The Process of Learning Craft Knowledge in the Case of Pottery in the UK

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Abstract

This thesis explores the nature of craft knowledge and how and where this knowledge can be learnt. Intrigued by the tension between the risk of pottery craft knowledge being lost and yet the persistence of pottery in the UK, I started to explore why and how this craft resilience happened and is still happening today. There are two aspects which affect the teaching and learning of craft knowledge: the contextual conditions, and the nature of craft knowledge. The contextual political, social, cultural, organisational, economic, and spatial factors have affected the teaching and learning of craft knowledge differently throughout history. These systems have both supported and disrupted the sharing and development of craft knowledge across time and space. Besides these contextual conditions, the nature of craft knowledge has also affected this process.

The tacit nature of craft knowledge makes it difficult to teach through formalised language, and, therefore, hard to learn independently from the knowledgeable or share separately from particular communities. There is various literature discussing the teaching and learning of craft through the perspectives of embodiment, master-apprentice relationships, and social communities. However, less attention has been paid to the material perspective when considering craft teaching and learning. Therefore, this thesis explores the materiality involved in embodiment, master-apprentice relationships, and the physical space of a pottery studio. Responding to the resurgence in craft practice in potters' studios and the theoretical approach to craft learning, this research constructs a theoretical framework of craft learning. Additionally, it explores the micro mechanisms of developing craft knowledge in the studio space in order to

support the effective teaching of craft knowledge. Within these contexts, I ask the question: how is craft knowledge learnt in the perspective of relationships between potters and matter, less and more experienced potters, and the learning in studio space?

Within this research, I conducted interviews with 20 studio potters in the UK and observed my own pottery learning experience to explore the various relationships between teacher, learner, materials, tools, equipment, space, and time. New materialism provided the theoretical approach to analyse these relationships.

The research findings show that non-humans played active roles in the production of craft knowledge and process of learning. Potters learnt craft in the moments of touching and feeling non-human actors' movements. They listened to the clay, embodied themselves into the tools, and kept pace with the movements of potter's wheels. Their level of expertise increased through the process becoming attuned with the movements of non-humans. Learning craft also emerged from the intra-actions between non-humans, for example in the firing of pots. This materialised sensitivity was key to the sharing of craft knowledge between the master and apprentice, teacher and learners. This craft learning happened, affected, and was affected by the particular material arrangements and layout of the studio space. The meaning of space was affected by spatial activities and it transformed and changed. In this studio space, the various relationalities between human and non-human actors were shifted, transformed, routinised, and destabilised across time and presented in the moments of practice. The social, imaginative, and material aspects of spaces were co-constructed and weaved together in the physical space of studio.

Through the research findings, a conceptual model was developed and constructed to locate craft learning in the aspects of social and material relationships. Previous research has discussed the social relationships and embodiment in the teaching and learning of craft knowledge, however, the aspect of materiality still needs more attention. Therefore, this research contributes to the understanding of craft knowledge, and where and how to learn craft knowledge, through exploring materiality in the micro mechanism of craft learning process. The perspective of materiality, drawing from new materialism, also contributes to the understanding of research methodology through reconsidering the active engagement of non-humans in the research process and recognising the uncertainty, fluidity, and changes present when conducting research. Additionally, this research contributes to the understanding of practical perspectives within the learning of craft knowledge in a small studio space and suggests policies to rebuild the physical and material spaces of studios to revive and reconstruct craft knowledge, craft practice, and craft communities.

Keywords: craft knowledge, craft learning, new materialism, materiality, intra-actions, space-time.

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Glossary

Theoretical terms

Eco-system (ecological system): It refers to the complex networks of individuals, policies, economics, culture, organisations and institutions, society, and materials in particular times and spaces which influence and are influenced by each other (Bronfenbrenner, 1979). Understanding the dynamics and multiple relationships in social eco-system is important to explain the social changes. In this thesis, eco-system is used to explain the complex political, economic, technological, organisational, cultural, material, and individual systems which has once supported and disrupted the craft training and learning system in the history in the UK. It helps to understand how craft knowledge can be effectively taught and learnt.

Intra-action: Barad (2007) came up with the word 'intra-action' to replace 'interaction'. For her, interaction is situated in the paradigm of the traditional dualism, which implies that things are independent and separate entities and necessitates the pre-established existence to take part in the actions with each other. Intra-actions recognise that distinct and separate agencies are not pre-existing, but emerge through entanglements (Barad, 2007). These entanglements are not just separate entities joining together, rather meaning is constituted within the entanglements and intra-actions between humans and non-humans. In this research, I will use intra-actions to reduce the dualism between humans and non-humans.

Terms in pottery[1]

Tools in pottery:

Rib: This is mostly used for sculpting, hand building, and throwing clay. Potters use it for opening, shaping, curving, smoothing, and trimming wet clay on the potter's wheel. It aids their hands in shaping the pot, or removing slurry from the surface of a pot. It can be made from wood, metal, or rubber. It is either rigid or flexible, depending on the material it is made from. Different materials afford varying opportunities for potters, for example, the metal rib can be bended easily and most potters can use it more flexibly to shape the clay. Ribs can have different surfaces that make specific patterns on clay.

Chamois leather: This is a piece of material that is soft and pliable. It helps potters to ensure an extra smooth finish on the rims of pots.

Pear tool: This is used mostly to remove controlled amounts of clay from wheel-thrown and hand-built ceramic pieces when trimming the pot. The shape looks like a pear, so it is called the pear tool. Pear tools are also used for decorating pots.

Loop tool: This is similar to a pear tool but a different shape.

Wire: This is used to cut off thrown pot from the potter's wheel. This enables the thrown pot to be easily picked up.

[1] Source from: Lakeside Pottery. (n.d.). Ceramic and Pottery Glossary. Retrieved August 8, 2023, from https://www.lakesidepottery.com/HTML%20Text/Tips/A%20pottery%20glossary.htm#Anchor-43259.

Techniques for glazing:

Pouring is where glaze is poured in the inside of the pot to coat the internal wall/s.

Dipping is where the whole pot is submerged in glaze liquid.

