an officer.
   (c) Did teachers apply any of the concepts or skills they leant through IPD in their teaching?/ If yes evidence: If no, why?
4. Describe the characteristics of the in-service activities you would like to see made available for teachers? Why do you think the characteristics you proposed might be important?
5. (a) According to your knowledge, are teachers of agriculture involved in working as a team in the region?
   (b). In your opinion, would a local network of teachers contribute to their pd? In what ways would it contribute?
   (c). *Have the teachers used the ideas they gained from the* cited network into their practice of teaching agriculture? Explain and show practical evidence.
   (d). What needs to be put in place for the teachers to benefit more from the network (s)?
6. In your opinion, what are the things that influence participation of teachers in IPD activities? And in what way do they influence in-service professional development of agriculture teachers?
7. Is there any other comment you may like to add?

Appendix 6: Questionnaire

EXPLORATION OF BOTSWANA AGRICULTURAL SCIENCE TEACHERS' DISPOSITION TOWARDS IN-SERVICE PROFESSIONAL DEVELOPMENT (IPD)

SECTION A: DEMOGRAPHIC CHARACTERISTICS

Information from this section will be helpful in the interpretation of the findings of this study. Please respond by ticking (✓) where applicable for the given personal details or by filling in the appropriate information where applicable.

1. Sex — Male [ ] Female [ ]

2. Age _____ (years)

3. Highest Academic Qualification — Diploma [ ] Degree [ ] Masters [ ] Other (Specify) _____ [ ]

4. Experiences in number of years as a teacher _____ years

5. Position of responsibility/ Teaching position — Assistant teacher [ ] Teacher [ ] Senior teacher II [ ] Senior teacher I [ ] Other (Specify) _____ [ ]

6. Phase of Education in which you work — Junior secondary [ ] Senior Secondary [ ]

7. School Location — Rural [ ] Peri-urban [ ] Urban [ ]

8. Are you from a farming family? — Yes [ ] No [ ]

9. Are you doing any part time course for enrichment?
If yes, specify below. — Yes [ ] No [ ]

_____

SECTION B: YOUR EXPERIENCES OF IPD AS A TEACHER

This section would, in general, reveal:

1) your participation in IPD activities and the perceived relevance of the IPD activities.
2) characteristics of the IPD activities you engaged in (i.e. in terms of methods and strategies & logistics involved).
3) extent to which content (knowledge strands) was given attention by IPD.

B.1 YOUR PARTICIPATION IN IPD ACTIVITIES AND THEIR PERCIEVED RELEVANCE

Instructions:
Please draw a circle around one number on the **participation scale** to show whether you have ever participated in the particular PD activity, and one number in the **relevance scale** to show your view on its relevance (i.e. Bearing in mind the nature of your subject).

****

PARTICIPATION SCALE	RELAVANCE SCALE
1 = Never Participated in it	1 = Very Irrelevant
2 = Some Years Ago	2 = Irrelevant
3 = One Year Back	3 = Slightly Irrelevant
4 = Last Six Months	4 = Not Sure
5 = More often	5 = Slightly Relevant
6 = On -Going	6 = Relevant
	7 = Very Relevant

****

EXAMPLES

Activity	**Participation Scale**	**Relevance Scale**
i). Touring.	(1) 2 3 4 5 6	1 2 3 4 5 6 (7)
ii). Attending exhibitions.	1 (2) 3 4 5 6	1 2 3 4 (5) 6 7

Interpretation: With the activity (i) above, the respondent indicated that s/he **never toured**. But s/he perceives touring to be a **very relevant** activity that can enhance his learning as a teacher of agriculture. With the activity (ii), the respondent indicated that s/he participated in exhibitions **some years ago** and perceives attending exhibitions to be **slightly relevant** in helping him/her learn as an agriculture teacher.

Activity/strategy	**Participation Scale**	**Relevance Scale**
10. School based workshop for all teachers in the school.	1 2 3 4 5 6	1 2 3 4 5 6 7
11. Agriculture related workshops.	1 2 3 4 5 6	1 2 3 4 5 6 7
12. Seminars (i.e. where one paper is presented and discussed).	1 2 3 4 5 6	1 2 3 4 5 6 7
13. Conferences (where many papers are presented and discussed).	1 2 3 4 5 6	1 2 3 4 5 6 7

Section B. 1. Continues:

****

PARTICIPATION SCALE	RELAVANCE SCALE
1 = Never Participated in it	1 = Very Irrelevant
2 = Some Years Ago	2 = Irrelevant
3 = One Year Back	3 = Slightly Irrelevant
4 = Last Six Months	4 = Not Sure
5 = More often	5 = Slightly Relevant
6 = On -Going	6 = Relevant
	7 = Very Relevant

