Visible Learning for Librarian Teachers

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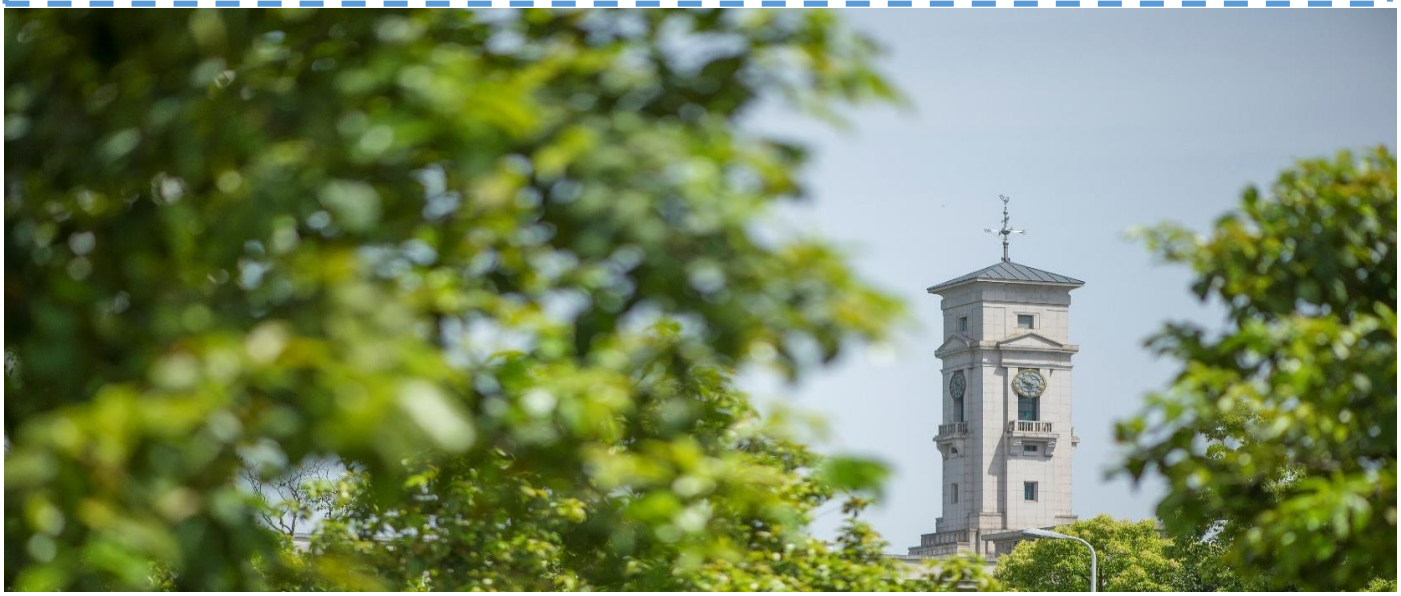

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First published 2020

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Introduction

This chapter reports on an exploratory study which sought to examine the impact of visible learning pedagogies on student learning using a specific learning technology: Echo360. We identify research questions: how effective are activities for teachers and students in enabling the diagnosis of student learning before the classroom teaching? How effective are classroom teaching strategies based on the diagnosis identified? How effective are activities in enabling the assessment of impact on student learning after the classroom teaching? The project brings together three components to deliver a case study: the learning technology, Echo360; the visible learning framework; and the Library Research Skills Teaching. The study examines how librarian teachers used a specific technology to understand and evaluate their impact on student learning. A distinctive feature of this study is the role of students in classroom content creation. Students were employed to create activities before the "one-off" classroom experience.

Visible Learning: theoretical framework

Visible learning, visible teaching is when students see themselves as their own teachers and when teachers see learning through the eyes of the student (Hattie 2009). It was described as teaching's Holy Grail: the best way to achieve higher learning is to improve the level of interaction between students and their teachers, giving both parties the information they need to be successful (Mansell 2008). Hattie expanded the approach to encompass considerations of teacher passion, flow through lessons and mind frames, relating each to quality learning when directed towards positive impact on all students (Hattie 2012).

Visible learning has six key findings about what has most impact on student learning in higher education (Hattie 2015a). It is when teachers:

- believe their major role is to evaluate their impact;
- work together to know and evaluate their impact;
- base their teaching on students' prior learning;
- explicitly inform the students about what success looks like near the start;
- implement programmes with optimal proportions of surface and deep learning;
- when teachers set appropriate levels of challenge and never expect 'do your best'.