Brushing is where different glazes are brushed onto the pot.

Stages of clay status:

I. **The wet stage**, where the clay is soft and pliable.
II. **The leather soft stage**, where the clay is still a little tacky and moist.
III. **The leather stage**, where the clay has dried slightly and is no longer tacky. Some shrinkage has taken place, but there is still some softness and flexibility. This stage is perfect for trimming the pot.
IV. **The leather hard stage**, where the clay is harder to mould but it still not completely dry. It means it is still possible to trim the pot in this stage.
V. **The bone dry stage**, where the clay is lighter in colour and feels hard. When you knock the surface, you will hear a 'crisp' sound. Clay cannot be trimmed any more in this stage, even when you spray more water onto the surface. More moisture will make the clay crack conversely.

Stages for firing:

Bisque fire: It is the first stage of firing the pot after the bone dry stage and without adding any ceramic glazes. After bisque fire, the pot becomes much harder, but still can absorb the glaze. After adding glazes onto pots, they are ready to be fired again.

Glaze fire: It refers to the stage of firing a pot when glazes are applied. In this process, the glazes and clay are fused together and transformed into a solid piece where the pot will no longer absorb water.

Oxidation: It takes places in the firing process, where there is an abundance of oxygen in the kiln, allowing materials to fully react with it. Oxidation firing usually results in bright and consistent colours, as metallic elements in the clay and glazes react predictably with oxygen. Unlike reduction firing, where oxygen is limited, oxidation ensures complete combustion. It does not produce a reduction effect on the clay or glazes, leading to different visual characteristics in the finished pots.

Reduction: It refers to a firing process where oxygen is restricted in the kiln, leading to unique chemical reactions within the clay and glazes. In the absence of enough oxygen, the metallic elements within the clay and glaze seek out oxygen molecules from other sources, such as the clay itself or the glazes applied to the pot. This process affects the colour and texture of the final product, with metals like iron, copper, and cobalt producing specific shades. The reduction atmosphere is typically achieved in gas or wood-fired kilns during phases of high-temperature.

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Publications and conferences from this research

Prior to submission of this thesis, I have attended two conferences and presented the findings and discussions from this research.

Conference presentations:

• Li, M., Holstein, J., & Wedekind, V. (2022). The informal learning space in craft in the UK. In: 4th the German Research Center for Comparative Vocational Education and Training (G.R.E.A.T.). Informal Learning in Vocational Education and Training, University of Cologne, Germany. 28th-30th September 2022.

• Li, M., Holstein, J., & Wedekind, V. (2022). The survival of the ceramics craft in the UK against the odds- a learning perspective. In: 37th EGOS Colloquium, Organizing for an Inclusive Society: Meanings, Motivations, and Mechanisms: Craft in Modern Society. Vrije Universiteit Amsterdam, The Netherlands. 8th-10th, July 2021.

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Chapter 1: Introduction

1.1 Research background

This research is a study of how craftspeople learn craft knowledge. According to the Heritage Crafts Association (HCA), industrial pottery is ‘critically endangered’, which means that it is at serious risk of no longer being practised (HCA, 2019). Moreover, there is a severe lack of potters, alongside a severe shortage of skilled roles in this industry (HCA, 2019). Data shows that at Wedgwood, once a world leading ceramics brand, there is currently only one person skilled at mould making and throwing. The hollowing out of the pottery industry, as firms outsource their production and retain a small, almost token, workforce in the UK to support heritage brand activity, is well known and documented (Ewins, 2017). This hollowing out was accompanied by a similar dramatic reduction in the broader teaching of pottery and the learning systems that supported the development of independent potters and broader pottery crafts. This included the ‘on the job’ industry training that went alongside short educational courses, often in a symbiotic relationship. Partington (2010) identified the significant decline in UK ceramic degree courses that has resulted in only three full-time courses currently being delivered (HCA, 2017). It appears that craft knowledge is in danger of being lost in the UK.

Nonetheless, some 1,500 professional studio potters still operate in the UK, together with 13,000 amateur and leisure potters (HCA, 2017). Therefore, the development of craft knowledge continues in the UK despite the reduction of dominant craft learning ecologies. This contrast of loss, and yet resurgence, of craft interested me. It propelled me to explore the learning of craft knowledge and investigate how the teaching and learning of craft knowledge can be supported and maintained. I started my PhD journey in the field of craft knowledge learning.

Previous researchers have discussed the contexts and systems of different learning spaces which have played important roles in supporting or disrupting the teaching and learning of craft knowledge in different time periods. These systems include the traditional craft apprenticeships of the Middle Ages (Coy, 1989; Lave & Wenger, 1991), craft factories in the modern industrialised period (Chan, 2020), and formal education in the 19th and 20th centuries (Gamble, 2001). These different contexts and systems organised craft knowledge teaching and learning through the master-apprentice [2] relationship, daily tasks and activities, and social communities. Social negotiations and relationships between the master, or more experienced craftsperson, and apprentice, or less experienced person, and between apprentices themselves have been recognised as key to learning craft knowledge (Cattani, Dunbar, & Shapira, 2013; 2017; Coy, 1989; Wallaert-Pêtre, 2001; Wolek, 1999). Within these relationships, showing and observing the bodily actions and movement of experienced craftspeople is a well-known and documented way for masters to teach and learners to learn craft knowledge (Miller, 2012; Portisch, 2010). The daily tasks and routines structured in the craft space enabled the master to demonstrate skills and the apprentice to learn from working with the master and others (Marchand, 2008). All of these had formed a supportive environment for teaching and learning craft knowledge (De Munck & Soly, 2007; Humphries, 2006).

[2] I use 'master' in the thesis because it has been generally used in the craft industry. As time goes by, people use 'master' as a neutral term to describe people who have developed proficient knowledge and skills with many years' experience in specific areas, rather than only refer to craftsmen.

However, these eco-systems declined and left apprenticeships largely informalised and unregulated, although some other trade associations continued into the 19^{th} century (Williams, 2013). During industrialisation, the nature of craft work changed due to technological and economic developments. Craft that was considered ‘real’ began disappearing, especially in large craft factories (Kroezen et al., 2021; Wallace & Kalleberg, 1982). This reduced craft training in industrial apprenticeships and increased the need for more mechanically dependent skills.