****

Activity/strategy	**Participation Scale**	**Relevance Scale**
14. Meetings.	1 2 3 4 5 6	1 2 3 4 5 6 7
15. Farm visit/ tour.	1 2 3 4 5 6	1 2 3 4 5 6 7
16. Networking with farmers (i.e. linking and learning from them).	1 2 3 4 5 6	1 2 3 4 5 6 7
17. Schools Agriculture fairs.	1 2 3 4 5 6	1 2 3 4 5 6 7
18. Agriculture fairs organized by Ministry of Agriculture.	1 2 3 4 5 6	1 2 3 4 5 6 7
19. Guiding or being guided by Somebody (Mentorship).	1 2 3 4 5 6	1 2 3 4 5 6 7
20. Observing lessons of fellow Teachers.	1 2 3 4 5 6	1 2 3 4 5 6 7
21. Having colleagues observing my teaching and giving feedback.	1 2 3 4 5 6	1 2 3 4 5 6 7
22. Getting students evaluating my teaching.	1 2 3 4 5 6	1 2 3 4 5 6 7
23. Induction programme for a new teacher.	1 2 3 4 5 6	1 2 3 4 5 6 7
24. Enrolling on part time course through distance learning programme.	1 2 3 4 5 6	1 2 3 4 5 6 7
25. Further Training to attain higher qualification in agriculture.	1 2 3 4 5 6	1 2 3 4 5 6 7
26. Use of electronic learning facilities (i.e. e-learning).	1 2 3 4 5 6	1 2 3 4 5 6 7
27. Self-directed reading of books.	1 2 3 4 5 6	1 2 3 4 5 6 7
Any other (specify and rate) _____		

B. 2. CHARACTERISTICS OF ACTIVITIES YOU PARTICIPATED IN

Instruction: Please draw a circle around one number on the scale provided to indicate your level of agreement or disagreement with each statement.

****

RATING SCALE

1 = Strongly Disagree
2 = Disagree
3 = Slightly Disagree
4 = Not Sure
5 = Slightly Agree
6 = Agree
7 = Strongly Agree

****

EXAMPLE

Statements	**Rating Scale**
IPD activities I participated in:	
i). were hectic to me.	1 2 3 4 5 6 (7)

Interpretation: With the statement above, the respondent **strongly agrees** that the activities he/she participated in were tiresome.

****

Statements	**Rating Scale**
In general terms, I would say the IPD activities I participated in, so far:	
28. used to have one teacher invited per school to represent others.	1 2 3 4 5 6 7
29. addressed aspects for school-wide professional development (collective participation) rather than subject- specific need.	1 2 3 4 5 6 7
30. were of reform type which were offered over an extended period of time (span of time e.g. whole term etc) to ensure mastery of skills and concepts by participants.	1 2 3 4 5 6 7
31. offered participants a reasonable number of contact hours to spend in the actual activities without straining them. (time per session).	1 2 3 4 5 6 7
32. offered time for participants to reflect upon what was learnt.	1 2 3 4 5 6 7
33. gave plenty of old, irrelevant information.	1 2 3 4 5 6 7
34. used resource persons who were experts in their fields.	1 2 3 4 5 6 7
35. had content delivered at the appropriate pace.	1 2 3 4 5 6 7
36. had clearly stated objectives.	1 2 3 4 5 6 7
37. were actively involving participants (participatory in nature).	1 2 3 4 5 6 7
38. had too much content delivered in a given time.	1 2 3 4 5 6 7
39. were practically oriented (i.e. providing hands-on activities).	1 2 3 4 5 6 7
40. had handouts issued to participants for later referral .	1 2 3 4 5 6 7

Section B. 2. Continues:

****

RATING SCALE

1 = Strongly Disagree
2 = Disagree
3 = Slightly Disagree
4 = Not Sure
5 = Slightly Agree
6 = Agree
7 = Strongly Agree

****

Statements	**Rating Scale**
In general terms, I would say the IPD activities I participated in, so far:	
41. had evaluation done at the end of the activity(ies).	1 2 3 4 5 6 7
42. did not offer scope for later follow up and support by resource persons or authorities.	1 2 3 4 5 6 7
43. offered the opportunity for me to give feedback on how the implementation progressed.	1 2 3 4 5 6 7
44. provided sustainable reforms in my practice (i.e. changes which did not collapse).	1 2 3 4 5 6 7
45. contradicted other school initiatives that were already in place (cohesion issue) thus causing confusion.	1 2 3 4 5 6 7

B. 3. EXTENT TO WHICH CONTENT STRANDS WERE GIVEN ATTENTION BY IPD

The following are some of the things expected of you as a teacher of agriculture. They are therefore expected to have formed the IPD content which you may have encountered as a result of your involvement in IPD activities.

The purpose of this section is to find out the extent to which you think each of these areas have been addressed throughout your experience of professional development. These might not have been the titles of the activities you attended, but you might have been, in one way or the other, exposed to the content.

Instruction: Please draw a circle around one number on the scale provided to indicate the level of attention that was given to the topic area.

****

RATING SCALE

1 = No Attention at all
2 = Very little Attention
3 = Little Attention
4 = Not Sure
5 = Much Attention
6 = Very Much Attention
7 = Exceptional Attention

****

EXAMPLE

Area of focus	**Rating Scale/Was given**
To what extent has the following area been given attention by IPD activities you attended in the past?	
i). Helping agriculture teachers to manage teaching large classes.	1 2 (3) 4 5 6 7

Interpretation: With the example above, the respondent indicated that **little attention** was given to the topic area by IPD activities.