Visible learning is also about transformational and collaborative leadership (Hattie 2015b, Peter 2018). Hattie's visible learning theory of teaching and concepts around teacher professionalism have, however, been challenged.

Meta-analyses is the basis of Hattie's results and conclusions and the research method has limitations (Terhart 2011; Orange 2014). Identified problems include combining results from multiple meta - analyses (Shanahan 2017). Beyond the criticism of the meta-analysis and the statistical rigour, visible learning has been criticised for its alignment with political agendas, including neoliberalism, sexism and ableism (McKnight and Whitburn 2018). Others have focused on the educational philosophy and theory, highlighting, for example, concerns about data-driven decisions and actions in teaching (Rømer 2018). Criticism has been addressed (Douglas and Nancy 2018), and the theory has developed for classroom application (Fisher, Frey, and Hattie 2017, Frey 2018) and therefore provided the pedagogical lens to shape our enquiry into learning and teaching.

Library Research Skills Teaching is embedded in the timetabled curriculum through three portfolios:

- Taught;
- Research;
- Data Scholarship.

Our approach in this study uses the DIE Model as illustrated in Figure 1 b, which comprises the following areas of practice: diagnosing student prior learning, interventions to improve student learning and evaluation of the student response (Hattie 2015a).

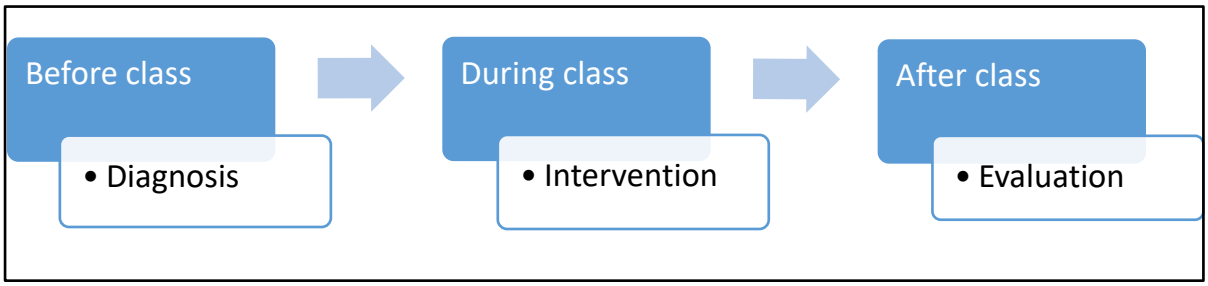

Figure 1: DIE (Diagnosis Intervention Evaluation) Model

Librarian teachers maintained diaries to self-review their experiences and develop new ways of thinking about teaching and learning, including: applying new professional knowledge of visible learning practices as they implement the model in Echo360; reflections on the teaching sessions, including any deliberate teaching interventions informed by the diagnosis of student learning in Echo360; and, the evaluation of teaching impact on learning and the effectiveness of Echo360.

Conceptual Framework Pedagogy

Library Learning Technologies developed the Conceptual Framework for practical application (Figure 2 below). Each phase has a set of key questions, such as:

- why do I want to assess student understanding;
- when do I want to make content available;
- how will I use Echo360 activities?

The answers to these questions shaped the implementation of the conceptual framework.

Visible Learning: Conceptual Framework					
BEFORE	Why?	I want to test student knowledge before the teaching time.			
	When?	I want to modify my teaching plan prior to class time.			
	How?	SQS	TPS	TCS	TQS
DURING	Why?	I want to modify teaching during the time with students.			
	When?	I want to make content available during the teaching time.			
	How?	TPS	TCS	SQT	TQS
AFTER	Why?	I want to know what students learned in teaching time.			
	When?	I want to make content available after the teaching time.			
	How?	SQT	TPS	TCS	TQS

Key:

- SQS – Student **Questions** Student
- TPS – Teacher **Polls** Student
- TQS – Teacher **Questions** Student
- SQT – Student **Questions** Teacher
- TCS – Teacher **Checks** Student

Figure 2: Conceptual Framework

Conceptual Framework Implementation

Librarian teachers chose methods based on the framework (Figure 3). Four methods were identified:

- Teacher Questions Student (Before) and Teacher Checks Student (After);
- Teacher Checks Student (Before) and Teacher Checks Student (After);
- Teacher Polls Student (Before) and Teacher Checks Student (After); and, Teacher Questions Student (Before); Teacher Questions Student (After).