Technical colleges and universities, in association with craft factories, gradually became the space for teaching craft knowledge in the 19th and 20th centuries (Gospel, 1995). However, the craft departments within these technical colleges and university declined as well due to cost pressures and the marketisation of the education system. Their spaces once played an important role in supporting the teaching and learning of craft knowledge, but have now declined or disappeared. Craft eco-systems now appear to be found within informalised social networks and craftspeople’s studios (Marchand, 2021). The learning and teaching of craft knowledge is still practised in the UK today.

The small craft workshops once marginalised have become more important in teaching this kind of knowledge. Researchers have started to consider wider contexts and conditions that have supported this revival and resurgence of craft (Cattani, Dunbar & Shapira, 2013; Kroezen & Heugens, 2019; Raffaelli, 2019). However, the question of how the teaching and learning of craft knowledge can be supported in small studio spaces is under-explored. This thesis addresses the question of ‘how’ craft knowledge is learnt within the space of small craft workshops and studios.

1.2 Research question

The main question explored by this research is: how do craftspeople learn their craft knowledge and skills in studio space? This question is divided into three sub-questions:

(1) What are the relationships (including craftspeople, materials, tools, and equipment) in learning craft?

(2) How do learners learn from more experienced and knowledgeable potters?

(3) Where is craft knowledge learnt and developed?

To answer these research questions, I interviewed 20 studio potters in the UK about their craft learning experience and observed their daily working practice. I also attended 3 ceramic short courses to learn pottery knowledge and skills in potter’s studio (details in table 4, appendix 8). This enabled me to use my body to feel and sense my pottery practice while learning craft knowledge. In this way, I developed understanding, knowledge, and captured the moments of communication that happened in the process of learning in the studio. The mechanism of tacit knowing behind these bodily actions and movements was also explored.

Previous research has discussed and described the tacit nature of craft knowledge, which is difficult to be formalised (Nasseri & Wilson, 2017; Polanyi, 2009; Temeltas, 2017). This tacit knowledge is embodied in highly skilled craftspeople and shared within communities (Cattani, Dunbar & Shapira, 2017; Hadjimichael & Tsoukas, 2019; Raffaelli, 2019). Prior research has explored the training and learning craft knowledge in terms of social relationships, including master-apprentice or teacher-learner relationships and relationships between workers and learners themselves (Lave & Wenger, 1991; Marchand, 2008).

Researchers have also discussed the role embodied showing and observation playing in teaching and learning craft within these social relationships (Portisch, 2010; Wolek, 1999). Additionally, they have explored the formation of social identities and how these form the relationships in the social communities (Lave & Wenger, 1991). However, the aspect of materiality in these relationships is still under-researched.

There is much research on the importance of relationships between materials, tools, equipment, and other non-human elements within craft making (Ingold, 2001; Nasseri & Wilson, 2017). Additionally, there is existing research regarding the learning of craft knowledge, for example, understanding how materials react in different circumstances through undertaking tasks like making an object (Lane, 2005). However, the role of non-humans in learning craft is still under-developed.

The teaching and learning of craft skills in different learning spaces, for example, in master's home/workshop, craft factories, colleges, or universities, has been widely discussed. However, there is less research analysing these spaces, especially in relation to the physical and material space which is dynamic rather than static.

Building on previous research, this study follows a materialised approach. It views the body as a site of knowing that develops understanding through embodied practice (Hindmarsh & Pilnick, 2007; Yakhlef, 2010). Here, bodily sensations are constructed (Strati, 2003; 2007) and the relationships between humans and non-human elements in forming new and creative knowledge are honoured (Gherardi & Perrotta, 2013). To understand the materialised aspect of craft teaching and learning I draw on the theory of new materialism (Bell &

Vachhani, 2020), where matter is understood to be vibrant, alive, and inseparable from human and social activities. This research found that craftspeople engage in learning relationships with non-human elements, for example, materials, tools, equipment, space, and time. These non-human elements play important roles in the relationships between more experienced craftspeople and those that are less experienced. Knowledge is constructed and produced in the material and social space-time, where relationships between humans and between human and non-human elements are produced and reproduced. This materialised approach to research on (craft) knowledge teaching and knowing is under-researched and this is where this thesis makes its main contribution.

1.3 Research purpose and contribution

1.3.1 Research purpose

The teaching and learning of craft knowledge were historically supported by traditional apprenticeships that were formalised within craft guilds and trades in the Middle Ages. During the industrial revolution, the craft industry and formal education institutions took over the responsibility for training potters and traditional apprenticeship guilds began to disappear. This resulted in the disruption to the ecology supporting teaching and learning of craft knowledge. Craft workshops and studios gradually became the space where the teaching and learning of craft knowledge occurred. This is the context of this research and its exploration of the essence of learning craft knowledge. The aim is to provide support for future craft teaching and learning. It constructs an effective pedagogy of teaching and learning craft to enhance craft education in the UK and help craft learners to develop their craft knowledge and skills. Such expertise can then be shared to following generations of potters. Additionally, this research's ontological, epistemological, and methodological understanding facilitates discussion and reflection on the foundation of knowledge and craft pedagogy through using specific research methods in the field of craft.

1.3.2 Research contributions

By answering the research questions, this research contributes to the field in the following ways:

1.3.2.1 Theoretical contributions

Knowing and learning have previously been considered as a social practice (Gherardi, 2001; Lave & Wenger, 1991). These learning theories mainly focus on communications between humans, less attention has been paid to the role of non-human actors in learning craft. Additionally, the learning space has been viewed by researchers as a set of social relations (Gulson, 2015; Gulson & Symes, 2007a; Massey, 2004). The material aspect of this space is still under-emphasised and under-researched. This thesis takes a new materialism approach, where non-human elements participate in the process of producing knowledge and affect humans actively. Therefore, this thesis contributes to the theories of knowledge development, the learning space, and craft teaching and learning through re-examining the relationship between materials, tools, equipment, learners, teachers, time, and space. This thesis also contributes to the reflection and re-examination of contemporary craft education, where the importance of materials, tools, or material environment in facilitating teaching and learning is currently ignored in colleges and universities. Additionally, this research encourages a pedagogical discussion about the relationship between humans and non-humans, and re-examine who teaches whom and what and how to teach and learn.