****

Section B. 3. Continues:

****

RATING SCALE

1 = No Attention at all
2 = Very little Attention
3 = Little Attention
4 = Not Sure
5 = Much Attention
6 = Very Much Attention
7 = Exceptional Attention

****

Area of focus	**Rating Scale /Was given:**						
To what extent has each of the following areas been given attention by IPD activities you attended in the past?							
46. Familiarisation of teachers with government initiative of improving performance (e.g. PMS).	1	2	3	4	5	6	7
47. Addressing teachers' personal needs e.g. coping with life stress.	1	2	3	4	5	6	7
48. Teachers' self empowerment so that they are multi-skilled.	1	2	3	4	5	6	7
49. Development of teachers' general professional or teaching skills.	1	2	3	4	5	6	7
50. Helping teachers to involve students with disabilities in learning agriculture skills.	1	2	3	4	5	6	7
51. Helping teachers to teach mixed ability classes.	1	2	3	4	5	6	7
52. Updating teachers' subject matter knowledge.	1	2	3	4	5	6	7
53. Helping teachers implement changes in the curriculum.	1	2	3	4	5	6	7
54. Familiarisation of teachers with policies and orders governing the teaching profession.	1	2	3	4	5	6	7
55. helping teachers understand themselves.	1	2	3	4	5	6	7
56. helping teachers to understand their job requirements.	1	2	3	4	5	6	7
57. Helping teachers to approach agriculture as a business.	1	2	3	4	5	6	7
58. Helping teachers to teach practical agriculture by example (demonstrating).	1	2	3	4	5	6	7
59. Making teachers realise the importance of translating agriculture content to reality.	1	2	3	4	5	6	7
60. Improving teachers ability to manage a group of agriculture enterprises in a school set up.	1	2	3	4	5	6	7
61. Helping teachers allocate marks to students' practical work.	1	2	3	4	5	6	7
62. Helping teachers to keep records.	1	2	3	4	5	6	7
63. Improvement of teachers' research skills.	1	2	3	4	5	6	7
64. Helping teachers incorporate ICT aspects into their teaching.	1	2	3	4	5	6	7

Any other area(s)

Given attention? (Specify)_____

SECTION C: IN-SERVICE PROFESSIONAL DEVELOPMENT NEEDS

Instruction: Please!, outline in the space provided any important area(s) you would like to be developed on in the coming foreseeable future.

_____

_____

Site

Appendix 7: Sites to help trace additional quotes to those presented in Chapter 4

NB/ This appendix is meant to have all qualitative data used accessible to readers. It shows location of quotes in the original transcripts, which share similar sentiments as those presented in Chapter 4 as evidence. SEE THE APPENDEXED TABLE BELOW.