Each method proposed is a combination of Echo360 activities before and after teaching, allowing multiple teacher interventions based on the diagnosis of prior learning. This "question-answer interface" approach builds on previous UNNC funded research (Harrison and University of Nottingham Ningbo China 2018).

Library Research Skills Teaching	Conceptual Framework Implementation		
Method	Before; (Diagnose)	During (Intervention)	After (Evaluate)
Method 1	TQS		TCS
Method 2	TCS		TCS
Method 3	TPS		TPS
Method 4	TQS		TQS

Figure 3: Conceptual Framework Implementation

Librarian teachers implemented the four identified methods. Three teachers used the same method in different teaching sessions, and data was collected for comparison. Echo360 activities are a mechanism for active learning involving higher order thinking. Active learning has been defined by Echo360 as engaging "students in an activity that forces them to reflect upon ideas and, by using those ideas, to attain knowledge through participation and contribution" (Maloney 2018). The classroom is extended through the innovative use of learning technology.

Students were part of the extended classroom, learning how to use Echo360 through email guidance rather than face-to-face instruction and demonstration.

Approach

A mixed-method approach, including: primary data collected through a student survey; student focus group discussion; interviews with teachers; and, the Echo360 learning technology system data about the student and teacher activity was utilised to explore the area of focus. The system data is not presented in this chapter but included: activity participation (number); activity score (%); notes word count; video views; presentation views; attendance; questions; engagement activity participation % (i.e. polls). Teachers were interviewed before and after they implemented the "visible learning" pedagogy in their teaching, and kept learning and teaching journals. Interviews were conducted and transcribed in English, with Chinese being the first language of most participants. Questionnaires were circulated to students in the Library Research Skills Teaching sessions. Students who attend teaching sessions were invited to focus groups.

Statistical Data Analysis

Traditional psychometric approaches were used to evaluate the reliability and validity of multi-item scales (Wagner and Bode, 2006). This included principal component factor analysis using Varimax as the method of rotation, and reliability evaluation with 25 rotations. Factor loading for each component with relevant construct and its Cronbach's alpha coefficients is presented (Table 1). Cronbach's Alpha is a reliability factor, so the number needs to be 0.7 and above to be statistically reliable. Factor loading is a validity Factor, and it needs to be 0.6 and above. We concluded that the data collected was both reliable and valid.

Indicators scope	Indicator label	Cronbach's Alpha	Factor loading	AVE	CR
Before class	b2	0.771	0.691	0.41	0.77
	b3		0.720		
	b5		0.746		
	b6		0.643		
	b7		0.714		
During class	b10	0.600	0.772	0.37	0.63
	b11		0.796		
	b15		0.692		
After class	b17	0.729	0.637	0.51	0.75
	b18		0.855		
	b19		0.848		

Table 1: Reliability and validity indicators of measurement instruments

In this study standardised Factor Loading was calculated through Explanatory Factor Analysis, not standardised regression weights of Confirmatory Factor Analysis. Reliabilities for all dependent variables were evaluated based on Cronbach's alpha coefficient (Revilla and Saenz, 2017). Cronbach's alpha coefficients range from 0.600 to 0.771 (Table 1). Convergent validity exists if all items for a construct are measuring one common factor. Moreover,

Composite Reliability and Convergent Validity was also calculated. The Convergent Validity should be 0.6 or higher.

Items	Standard cut-off value	Model Value
CMIN/DF	Less than 5	2.806
NFI	Higher than 0.90	0.919
TLI		0.927
CFI		0.946
RMSEA	Lower than 0.08	0.058

Table 2: Confirmatory Factor Analysis

Table 2 indicates all the required questions for establishing the model fit for Confirmatory Factor Analysis. Every essential value is in an acceptable range, based on all the values from Confirmatory Factor Analysis and Explanatory Factor Analysis reported in Table 1 and 2. It is clear that the data were reliable and valid for further analysis, even though during class items are under the margin for the Confirmatory Factor Analysis test. There was no regression and causality test. We used the values presented to understand students' perceptions. Factor themes were decided based on the frequency of similar expressions used by the different interviewees.