1.3.2.2 Methodological contributions

Previous research has privileged human language as a tool over non-human elements when generating and analysing data (Davies, 2018). This research involved non-human elements, for example, materials, material environments, tools, in the process of co-producing and co-generating data. The researcher's body was used as an important tool in the process of conducting the research through feeling, listening, watching, and touching. Allowing data to affect the researcher is part of the research's analytical strategy. This methodological approach challenges the traditional research methodological paradigms, and proposes a different perspective when conducting research, especially in craft related research.

1.3.2.3 Policy implication

The traditional apprenticeship system, which once supported the teaching and learning of craft knowledge, had disappeared by the end of 19th century (Clarke & Winch, 2004; Howell, 1877). However, some researchers still consider apprenticeships an effective method for teaching and learning craft knowledge (Ainley & Rainbird, 2014). In 1994, the government in England developed a programme of modern apprenticeships, which were based on the competence-based approach. This approach divided practice into separate tasks and focused on learning outcomes rather than the process (Gamble, 2004a). Under this approach, craftspeople only have access to related procedural knowledge. It is difficult for them to integrate different parts of their knowledge into a whole process and learn tacit craft knowledge (Gamble, 2004a). Additionally, what the government in England funded in apprenticeships was mainly directed at engineering, rather than craft expertise, especially ceramics. According to the

Crafts Council (2014), formal apprenticeships in the UK have historically not been available in large range of craft disciplines. There have been some apprenticeships available in furniture making and textiles, with small numbers in woodwork and jewellery. Unfortunately, since 2007/8 ceramics apprenticeships have disappeared (Crafts Council, 2014). This thesis raises this problem with the intent of influencing policy regarding craft education and contributing to the re-establishment of craft apprenticeships through discussing what is required to support the learning and teaching of craft knowledge.

1.4 The thesis structure

This chapter has introduced my research, my reasons for choosing this subject research, and the research questions. To communicate the answer to these questions, this thesis is structured in the following way:

In Chapter 2, I discuss the historical shifts in craft learning and related spaces. How the learning of craft knowledge is organised in different contexts is also discussed in terms of the master-apprentice and teacher-learner relationship, the assigned working tasks or learning modules. I outline how craft knowledge was taught and learnt in traditional apprenticeships, which was disrupted when learning was transferred to craft factories and formal education institutions, only to re-emerge in informal networks. The teaching and learning of craft are shown to be resurged in the informal networks and craftspeople's studios and workshops nowadays. Therefore, the reason why choose craft studio as the space of learning craft in this research has been explained in this chapter.

In Chapter 3, I outline the key theories and debates around craft knowledge and craft learning. I discuss the nature and structure of craft knowledge through engaging with theoretical debates on the structure of knowledge. Then I trace previous literature about how to learn craft knowledge. The social aspect of craft learning practice is discussed through the perspectives of micro master-apprentice relationships and macro social relationships which are embedded in social communities. I introduce previous research developed to explore the learning of knowledge and craft knowledge to explore the material aspects of learning crafts. The embedded nature of learning craft knowledge and the learning space are also discussed.

In Chapter 4, I describe my philosophical transformation. I introduce the fundamental positions of my new materialism theoretical approach and its ontological, epistemological, and ethical positions. I discuss the understanding of knowledge and learning within new materialism. Finally, I outline how this theoretical framework helped my understanding of craft teaching and learning in terms of the relationships between the human body, non-humans, space, and time.

In chapter 5, I illustrate my transitions in the process of doing research and how the research was conducted. New materialism is introduced and I provide a description and reflections on my research process, including details about interviews, observations, documents, pictures/photos, and videos. I then talk about the dynamic and ongoing process of research ethics and the iterative changes to my researcher positioning that occurred during my research. The process of analysing data is explored, along with the three themes that were generated.

In Chapter 6, I discuss learning relationships and communication between different actors, including humans, materials, tools, and equipment. Three relationships are elaborated on: intra-actions between the body and clay, intra-actions between materials themselves (clay and glaze), and intra-actions with tools. Materials, tools, and equipment are not viewed as dominated by the potter. Rather they actively engage potters in the process of learning and affect and are affected by each other. They are not passive and static objects, they are always involved in intra-actions and affecting the process of learning.

In Chapter 7, I focus on the relationship between learners (the less knowledgeable) and teachers or masters (the more knowledgeable and experienced). This includes the use of observation, for example, how and what to observe when learning craft knowledge. Here, the conversation between learner and teacher focuses on shared embodied and materialised sensitivities. How the embodied and materialised sensitivities are shared is explored.

In Chapter 8, time and space within the learning of craft are considered. I describe the physical learning space layout in the studio where I developed pottery knowledge and skills. I explore how each key element, including the human and non-human, intra-acted with each other and generated the learning space. The space in this thesis is not a physical and objective environment, it weaves the material, social, and imaginative together. Space is not considered fixed, rather it moves, changes, and shapes and is shaped by communications with every human and non-human element. I discuss the movements of space in terms of temporality, along with the practice of imagination, development of expertise, formation of habits, and visioning possibilities in the studio space.

In chapter 9, I outline a pedagogy for developing craft knowledge and skills and a conceptual model is constructed. Within this model, I outline the social and material relationships that are important to the craft learning process and discuss the main contributions of this research. I argue that researchers need to consider material's active engagement in research. I also stress the importance of intra-acting with materials, tools, equipment in the process of developing craft knowledge. I advocate a focus on providing opportunities for learners to touch materials, use tools with their hands, and engage in studio spaces to teach and develop craft knowledge within craft learning policies.

In the final section, Chapter 10, I reflect on conducting research from the perspectives of research identity and subjectivity, research methods, constructing a theoretical framework, and writing a thesis. I reflect on the process of making pottery and advocate for more embodied and materialised approaches to research, that engages the researcher in the research field and enables them to feel the environment and be affected by non-human actors.