List indicator shown in Chapter 4		Sites for locating quotes in the CD-ROM
List No.	Page	
1		T3(L.16), T14(LL.26-29), T36(LL.93-95) and O3(LL.31-34)
2		T3(LL.21-23), T6(LL.92-99), T21(LL.114-116), T7(LL.18-19), T28(19-23), T32 (LL.60-63), T16 (LL.38-40) and T33(LL.16-18).
3		O3(LL.22-25), T3(LL.17-18), O4(LL.30-34) and T12(LL.24-27).
4		T24(LL.17-20), T25(LL.22-25), T5(LL.19-22), T6(LL.22-23), T4(LL.11-12), T10(LL.24-26), T21(LL.114-116), T35(LL.15-18), T22(LL.230-232), T23(LL.30-33), T28(LL.19-23), T11(LL.22-23), T13(LL.20-23), T19(LL.26-29), T1(LL.10-12), T15(LL.10-12), T27(LL.59-68), T9(LL.26-27), O4(LL.30-34), and O6(L.21)
5		T26 (LL.193-197), T8 (L.193), T36 (LL.177-180), T25 (L.90), T16 (LL.251-259), T31 (LL.129-131), T22 (LL.295-302), T28 (LL.179-180), and T19 (LL.249-250).
6		T27(LL.281-284), T16(LL.251-254), T4(LL.131-134), T7(LL.141-142), T11(LL.197-198), O5(LL.401-402) and T5(LL.250-252)
7		T12(LL.180-183), T28(LL.233-235), T5(LL.318-320), T6(LL.288-291), T36(200-203), T13(LL.258-262) and T30(LL.144-147)
8		T35(110-111), T24(LL.148-152), T33(108-112), T19(111-123), T20(80-82), T4(LL.92-96), T32(LL.127-128), T16(LL.157-167), T30(L.159), T18(LL.206-208), T28(LL.149-153), T3(LL.170-174), T1(LL.178-176), T2(LL.137-138), T8(LL.115-126), T10(LL.273-278), T14(193-199), T15(LL.85-90)
9		T21(LL.417-418), T24(LL.79-81), T5(LL.53-54), T8(LL.150-153), T22(LL.113-118), T28(L.89), T11(LL.58-60), O2(LL.150-153) and O1(LL.150-153).
10		T22 (LL.88-90 &128-135), T35 (LL.141-142), T23 (LL.238-242), T7 (L.56),
11		T21(LL.398-403), T26(LL.66-67), O3(LL.214-216), T17(LL.27-32; LL45-49), T24(LL.142-145), T15(LL.93-95), O4(LL.154-158: LL.207-212), T30(LL.89-90), O6(LL.184-189: LL.192-194), T18(LL.264-267), O7(LL.229-234) and T10(LL.353-357)
12		T34(LL.30-34 & 168-172), T26(LL.225-234), T32(LL.154-155) and T17(LL.130-132)
13		T1(LL.180-186), O1(LL.234-235), T36(LL.131-139), T35(L.102), O4(LL.154-161), T28(LL.331-333), T18(LL.252-253), T34(LL.30-32), T11(LL.139-144).
14		T34(LL.30-32), T32(LL.170-176), T26(LL.225-234), T13(LL.125-126), T19(LL.196-199, T21(LL.310-314)
15		T17(LL.340-346), T31(LL.205-209), T12(LL.180-189), T36(LL.202-203), T24(LL.132-134)
16		T7(LL. 89-92), T10(LL.73-77), T8(LL.213-218), T7(LL.91-92), T15(LL.226-233), T6(LL.106-112).
17		T32(LL.77-79), T23(LL.99-102), T35(L.72), T30(L.59) and T28(L.110)
18		T21(LL.119-120), T34(L.91), T29(L. 210), T4(LL.162-163), T8(L.51), O5(LL.133-137), T30(LL.62-64), O6(LL.78-79), O3(LL.153-154), O8(LL.71-75), T20(L.24) and T13(LL.47-48).
19		T12 (LL.116-121), T36(LL.121-125), T15(LL.101-112) and T1(LL.178-180)
20. A		T28(L.107), O3(L.132), T12(L.66), T3(L.111), T4(L18), T5(LL.45-46), T12(LL.65-66), T17(LL.162-166), T21(108-113), T35(LL55-56), T27(L.84), O6(L.64), T30(L.34), T10(L.91), T18(L.140), O5(LL.95-99), T23(LL.71-72), T14(L.45), T19(LL.92-94), T16(LL.115-117)
20. B		T26(L.42), T1(LL.53-57), T2(L.83), T4(L.23), T36(L.41), O4(LL.163-166), T33(L.64), T18(L.42), O2(L.160), T13(L.47), T20(L19), T24(L.77), T25(LL.40-45), T23(LL.23-27), T34(LL.22-24)
20. C		O7(L.156), T6(L.69), T9(L.46), T36(LL.80-81)
20. D		O8(L.63), T8(L.38), T9(L.46), O1(LL69-73), T31(LL.52-53), T27(L.80), T22(LL.103-104), T18(L.127), T11(L.52), T7(L.42), T15(LL.22-23)
21		T16(LL.157-167), T10(LL.273-275), T4(LL.113-115), T28(LL.152-153, O8(L.218), T8(LL.133-137), T7(LL.84-86), T25(LL.71-74), T36(LL.105-107) and T2(LL.151-153)
24		T35(L.39), T27(LL.115-118), T1(LL.42-44), O8(LL.65-66), T29(LL.89-91), O3(LL.136-141), O7(LL.153-157), O4(LL.139-143), O5(LL.116-123&152-155), T13(LL.59-61), T15(LL.64-73), T18(LL.95-101), T32(LL.23-27), T34(L.140), T16(LL.94-96)
25		T28 (LL.211-212), T30(LL. 70-71), T9(LL.60-61), T5(LL.108-111), T21(LL.131-138), T24(LL.94-98), O6(LL.90-97), T7(LL.47-48), T17(LL.112-117), T22(LL.103-110) and T19(L.68)
26		T21(LL.197-201), O3(LL.214-215), T6(LL.106-116), T16(LL.157-167), T33(LL.126-127), T28(LL.152-153), T7(L.82), T4(LL.92-94) and T20(L.92)
32		T4(LL.80-83), T5(LL.163-168), T12(LL.87-91), T6(LL.142-147), T27(LL.138-143), T22(LL.150-152), T18(LL.121-122), T28(LL.129-133), T26(LL.111-113), T11(L.74), T17(LL.114-147)
39		T17(LL.163-167), T27(LL.291-294), T35(LL.162-165), T1(LL.263-264), T5,(LL.250-252), O3(LL.371-374), O2(LL.56-60), O1(LL.98-99).
40		T8(LL.208-211), T3(LL.172-174), T32(LL.130-132), T26(LL.253-258), T36(LL.131-139), T16(LL.129-131), T31(LL.103-107), T15(LL.112-125), T27(LL.201-209), T22(LL.139-140), T1(180-186), T23(LL.189-191), T28(LL.104-105), T11(116-118), T13(LL.73-74), T19(LL.131-132).