Two different sets of interviews were conducted and classified: before the conceptual framework implementation; and, after the classroom teaching. All those semi-structured interviews were transcribed and NVivo12 was used to code and develop an analysis of the interview data.

Findings: before Class

In general, before class activities received a positive response from students. 42% of students surveyed completed the before class activity. Figure 4 shows the difference between the students who checked activities before class (i.e. response: Yes) and those who did not (i.e. response: No). The responses for "My learning needs were identified before the classroom teaching" and "The activities before the class improved my learning experience" show significant satisfaction levels of 62% and 71% for agree and strongly agree when the students said they had completed the activities. When students checked before class activities, almost half (49% in Figure 4) felt more confident in class.

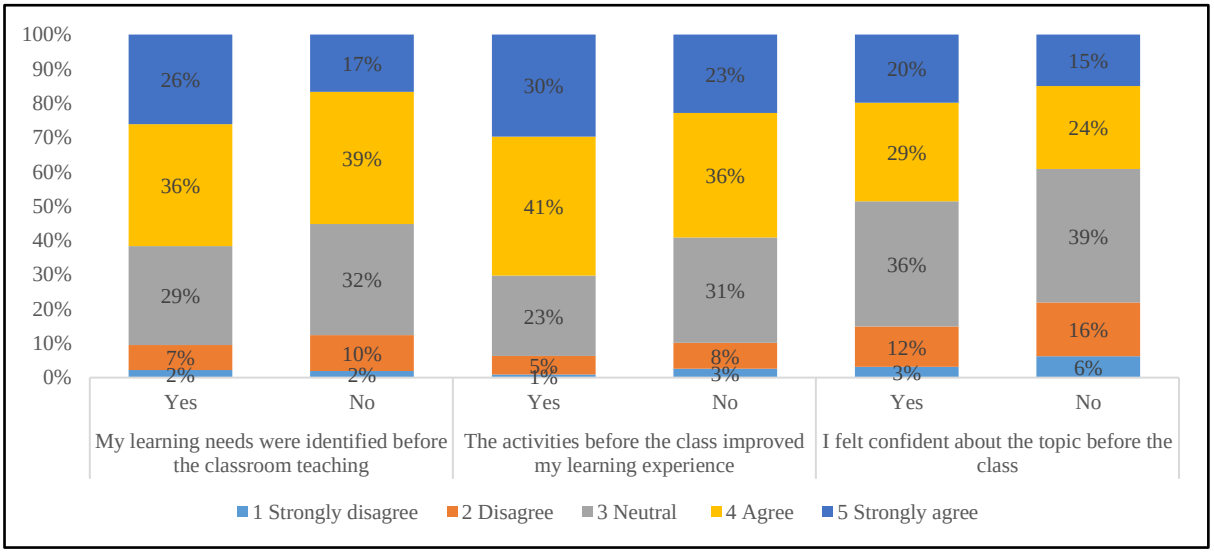

Figure 4: Student response based on before-class activity

In comparison, when students did not complete the activities, more than half (56%) did not think their learning needs were identified before the class; 59% did not feel the activity improved the learning experience; and, only 39% agreed or strongly agreed that they felt confident about the topic during the class. All of the three statements experienced a decline in the positive response compared with the results amongst the students who had done the activities. The results indicate that teachers can develop effective classroom strategies when students complete technology enabled activities to make learning visible.

During Class

Figure 5 presents results based on whether the students surveyed had used the Echo360 learning technology before (i.e. response: Yes) or they had not used it before (i.e. response: No).

In response to negative statements, the majority of students were positive about the teaching content and activities in the classroom. The results in Figure 5 show that 67% of students indicated the class was based on their learning needs.. Interestingly, the figure increased by 6% when the students had no system experience. Similarly, the evidence indicates 64% of students believed the classroom interaction improved their learning experience when they had not used the system before, compared with 52% among students who had system experience. The evidence may indicate students like new technologies in learning.