Chapter 2: Where to learn craft knowledge? — The historical shifts of the space of learning crafts within the UK

The structure of training and learning depends on the nature of knowledge. Craft knowledge is understood as largely tacit, which cannot be codified and is difficult to articulate in formulated language (Gamble, 2016; Latilla et al., 2018; Nasseri & Wilson, 2017; Polanyi, 2009; Temeltas, 2017). This knowledge is taught or shared most effectively through close observation, participation in working tasks, activities and practices, and interpersonal communications within the master-apprentice[3] and teacher-learner relationship[4] (Cattani, Dunbar, & Shapira, 2017; Coy, 1989; Lave & Wenger, 1991; Nadler, Thompson & Boven, 2003; Wallaert-Pêtre, 2001; Wolek, 1999). The details of the nature of craft knowledge and the teaching and learning of craft knowledge will be examined in the next chapter. In this chapter, I will discuss the history of how this craft knowledge is (un)organised in specific time and space in the UK.

The teaching and learning of craft knowledge was once effectively produced and reproduced within the traditional apprenticeship model, under craft guild's regulation and supervision. This was the case from the Middle Ages through to 18th and 19th centuries. That traditional space for craft training and

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[3] In this thesis, I use 'master' and 'apprentice' to refer to the formal relationships that existed in traditional apprenticeships, where experienced craftspeople teach craft knowledge and provide resources and spaces, and in exchange, the unexperienced craftspeople need to work for them to learn. There are different development stages between the two.

[4] In this thesis, I use 'teacher' and 'learner' to refer to other formal relationships in universities or informal relationships, where unexperienced people learn craft knowledge from more experienced friends or online videos.

learning was then transferred to craft factories with the decline of craft guilds and the change of craft production in 18th and 19th centuries. At the same time, technical colleges were also becoming part of the provision of craft skills in order to assist training within craft factories. These colleges then built up their specialised teaching modes to teach specific theoretical and practical knowledge. They became the main space for the teaching and learning of craft knowledge, with industrial apprenticeships unable to remain craft knowledge in craft factories. Due to globalisation, the changes in craft markets, and technological developments, many craft manufacturers in the UK were closed down in 20th and 21st centuries. Numerous college departments for teaching craft have also been shut down due to the cost of equipment. The learning of craft knowledge became difficult in colleges or universities with the loss of relevant courses. However, recently the teaching and learning of craft knowledge has become active in some small craft workshops and has started to gain more attention in the UK.

The teaching and learning of craft knowledge have experienced a few shifts and transformations throughout history from traditional craft apprenticeships, craft factories, formal education, and towards the informal studio/workshop environment. Through this shift in environments, work tasks, activities, learning modules, and the relationship between the master and apprentice, teacher and student have shifted as well. This has accordingly, affected the teaching and learning of craft knowledge.

In this chapter, I will discuss the social process behind the historical shifts and how craft teaching and learning were organised in different spaces and times. Additionally, I will explore how this affected the teaching and learning of craft knowledge in the aspects of work tasks, activities, learning modules, and the relationship between the master and apprentice, teacher and student.

2.1 Traditional craft apprenticeship and craft guilds

Traditionally, learning craft was undertaken within apprenticeships, which originated from informal on-the-job training in families or sending children to the host families (Wedekind, 2018). Later, in the Middle Ages, these were organised through local craft guilds (Lane, 2005). These apprenticeships have been referred to as “an agreement between a skilled person and an unskilled person, whereby the unskilled person learns to practise a specialized craft” (Coy, 1989, p.3). These apprenticeships could be in the form of formal indentures or informal enforcement, for example, the custom and the tradition (Humphries, 2006). The master normally provided the living place, paid the living expenses for apprentices, and agreed to teach craft skills and techniques. In exchange, apprentices lived with the master’s family and worked for the master at a training wage, which was relatively low in order to benefit the master (Aldrich, 1999).

Such an apprenticeship model has been considered as a valued form of education in many contexts for centuries (Wolek, 1999). This model played a key role in reproducing what was learnt, shared, and passed onto the next generation (Wallaert-Pêtre, 2001). In this section, I will begin with how the teaching and learning of craft knowledge was organised through traditional apprenticeship, mainly in terms of the master-apprentice relationship and the assigned tasks.

2.1.1 The training and learning of craft knowledge in traditional apprenticeship

2.1.1.1 Master-apprentice relationship

In traditional apprenticeships, the relationship between the master and apprentice was key to training craftspeople (Cattani, Dunbar, & Shapira, 2017; Coy, 1989; Wallaert-Pêtre, 2001; Wolek, 1999). In these communities, knowledge, techniques, and/or skills were passed on from parents to children, or master to apprentice (Dilley, 1999). Normally, the master did not teach abstract and theoretical knowledge. The master showed his or her way of using particular techniques to do work tasks without much verbal explanation, and apprentices learnt this knowledge through observation, imitation, and practice through daily tasks (Lancy, 2012; Tehrani & Riede, 2008). The apprentices normally had to follow exactly the same patterns and gestures that the master had showed them and they mostly learnt through trial and error (Wallaert, 2012).Through different work tasks, apprentices learnt about the properties of raw materials and how they react in different circumstances, for example, how they react to different temperatures (De Munck & Soly, 2007).The master generally watched apprentices' working process and checked if they were doing it correctly, giving additional instructions if necessary (Miller, 2012).

2.1.1.2 Assigned work tasks and activities

To make sure that the cost of training apprentices was paid back, the apprenticeship always lasted for a long time, generally five - seven years. During the five - seven years, apprentices stayed with the master's family every day and were assigned different daily tasks authorised by the master to help and assist production (Marchand, 2008). There were different working tasks assigned by the master in different skills development stages. In general, in the beginning of the apprenticeship term, the apprentice was mostly assigned the menial chores and non-craft tasks, for example, cleaning the room, sweeping the floor of the shop, or delivering water or clay to the master (Dilley, 1999; Lane, 2005; Wallaert, 2008). This stage was mainly to test or prove the apprentice's responsibility levels, motivation, and dedication through doing these seemingly 'unrelated' tasks (Singleton, 1989). The apprentices were not allowed to do much craft work, so they did not have much chance to learn through imitating and practising. However, these menial tasks allowed apprentices to develop the basic understanding of the characteristics of materials, for example, clay. In the later stages, apprentices were relieved of some chores and allowed to work with materials and focus on craft related tasks, for example, pottery making and shaping of miniature objects (Wallaert, 2008).