Appendix 10: Set of Comparative analysis tables (SEE CD-ROM for complete tables)

Participation

Reduced Table 5.8: Percentages indicating the participation of teachers in IPD activities compared according **to Sex** (N=228)(Male=149+ Female=79)

IPD Activities	SEX	Never Participated Count (%)	Participated Count (%)	Pearson Chi Square value	df	Pearson p-value	Fisher's p-value
7. Networking with farmers (linking and learning from them).	Male Female	89(59.7) 61(78.2)	60(40.3) 17(21.8)	7.80	1	0.01*	0.01*
9. Agriculture fairs organised by Ministry of Agriculture.	Male Female	59(39.6) 47(59.5)	90(60.4) 32(40.5)	8.23	1	0.00*	0.01*
18. Self directed reading of books.	Male Female	14(9.4) 18(22.8)	135(90.6) 61(77.2)	7.67	1	0.01*	0.01*

$p \leq 0.05$ *- Significant difference

Reduced Table 5.9: Percentages indicating the participation of teachers in IPD activities compared according **to Age** (N=228)(20-29=54+30-39=147+40-49=27)

IPD Activities	AGE Grp (Yrs)	Never Participated Count (%)	Participated Count (%)	Pearson Chi Square value	df	p-value
1. School based workshop for all the teachers in the school.	20-29	9(16.7)	45(83.3)	7.00	2	0.03*
	30-39	19(12.9)	128(87.1)			
	40-49	9(33.3)	18(66.7)			
2. Agriculture Related Workshops.	20-29	26(48.1)	28(51.9)	25.78	2	0.00*
	30-39	21(14.4)	125(85.6)			
	40-49	5(18.5)	22(81.5)			
4. Conferences (where many papers are presented & discussed).	20-29	43(79.6)	11(20.4)	8.39	2	0.02*
	30-39	102(69.4)	45(30.6)			
	40-49	13(48.1)	14(51.9)			
5. Meetings.	20-29	11(20.4)	43(79.6)	5.96	2	0.05*
	30-39	29(19.7)	118(80.3)			
	40-49	11(40.7)	16(59.3)			
8. Schools Agriculture Fairs.	20-29	14(25.9)	40(74.1)	6.00	2	0.05*
	30-39	18(12.2)	129(87.8)			
	40-49	6(22.2)	21(77.8)			
16. Further training to attain higher qualification in Agriculture.	20-29	49(90.7)	5(9.3)	25.61	2	0.00*
	30-39	126(85.7)	21(14.3)			
	40-49	13(48.1)	14(51.9)			

$p \leq 0.05$: *- Significant difference. NB/ CD-ROM for complete table

Reduced Table 5.10: Percentages indicating the participation of teachers in IPD activities compared according **to Academic Qualification** (N=228)(Dip=144+ Deg=84)

IPD Activities	Qualification	Never Participated Count (%)	Participated Count (%)	Pearson Chi Square value	df	Pearson p-value	Fisher's p-value
2. Agriculture Related Workshops.	Diploma Degree	20(14) 32(38.1)	123(86) 52(61.9)	17.42	1	0.00*	0.00*
8. Schools Agriculture Fairs.	Diploma Degree	17(11.8) 21(25)	127(88.2) 63(75)	6.65	1	0.01*	0.02*
16. Further training to attain higher qualification in Agriculture.	Diploma Degree	134(93.1) 53(64.3)	10(6.9) 30(35.7)	30.36	1	0.00*	0.00*

$p \leq 0.05$ *- Significant difference

Reduced Table 5.11: Percentages indicating the participation of teachers in IPD activities compared according **to School Location** (N=228)(R=119+ PU=77+U=32)

IPD Activities	School Location	Never Participated Count (%)	Participated Count (%)	Pearson Chi Square value	df	p-value
8. Schools Agriculture Fairs.	Rural Peri-Urban Urban	18(15.4) 10(12.7) 10(31.3)	99(84.6) 69(87.3) 22(68.8)	5.95	2	0.05*

$p \leq 0.05$ ns – No significant difference & *- Significant difference

Reduced Table 5.12: Percentages indicating the participation of teachers in IPD activities compared according **to Education Phase** (N=228)(Junir=175+ Senir=53)

IPD Activities	Education Phase	Never Participated Count (%)	Participated Count (%)	Pearson Chi Square value	df	Pearson p-value	Fisher's p-value
7. Networking with farmers (linking and learning from them).	Junior Senior	123(70.3) 28(52.8)	52(29.7) 25(47.2)	5.42	1	0.02*	0.03*
9. Agriculture fairs organised by Ministry of Agriculture.	Junior Senior	88(50.3) 18(34)	87(49.7) 35(66)	4.36	1	0.04*	0.04*
15. Enrolling in part time course through distance learning.	Junior Senior	154(88) 39(73.6)	21(12) 14(26.4)	6.51	1	0.01*	0.02*
16. Further training to attain higher qualification in Agriculture.	Junior Senior	157(89.7) 31(58.5)	18(10.3) 22(41.5)	27.42	1	0.00*	0.00*

$p \leq 0.05$: *- Significant difference
NB/ see CD-ROM for complete table

Reduced Table 5.13: Percentages indicating the participation of teachers in IPD activities compared according **to School Performance** (N=228)(Low=88+ Av=64+Hgh=76)