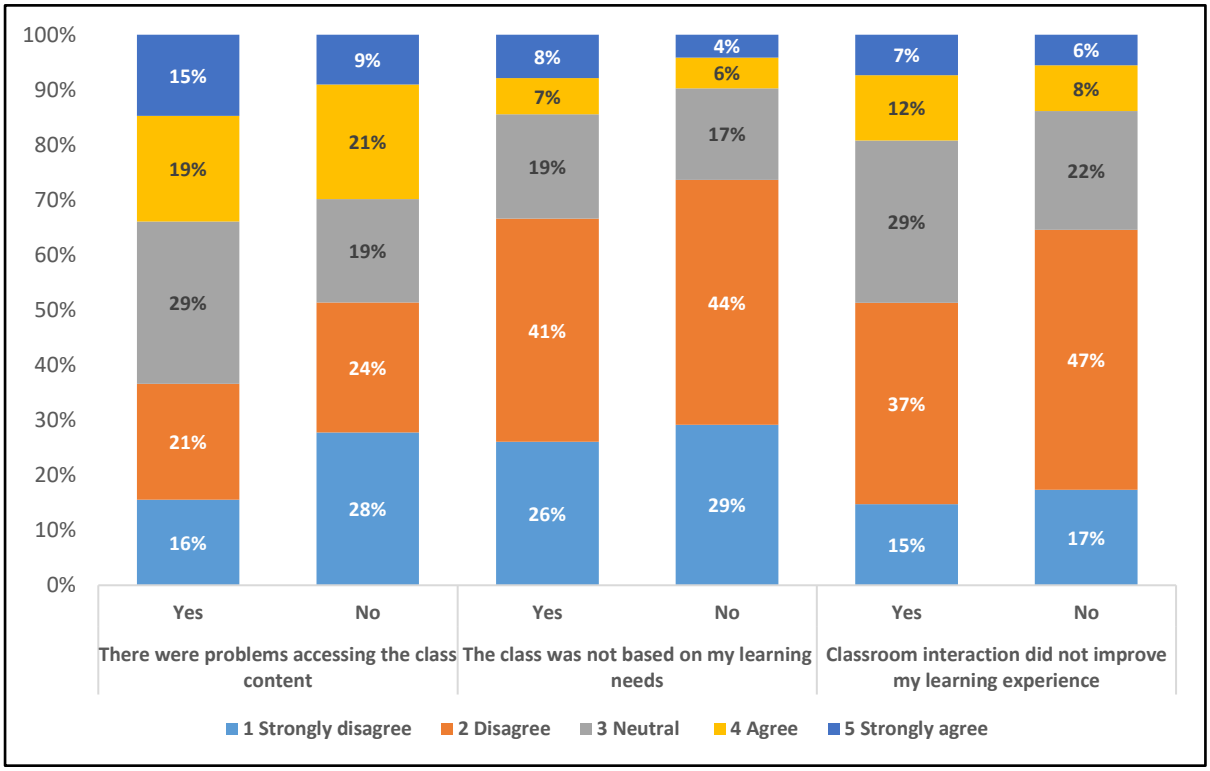

Figure 5: Student response to class activity based on whether they had used Echo 360 before

There were problems accessing the class content. When students had not used the technology before, they were more positive about accessing the content (52%) than students who had used the technology before (37%). The evidence indicates negative experiences of learning technologies impact on later attempts to access the technology. Teachers may respond to negative experiences of technology by improving classroom teaching strategies, such as instructional material and verbal communication for accessing the classroom content. These issues are explored in the discussion below using data from teacher interviews and student focus groups.

After class

The different methods used in the study show conflicting results related to student confidence and learning. The survey results indicate a high level of student confidence (68%) after the class, with 76% of students saying teacher support after the class is important. 74% of students felt the activity after the class helped them to retain knowledge. The focus group data, however, indicated students did not respond to the activities in practice due to factors discussed below.