Though apprentices were only allowed to deal with the low-skilled craft work, they could still acquire a lot of practical experience of working with materials. They did this through making hundreds and thousands miniature objects, which enabled them to gradually become familiar with the basic materials (Lane, 2005). After the apprentices were able to make good miniature objects, the master would trust their craft identity and skills. The master would then give more explanation and instruction about different, more difficult techniques, and show the details to apprentices (Wallaert, 2012). Most of the time, the journeymen (the middle level of skill development in apprenticeships) helped the master to show and train apprentices. After much practice, apprentices developed greater expertise in the shaping and producing objects. However, they still did not have the experience of firing pots. They were shown how to fire the pots and allowed to do the firing tasks and learn some aspects of decorating the pots at the end of their apprenticeship (Wallaert, 2008). Then apprentices would be capable of firing the pieces and decorating the pots (Wallaert, 2008; 2012). The work tasks of the apprentices followed the sequence of simple to difficult based on the nature of producing craft products. Apprentices had additional chances to learn more craft knowledge through doing and practising different tasks at various stages. This enabled them to master all aspects of craft work, including preparing materials, making and shaping, glazing, firing, and decorating.

This apprenticeship model showed a way of training and learning craft knowledge, where apprentices were able to acquire most of the skills of craft work. Generally, the master started to make a profit once the apprentice had gained some craft skills and proficiencies. Therefore, it was in the master's interest to provide effective training at all stages to improve the skills of the apprentice (Barahona & Sánchez, 2020). However, the training and learning of craft skills was affected by many factors, including the cost of materials and training, the profit, the market, or some social and cultural issues. In the absence of compulsory apprenticeship education and efficient bureaucracy, the complexity of teaching techniques in preindustrial craft, and the difficulty of counting the cost and benefit of the training, were arguably managed effectively by the craft guilds (Epstein, 1998). In the next section, how apprenticeships were organised, operated, and supervised by craft guilds and how craft guilds supported knowledge teaching and learning will be discussed.

2.1.2 The role of craft guilds

Craft guilds can be traced back to the early 12th century in Europe (Kieser, 1989). They were originally formed in the kinship system and then built up by associations and cooperation between craftspeople, including carpenters, masons, painters, or potters. They were created in particular local regions to protect the trade market in these areas and to get more economic advantages (Rosser, 1997; Souleles, 2013). The craft guilds were authorised and served to regulate apprenticeships, and monitor their enforcement (De Munck & Soly, 2007; Humphries, 2006).

These guilds stipulated the duration of apprenticeships, fees, the number of apprentices, and the registration (Davids, 2007). For example, the apprenticeship had to last for a certain number of years, normally seven years, and one master could take on no more than three apprentices (Humphries, 2006). These regulations made it possible for one-to-one training between the master and the apprentice, which allowed the apprentice to observe, imitate, and learn certain techniques and skills from the master directly. Therefore, the apprenticeship enabled the teaching of craft knowledge from experienced masters to future generations.

The craft guilds also passed rules that reduced potential opportunism of the master and apprentice and therefore, protected the rights of both sides (Epstein, 1998). For example, through enforcing the master to provide adequate skills training it protected apprentices from being discharged before having learnt any skills, working as cheap labour, or being poorly trained. Additionally, the guilds would arrange a new master for the apprentice if the previous master died (Epstein, 1998).

At the end of the apprenticeship term, the apprentices were asked to make a craft piece/object and submit it to a guild. The principles in the craft guild would decide if the apprentice had attained certain skills standards and whether he or she was qualified to work as a craftsperson. Additionally, guilds would assess whether the apprentice could open his or her own workshop and take a certain number of apprentices as a master. The apprentices were required to get permission from the guilds to establish their own mastership and set up their own master workshops (Davids, 2007; Souleles, 2013). The guilds acted here as the monitor to control the quality of apprenticeship training and assured the skill development of apprentices.

Though the main objective of craft guilds was not to purely train apprentices to get high level craft skills (Epstein, 1998), it still provided a comparatively effective environment for the training and learning of craft knowledge through the traditional apprenticeships and the training of future generations to be a skilled workforce. In 1563, the English Government published the state law of the Statute of Artificers in England to regulate English apprenticeship. The Government acknowledged the power craft guilds had, afforded the official power to craft guilds for training craft apprentices, and expected to get the economic and political benefit from the guild training (Lyon, 1920). This law prescribed that each apprentice should be bound to written indentures and they had to be trained for seven years to be able to practise craft (Aldrich, 1999). This officially regulated the quality of teaching and learning of craft knowledge.

These traditional apprenticeships provided a space to allow apprentices to watch the expert performance, practise how to use tools, and make different objects through assigned tasks. Additionally, new apprentices learnt daily from other apprentices (the beginners) and journeymen (in the middle level of skill development). However, such apprenticeships are disappearing in many countries, especially in today's economic and technological society (Guile & Young, 1999; Sennett, 1998). The traditional apprenticeships for learning craft skills had already disappeared in many trades by the end of 19th century (Clarke & Winch, 2004; Howell, 1877). The craft guilds also experienced transformation and lost their power at the same time.

2.1.3 The decline of craft guilds and traditional apprenticeships

Craft guilds started to decline from the 16th century due to certain social, economic, political, and technological changes. Technological development and market expansion, profit, and efficiency gradually became the main criteria for craft institutions (Kieser, 1989). The traditional guilds were challenged in the face of factories and manufacturers who could adapt to changes and follow the principles of economic profit. The demand for semi-skilled and unskilled labours began to expand rapidly in the market aiming for higher profit (Epstein, 1998). Craft guilds failed to adapt to the technological innovations and market changes and gradually lost their coercive power and support from central government. The 1563 state law of the Statute of Artificers was repealed in 1814 and the craft guilds were officially abolished by the government due to their loss of economic strength and the government's desire to own the political power (Epstein, 1998). Under these economic, technological, political, and social circumstances, traditional apprenticeship, providing all–round craft skills, seemed outdated. Craft production required less skilled labour. Workers became more mobile due to technological development and the cost of training workers in traditional ways was not financially beneficial for the modern industries (Gospel, 1995).