IPD Activities	School Performance	Never Participated Count (%)	Participated Count (%)	Pearson Chi Square value	df	p-value
1. School based workshop for all the teachers in the school.	Low	9(10.2)	79(89.8)	7.53	2	0.02*
	Average	17(26.6)	47(73.4)			
	High	11(14.5)	65(85.5)			

p≤ 0.05 ns – No significant difference & *- Significant difference

Relevance

Reduced Table 5.14: Differences in Perceptions of Teachers on the Relevance of individual IPD activities According **to Sex** (N=228)

IPD Activities	Male			Female				
	N	Mean	SD	N	Mean	SD	Z value	P value
7. Networking with farmers (i.e. linking and learning from them)	136	5.18	1.05	71	5.45	0.92	-2.3	0.02*
10.Guiding and being guided by somebody (Mentorship).	133	4.89	1.09	72	4.97	0.80	-0.12	0.91^{ns}
17.Use of electronic learning facilities (i.e. e-learning)	131	5.50	0.91	73	5.32	0.62	-3.02	0.00*
18								

p≤ 0.05

z- Indicates value from Mann-Witney U test

ns – No significant difference *- Significant difference

Reduced Table 5.15: Differences in Perceptions of Teachers on the Relevance of individual IPD activities According **to Age** (N=228).

IPD Activities: Age	20 - 29 yrs			30 - 39 yrs			40 - 49 yrs				
	N	Mean	SD	N	Mean	SD	N	Mean	SD	Chi-square	P value
1. School based workshop for all teachers in the school	53	5.08	1.15	144	5.22	0.86	27	5.26	0.98	0.43	0.81^{ns}
16. Further training to attain higher qualification in agriculture	51	5.41	1.28	142	5.54	0.94	27	5.00	1.36	8.18	0.02*
18											

$p \leq 0.05$

Chi-square values are from Kruskal-Wallis H test

ns – No significant difference *- Significant difference

Characteristics

Reduced Table 5.20: Differences in ways Teachers perceived the Characteristics of IPD activities According **to Sex** (N=228)

Characteristics SEX	Male			Female				
	N	Mean	SD	N	Mean	SD	Z value	P value
1. Used to have all agriculture teachers in a department attending to get first hand information.	138	2.68	1.75	72	2.82	1.74	-0.61	0.54^{ns}
13. Had handouts issued to participants for later referral	139	4.53	1.32	75	4.15	1.36	-2.19	0.03*
18								

$p \leq 0.05$

z- indicates value from Mann-Witney U test

ns – No significant difference, *- Significant difference

Reduced Table 5.21: Differences in Teachers' Perceptions on Characteristics of IPD activities According **to Age** (N=228).

Characteristics: AGE IPD activities I participated in, so far:	20 - 29 yrs			30 - 39 yrs			40 - 49 yrs				
	N	Mean	SD	N	Mean	SD	N	Mean	SD	Chi-square	P value
1. Used to have all agriculture teachers in a department attending to get first hand information.	46	3.28	1.82	139	2.61	1.71	25	2.36	1.63	7.12	0.28^{ns}
7. Used resource persons who were experts in their fields.	47	3.79	1.46	129	4.38	1.32	26	4.54	0.99	9.31	0.01*
8. Had content delivered at the appropriate pace	49	4.27	1.19	139	4.10	1.18	22	4.77	0.81	6.82	0.03*
18											

$p \leq 0.05$

Chi-square values are from Kruskal-Wallis H test

ns – No significant difference, *- Significant difference

Reduced Table 5.22: Differences in Teachers perceptions regarding the Characteristics of IPD activities According **to Academic Qualification** (N=228)

Characteristics: QUALIFICATION IPD activities I participated in, so far:	Diploma			Degree				
	N	Mean	SD	N	Mean	SD	Z value	P value
1. Used to have all agriculture teachers in a department attending to get first hand information.	135	2.50	1.68	75	3.15	1.78	-2.77	0.11^{ns}
7. Used resource persons who were experts in their fields.	125	4.34	1.44	77	4.13	1.16	-2.08	0.04*
18								

$p \leq 0.05$

z- indicates value from Mann-Witney U test

ns – No significant difference, *- Significant difference

Reduced Table 5.23: Differences in Teachers' Perceptions regarding Characteristics of IPD activities According **to School Location** (N=228).

Characteristics: SCHOOL LOCATION IPD activities I participated in, so far:	Rural			Peri-Urban			Urban				
	N	Mean	SD	N	Mean	SD	N	Mean	SD	Chi-square	P value
1. Used to have all agriculture teachers in a department attending to get first hand information.	107	2.94	1.84	76	2.54	1.61	27	2.41	1.65	3.29	0.19^{ns}
7. Used resource persons who were experts in their fields.	102	4.02	1.44	71	4.41	1.28	29	4.76	0.87	7.21	0.03*
18											

$p \leq 0.05$

Chi-square values are from Kruskal-Wallis H test

ns – No significant difference, *- Significant difference

Reduced Table 5.24: Differences in the Teachers perceptions on the Characteristics of IPD activities According **to Phase of Education** (N=228)

Characteristics: EDUCATION PHASE IPD activities I participated in, so far:	Junior Secondary			Senior Secondary				
	N	Mean	SD	N	Mean	SD	Z value	P value
1. Used to have all agriculture teachers in a department attending to get first hand information.	158	2.63	1.74	52	3.04	1.73	-1.79	0.07^{ns}
13. Had handouts issued to participants for later referral	164	4.29	1.39	50	4.76	1.12	-2.09	0.04*
18								

$p \leq 0.05$

z- indicates value from Mann-Witney U test

ns – No significant difference, *- Significant difference

Content

Reduced Table 5.27: Differences in Teachers' Perceptions on the attention given to the Potential IPD Content According to Age (N=228).