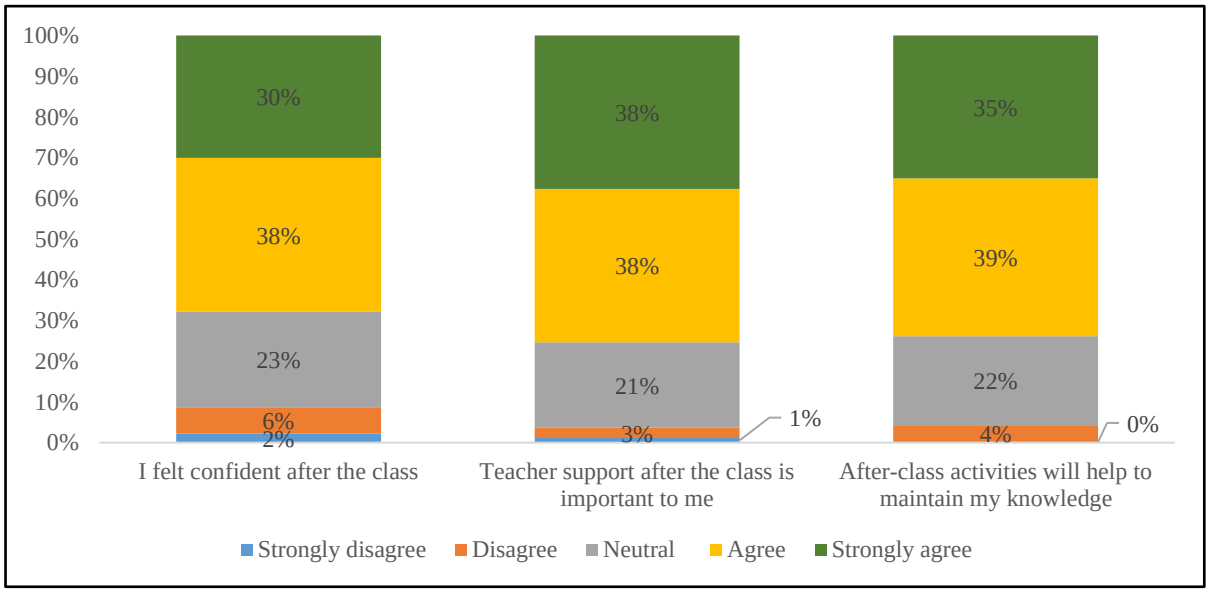

Figure 6: Student responses to after-class teaching activities

Discussion

Interviews revealed librarian teachers had engaged with the theory and were positive. Teacher 1, for example, expressed how the teacher and students "didn't know each other very well, so the learning process may be invisible" and how they could use "a platform like Echo360 to make it more visible." The teacher described how

> "students will have a clear definition about what you're going to learn and what success looks like in the future after these sessions" and that "the students and teachers will have a better communication compare with traditional teaching way." The interviews indicated teachers believed the learning technology could help with classroom challenges. Teacher 2, for instance, talked about the classroom relationship with students: "I cannot easily tell the student whether they cannot follow my session;" "actually I cannot easily tell from their facial expression"; and, "they are very shy and very quiet to answer my question. So I don't know what's going on."

Using Echo360 was a challenge for both teachers and students. One teacher described how "trying a new technology is a very risky step" and "I don't want to go further to try some new technologies." A different teacher said, "I worry about using the echo360 in the teaching," discussing how it was an extra part of learning during classroom teaching. In the focus groups, students commented on difficulties using the learning technology: the "network connection is poor sometimes"; "It is very difficult to access to the content and I cannot use it easily whenever I want"; and, "it was troublesome with so many steps to access the platform." Students also discussed their past experiences with teachers and technology. One student said:

> "to not know how to use various kinds of electronic devices and are even not good at typing. It is possibly easier for engineering faculty to adapt to the system, but it may be very hard for humanities and social science faculty."

Another student said: “some professors do not use [the] computer or do not know how to use it during the class, and they teach in a very traditional way.” This was re-enforced by another students who stated that their lecturer uses approaches in their teaching and the lecturer “required us to use paper materials in class.” The comments indicate that past student experiences of teachers and technology and the specific system used in this study influence student thoughts, feelings and learning.

The student focus groups also showed the potential for the learning technology. One student commented on how some reading materials require “a strong ability of comprehension and a certain understanding of the topic” and how some students “will not do the homework even if it is a compulsory task” if it is a “high threshold” for student learning. One student comment focussed on relevance of teaching material: “sometimes you may find that what you preview before class is not so relevant to what the professors teach on class…because teachers do not arrange the class well or they choose to focus on several parts in depth.” A different student said:

> “I think it is also feasible to set open questions as preview materials. I have an experience before that the open questions for preview are not relevant to the course content taught on classes, therefore, I have no motivation to answer them. However, if the open questions are closely related to what professors teach on classes, it will push me to search further information when meet something unknown in order to have a better comprehension about the course content. Hence, I think although choice questions are easier to answer, it may not as effective as what open questions could do.”