During this period of the decline of traditional craft guilds, the production of craft objects was gradually moved to bigger craft factories and manufacturers. The traditional apprenticeship was transformed to a new form of industrial apprenticeship. This brought about big changes to the assigned daily work tasks and activities of apprentices and the relationship between the master and apprentice. In the next section, I will illustrate how the traditional way of training workers changed in manufacturers during the modern industrialisation period, which influenced the teaching and learning of craft knowledge.

2.2 Craft industrial apprenticeship and craft factories

The centralised factory and manufacturer already existed around the 14th century, but it was always marginalised by craft guilds until 19th century (Epstein, 1998). In the preindustrial period, the local putting-out systems (will explain in the next paragraph), such as protoindustry, were the main competitors of craft guilds, which were arguably considered to have created the social and economic conditions and environment for the later industrial revolution (Kieser, 1989).

In Medieval times, the master usually took charge of everything, including buying raw materials, setting up making spaces furnished with different equipment and tools, training apprentices to make the products, and selling the finished products to the market. The putting-out system was a new way of organising craft work and production, which originated from cloth production. The making of finished craft products was not always produced in the same place as in the traditional system, but could also be organised in different places with orders and sequences of production. The merchant bought the raw materials and 'put it out' to be produced in different worker's home. The workers took charge of one part of the production using their own equipment, tools, and workspace. After one part of the production was finished, the product would be transported to other places to produce the next part. After the product was finished, the merchant would take it and sell it (Littlefield & Reynolds, 1990). Through the whole process, the merchant owned the product and the workers who were producing it could make a living by working for the merchant.

These forms of craft production were more open to technological innovations than the craft guilds. They were more adaptable to market expansion due to social and geographical mobility and the principles of profit maximisation. This challenged the existence of craft guilds and directly or indirectly brought about their collapse (Kieser, 1989). As the system of craft guilds collapsed in the modern industrialisation period, craft and modern industry developed complementarily together. This development necessitated a change in the system of training workers. In the next section, I will discuss how the skills training of workers in the craft industry was regulated and operated and how it affected the teaching and learning of craft knowledge.

2.2.1 The training and learning in industrial apprenticeship

In the beginning of 18th, 19th, or even early 20th centuries, apprenticeships remained the main method of training workers for craft factories. This apprenticeship system mainly focused on on-the-job training, where practice was separated from theory (Fuller & Unwin, 1998). This was partly because the development of state-funded technical education was still slow and had little impact on the training of the labour force in the 18th and 19th centuries (Unwin, 1996). Additionally, craft production in the 19th century did not require apprentices to know much theoretical knowledge to understand the production process and work on tasks (De Munck & Soly, 2007). The lack of theoretical knowledge did not prevent the achievement of apprentice qualifications on completion of an apprenticeship (Haxby & Parkes, 1989). The practice of learning through working on the job in the craft factories had changed and was differentiated from the on-the-job training of traditional apprenticeship. Due to industrialisation, mechanisation, and technological development, most factories, especially mass-manufacturers, adopted the strategy of scientific management to gain maximum profit. The nature of craft work was transformed accordingly, which interrupted the teaching of craft knowledge in particular ways in the modernised craft factories (Kroezen et.al, 2021). In the next section, I will discuss how the relationship between master and apprentice and assigned tasks were changed during the modern industrialisation period, which influenced the teaching and learning of craft knowledge.

2.2.1.1 Supervisor-trainee relationship

The relationship between more and less experienced workers became more like that of a supervisor-trainee than master-apprentice because of the transformation of the nature of craft work. In these factories, observing and practice were still the main ways for trainees to learn skills from experienced workers. Chan (2015) stated that this was because of the nature of the work. The workplace environment generally includes “high levels of noise, spatial distance from actual enactment of work or work carried out in spaces not always easily accessible by more than one worker” (Chan, 2015, p.444). Therefore, it was important for workers to learn how to observe and communicate through hand

and body movement. Experienced workers or supervisors would check trainees' behaviours and supervise their work to see if they had met the job requirements (Tanggaard, 2005). Trainees needed to ask questions if they had problems and the supervisor would help to solve the issues. Workers observed and imitated the experienced worker's performance and behaviours and followed and honed their skills through practice on the job (Billett, 2006). Workers were not allowed to just stand and observe how more experienced workers did the job tasks. Therefore, they had to "steal" the knowledge "with their eyes" (Herzfeld, 2004, p.107 cited in Marchand, 2010, p.S10). Though there was not much verbal communication, workers could communicate and learn from each other through body language and reciprocity (Chan, 2015). Even though trainees could learn how to do particular jobs through observing and imitating experienced workers' performances, what they learnt was largely dependent on, and limited to, what tasks they were assigned and how craft products were produced inside the factories. I will discuss this in the next section.

2.2.1.2 Assigned work tasks and activities

In modern factories, on-the-job learning of craft knowledge became segregated because of the separation of craft tasks. When crafts were organised in factories, the work was divided into different sections and craft skills were cut into different specialisations (Kroezen et.al., 2021). Here there was "no one in the workshop who does more than a fractional part of the process of manufacture" (Lewis, 1984, p.26). Workers in factories did not have much chance to be allowed to know all the procedures for producing craft products. The expertise was specialised, and everyone was assigned specialised work in a fixed and separated space (Wallace & Kalleberg, 1982). Under these conditions, craft knowledge was broken into different parts of procedural knowledge. Craft workers only gained knowledge in particular work procedures. This meant that they could not integrate this procedural knowledge to construct the whole craft knowledge and generate the tacit knowing of specific knowledge, which is the key to master craft knowledge and becoming a craft master (Gamble, 2016). I will explain what tacit knowing is entailed in craft knowledge and the learning of craft knowledge in next chapter.