Content / AGE	20 - 29 yrs			30 - 39 yrs			40 - 49 yrs				
	N	Mean	SD	N	Mean	SD	N	Mean	SD	Chi-square	P value
14. Making teachers realise the importance of translating agriculture content to reality.	52	2.90	1.32	128	3.40	1.29	25	3.60	1.35	6.54	0.04*
16. Helping teachers allocate marks to students' practical work.	51	3.22	1.42	139	3.42	1.38	25	4.12	1.45	6.18	0.05*

$p \leq 0.05$

Chi-square values are from Kruskal-Wallis H test

ns – No significant difference

*- Significant difference

Reduced Table 5.30: Differences In Teachers Perceptions Regarding the Attention Given To the Potential IPD Content According **To Education Phase** (N=228)

Content EDUCATION PHASE	Junior Secondary			Senior Secondary				
	N	Mean	SD	N	Mean	SD	Z value	P value
1. Familiarisation of teachers with government initiative of improving performance (e.g. PMS)	167	4.07	1.23	51	3.86	1.1	-1.51	0.13^{ns}
6. Helping teachers to teach mixed ability classes.	163	3.07	1.37	48	2.65	1.23	-1.97	0.05*
8								

$p \leq 0.05$

z- Indicates value from Mann-Witney U test

ns – No significant difference, *- Significant difference

Appendix 11: Main Tables

Table 5.1: Distribution of Secondary Agriculture Teachers by Demographic Characteristics (n=228)

Characteristics		Frequencies	Percentages (%)
1. Sex	Male	149	65.4
	Female	79	34.6
2. Age	20 – 29	54	23.7
	30 – 39	147	64.5
	40 – 49	27	11.8
3. Highest academic qualification	Diploma	144	63.2
	Degree	84	36.8
4. Teaching Experience	4 and below	49	21.5
	5 – 9	89	39.0
	10 – 14	74	32.5
	15 and above	16	7.0
5. Teaching position	Assistant Teacher	55	46.6
	Teacher	23	19.5
	Senior Teacher II	18	15.3
	Senior Teacher I	18	15.3
	Other (Specify)	4	3.5
6. Phase of Education	Junior Secondary	175	76.8
	Senior Secondary	53	23.2
7. School location	Rural	119	52.2
	Peri-urban	77	33.8
	Urban	32	14.0
8. School Performance Level	Low	88	38.6
	Average	64	28.1
	High	76	33.3
9. Are you doing part-time course for enrichment?	Yes	15	6.6
	No	213	93.4

Table 5.3: Perceived Relevance of IPD Activities in Helping Agriculture Teachers Learn (N = 228).

Topics	N	Mean	SD	Percentiles 25th	50th (Median)	75th
1. School based workshop for all teachers in the school.	224	5.19	0.95	5.00	5.00	6.00
2. Agriculture Related Workshops	218	5.48	0.81	5.00	6.00	6.00
3. Seminars (i.e. where one paper is presented and discussed)	189	4.99	1.11	4.00	5.00	6.00
4. Conference (i.e. where many papers are presented and discussed)	180	4.91	1.34	4.00	5.00	6.00
5. Meetings	225	5.30	0.72	5.00	5.00	6.00
6. Farm Visit/Tour	214	5.43	1.00	5.00	6.00	6.00
7. Networking with farmers (i.e. linking and learning from them)	207	5.27	1.01	5.00	6.00	6.00
8. Schools' Agriculture fairs.	221	5.29	0.84	5.00	5.00	6.00
9. Agriculture fairs organised by Ministry of agriculture.	207	5.25	0.91	5.00	5.00	6.00
10. Guiding and being guided by somebody (Mentorship).	205	4.92	0.99	4.00	5.00	6.00
11. Observing lessons of fellow teachers.	224	5.37	0.81	5.00	6.00	6.00
12. Having colleagues observing my teaching and giving feedback.	224	5.35	0.79	5.00	5.00	6.00
13. Getting students evaluating my teaching	221	5.19	0.91	5.00	5.00	6.00
14. Induction programme for a new teacher	220	5.28	0.93	5.00	5.00	6.00
15. Enrolling on part time course through distance learning programme	202	5.14	1.18	5.00	5.00	6.00
16. Further training to attain higher qualification in agriculture	220	5.45	1.09	5.00	6.00	6.00
17. Use of electronic learning facilities (i.e. e-learning)	204	5.43	0.82	5.00	6.00	6.00
18. Self-directed reading of books	222	5.44	0.68	5.00	6.00	6.00
(Alpha = 0.878)						

Rating Scale: 1 = Very irrelevant; 2 = Irrelevant; 3 = Slightly irrelevant; 4 = Slightly relevant; 5 = Relevant; and 6 = Very Relevant

Table 5,4: Characteristics of IPD activities as perceived by Agriculture teachers (n = 228).