Before class activities need to be at the right level for individual student learning and linked to during class activities.

Students indicated the type of question used in the before class activities was important. One student said: “it would be better if the pre-class test can arise students’ interests on the topic.” A different student liked the test of learning, stating:

> “I think it is more helpful to post this kind of questions with right answer before class because they can test our understanding of some basic concepts. Thus, we can have an initial idea about whether the concepts are right or wrong or something between the two sides before attending the classes. After class, it is suitable to post some open questions.”

Some students disliked open questions. For example, “when I see open questions, I usually have no patience to answer and will directly pass these questions.”

The focus groups with students showed engagement in the classroom was an issue for different individual reasons: “it is possible I will not ask questions in class;” “I am afraid of being laughed at because of asking questions which are easy for others”; and, “it is wasting others’ time if ask easy questions.” The student comments also show that activities before the classroom can be important if the teacher makes a positive link to the classroom experience. One student said: “if I spend a lot of time in reading the materials but teachers do not talk about the topic on class at all. It may make me fell disappointed and frustrated.” A different student described the importance of linking before and during classroom activity:

> “I think learning materials and practice questions provided before class and after class really help me have a good command of the knowledge, but it does not offer more chance to interact with teachers during class and we also cannot raise questions.”

These comments indicate it is important for teachers to use technology through meaningful collaboration with students in addition to students’ preference for dealing directly with their lecturers.

The practical application of the learning technology was a challenge. Teacher 2, for example summarised the experience during the classroom: “it seems like students are quite struggling to open that presentation, they didn’t focus on what the teacher was saying. They just focus on all I need to open this page. The teachers’ page is

on page three, but I can't open." Some students agreed, with one, for example, saying: "compared to traditional class, we need to spend more time to get used to the Echo 360 system. I think maybe lack of time will prohibit students from accomplishing the questions."

The students in focus groups, however, were positive about the technology. One student said:

> "Actually, I think through the questions post on Echo 360, I can see not only the answers of teachers but also the answers of other students. It is a good way to evaluate myself and see the gap with others because many students do not answer questions during lectures. Maybe because we are year one students, we like using Echo 360 to discuss, therefore, we are engaged in classes."

The focus group discussion revealed that learning might not be about the technology or teacher. One student said: "I think whether I am engaged in a class depends on whether the class is in the morning or in the afternoon. If the class is in the afternoon, I cannot concentrate my attention." One student thought all engaged students are the same regardless of whether technology is used: "actually, I think the function of raising questions in real time during class is great, but I am wondering that who are likely to use this function to ask questions are still the students who are active at traditional classes." A different student said:

> "I think it depends on the number of students in a class. If there are around one hundred students in the class, they may not be willing to ask questions as interrupting tutors may influence other classmates. However, if there are only twenty or thirty people a class, it is more convenient to raise questions using Echo 360."

The student comments suggest Echo360 has the potential to aid student engagement and learning, but it may be the students who are active in traditional classrooms who are the ones who also benefit through online engagement.

Conclusion

The study provided and applied a visible learning conceptual framework to guide the design of librarian teaching. It demonstrated the importance of three key areas: pedagogic enquiry in teaching and learning practice; the thoughtful use of learning technology; and, collaboration with students. Librarians are experts with knowledge. Weller (2019) identifies the need to undertake enquiry into learning and teaching and adapt curricula for students using scholarship to examine teaching through the "lens of pedagogic enquiry" (p.288). Learning technologies are important; evidence suggests students have an initial positive frame of thinking for new technologies in learning. Teaching approaches need to build on positive student thinking, making relevant links between technology-based activities and face-to-face teaching. The greatest impact on learning are through collaborations in visibility: students and librarian teachers, working to make learning visible to each other; teachers working together to make impact on student success visible to each other and wider educational communities through scholarship.

Acknowledgements

We are grateful to many colleagues who supported this enquiry into learning and teaching practice: the University of Nottingham Ningbo China, who awarded the Small Teaching and Learning Development Grant; and, the project team, Aaron Kennedy, Cocoa Wu, Daniel Dai, Elsie Zhou, Haoran Ding, Kai Ye, Lulu Qiu, Siyuan Wang, Yuqi Hu and Ziqi Yuan.

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