Characteristics IPD activities I participated in, so far:	N	Mean	SD	Percentiles 25th	50th (Median)	75th
1. Used to have all agriculture teachers in a department attending to get first-hand information.	210	2.73	1.74	1.00	2.00	4.00
2. Addressed aspects for school-wide professional development (collective participation) rather than subject-specific need	202	4.01	1.53	3.00	4.00	5.00
3. Were of reform type which were offered over an extended period of time (span of time e.g. whole term etc) to ensure mastery of skills and concepts by participants.	183	2.73	1.55	1.00	2.00	4.00
4. Offered participants a reasonable number of contact hours to spend in the actual activities without straining them (time per session).	194	3.26	1.51	2.00	4.00	4.00
5. Offered time for participants to reflect upon what was learnt.	209	3.79	1.40	3.00	4.00	5.00
6. Gave plenty of new, relevant information.	195	4.43	1.45	3.00	5.00	6.00
7. Used resource persons who were experts in their fields.	202	4.26	1.34	4.00	5.00	5.00
8. Had content delivered at the appropriate pace	210	4.21	1.16	4.00	4.00	5.00
9. Had clearly stated objectives.	215	4.77	1.12	4.00	5.00	5.00
10. Were actively involving participants (participatory in nature).	207	4.47	1.28	4.00	5.00	5.00
11. Had appropriate amount of content delivered in a given time.	201	2.78	1.42	2.00	3.00	4.00
12. Were practically oriented (i.e. providing hands-on activities).	206	3.73	1.42	3.00	4.00	5.00
13. Had handouts issued to participants for later referral	214	4.40	1.35	4.00	5.00	5.00
14. Had evaluation done at the end of the activity(ies)	212	4.17	1.48	3.00	5.00	5.00
15. Offered scope for later follow up and support by resource persons or authorities.	195	3.22	1.52	2.00	3.00	5.00
16. Offered the opportunity for me to give feedback on how the implementation progressed.	212	3.24	1.49	2.00	3.00	4.75
17. Provided sustainable reforms in my practice (i.e. changes which did not collapse).	180	3.71	1.39	3.00	4.00	5.00
18. Complemented well with other school initiatives that were already in place (cohesion issue) thus avoiding confusion.	190	3.90	1.55	3.00	4.00	5.00
(Alpha = 0.813)						

Rating Scale: 1 = Strongly disagree; 2 = Disagree; 3 = Slightly disagree; 4 = Slightly agree; 5 = Agree; and 6 = Strongly Agree.

Table 5.5: Perceived Attention given to Potential IPD content for Agriculture Teachers (n = 228).

Topics	N	Mean	SD	Percentiles 25th	50th (Median)	75th
1. Familiarisation of teachers with government initiative of improving performance (e.g. PMS)	218	4.02	1.20	3.00	4.00	5.00
2. Addressing teachers' personal needs e.g. coping with life stress.	207	2.81	1.34	2.00	3.00	4.00
3. Teachers' self-empowerment so that they are multi-skilled.	210	2.93	1.26	2.00	3.00	4.00
4. Development of teachers' general professional or teaching skills.	214	3.48	1.24	3.00	4.00	4.00
5. Helping teachers to involve students with disabilities in learning agriculture skills.	213	2.47	1.46	1.00	2.00	3.00
6. Helping teachers to teach mixed ability classes.	211	2.98	1.35	2.00	3.00	4.00
7. Updating teachers' subject matter knowledge	214	3.10	1.31	2.00	3.00	4.00
8. Helping teachers implement changes in the curriculum.	206	3.26	1.33	2.00	3.00	4.00
9. Familiarisation of teachers with policies and orders governing the teaching profession.	209	3.37	1.22	3.00	3.00	4.00
10. Helping teachers understand themselves.	201	3.21	1.30	2.00	3.00	4.00
11. Helping teachers to understand their job requirements.	210	3.59	1.28	3.00	4.00	4.25
12. Helping teachers to approach agriculture as a business	218	3.00	1.32	2.00	3.00	4.00
13. Helping teachers to teach practical agriculture by example (demonstrating).	218	3.36	1.34	2.00	3.00	4.00
14. Making teachers realise the importance of translating agriculture content to reality.	205	3.30	1.32	3.00	3.00	4.00
15. Improving teachers' ability to manage a group of agriculture enterprises in a school set up.	211	3.07	1.32	2.00	3.00	4.00
16. Helping teachers allocate marks to students' practical work.	215	3.46	1.41	2.00	3.00	5.00
17. Helping teachers to keep records.	212	3.61	1.28	3.00	4.00	5.00
18. Improvement of teachers' research skills.	210	2.79	1.35	2.00	3.00	4.00
19. Helping teachers incorporate ICT aspects into their teaching	214	2.93	1.39	2.00	3.00	4.00
(Alpha = 0.964)						

Rating Scale: 1 = No attention at all; 2 = Very little attention; 3 = Little attention; 4 = Much attention; 5 = Very much attention; and 6 = Exceptional attention