Another factor which influenced the teaching and learning of craft knowledge was mass mechanisation. In the beginning of the 19th or even 20th centuries, some modern industries, for example, the patternmaking industry, still allowed craftspeople to work with materials with their own hands, for example, building their own toolbox. Through this the workers were able to understand the properties of materials, for example, the wood, and know how these materials work under different circumstances. Therefore, they developed the embodied knowledge and craft skills through this hand-making process (Stein, 2019).

However, in the later stage, when it came to 20th century, the handmaking tasks were transformed by technology, such as 3D printing. This reduced the work to mechanical tasks rather than hand-making tasks (Stein, 2019). The machine was prioritised in factories. Workers did not learn how to do craft through their body and hands and become craftspeople but learnt how to operate the machines well. Here, work difficulties were reduced, required skill levels were low or limited, and efficiency and productivity got increased (Kroezen et.al, 2021). The work tasks were broken down and aligned with the rhythm of the machine, rather than assigned according to human skills development (Popp & Holt, 2016). Craft knowledge was organised and codified into explicit instructions and procedures through the operation of machines. Workers in those factories were “withdrawn from the core to the margins of the labour process”, their sense and feelings of the work of craft which are for developing craft knowledge and skills through rules of thumbs were detached from the assigned separated work tasks in this space (Ingold, 2021, p. 328). Craftspeople became operators and assembly-line workers. The mechanisation deskilled workers in craft (Form, 1987). This high reliance on machinery and hierarchical, scientific organised work to produce craft objects more efficiently and productively, decreased the reliance on craft knowledge and skills. Therefore, craftspeople became technicians who were removed from the process of working with materials (Kroezen & Heugens, 2019). The true craft skills were disappearing in such a process of producing objects, which led to the severe disruption of the teaching and learning of craft.

2.2.2 The regulation of apprenticeships

After the decline of the craft guilds, other professional employer associations and trade unions took the role of regulating and negotiating apprenticeships, including the wages, duration of training, working conditions, day release off-the-job training, and so on (Toner, 2008). These associations were developed in 19th century and continued to act in the post-war period in 20th century (Howell, 2005). Different from the traditional apprenticeship where the apprentices lived with the master in the master’s family, apprentices in the modern factories lived in, for example, lodging houses (Reinarz, 2007). Unlike the traditional apprenticeships, which were formally regulated by the craft guilds with legislated power to enforce the skills training, the trade unions and employer associations lacked the authority of legal sanction or supervision (Williams, 2013). There were no fixed and formal written indentures. Masters could take as many apprentices as they wanted (Williams, 2013). The duration of apprenticeships was shortened to five, four or even three years of instruction in some factories (Gospel, 1995).

Consequently, the content of the training in industrial apprenticeships was not regulated and so they differed from each other. Some apprentices were lucky enough to get proper training as craftspeople, whereas some were poorly trained in a narrow field (Unwin, 1996). Some factories employed children apprentices as the cheap labour and the employer had no obligation to train them (Aldrich, 1999). Some factories did keep traditional apprenticeships to train apprentices to get craft skills and become masters in the future (Williams, 2013). However, there were no legal training standards in apprenticeships. With the lack of support from powerful organisations to regulate training, the teaching of craft skills was not safeguarded.

2.2.3 The decline of craft factories and industrial apprenticeship

Industrialisation brought about the decline or even loss of a number of craftspeople and the system for sharing their knowledge. Additionally, it made the training of apprentices towards craft masters difficult (Cattani, Dunbar, & Shapira, 2013). It did provide some opportunities for training and learning some craft skills, especially in the earlier period of industrialisation when craftspeople were still doing work tasks with their hands and relying less on machines and technology. However, in the late 20th century, lots of big craft factories, for example, textiles and ceramics, had demolished (Ewins, 2017; Unwin, 1996). British craft industries outsourced their production to the Far East due to cheaper labour which increased profits (Ewins, 2017). The employees were cut off sharply in these industries and lots of people lost their jobs. The number of apprentices in these factories was reduced a lot. Taking the craft factory in Spondon, Derbyshire as an example, there were only six apprentices in the textile industry between 1984 and 1992 and apprentice training was mostly closed (Unwin, 1996). The big craft factories and manufacturers and the industrial apprenticeships were disappearing. The few ceramics factories who survived focused more on the design of craft, adapting to the rapid changes in customer demands and tastes, and globalisation. The manufacturing, producing, and making of craft products became less important (Ewins, 2017). This added to the loss of craft making skills.

The craft factory could no longer provide the appropriate space to learn crafts and teach craft knowledge. Therefore, the responsibility of teaching craft knowledge was left to formal education.

2.3 Formal craft education in colleges and universities

In the 19th and 20th centuries, there were a number of apprentices who were allowed attend day-release from work or began to go to evening classes. These classes were in held in local state funded technical schools, art schools, mechanic schools, and polytechnics, which later became universities (Gospel, 1995).

This technical education was originally used to support industrial apprenticeship by teaching apprentices, most of whom went to work when they were still children. Their general education included maths, science, and the artistic and theoretical aspect of craft knowledge (Davids, 2007). After the decline of industrial apprenticeship, technical colleges and universities gradually became the main space for teaching and learning craft knowledge. Unlike the previous apprenticeships, here the theoretical aspect of craft knowledge was considered. The relationship between the master and apprentice became between teacher and learners. The teaching and learning tasks were designed in advance for students. At the end of 19th century, technical education in England was in the ‘golden age’ with “central intervention, the authorisation of local authority expenditure on technical studies, and the development of institutes and polytechnics” (Aldrich, 1999, p.20). It sustained craft education and shared craft knowledge in certain ways. However, lots of these colleges and courses were closed later.

In this section, I will discuss theoretical and practical knowledge, and describe how the teaching and learning of craft knowledge ideally operates in contemporary colleges and universities. Additionally, I will show the current craft education situation in the UK.

2.3.1 The teaching and learning of craft knowledge in formal education

2.3.1.1 Theoretical and practical knowledge

In the last two sections I discussed how on-the-job training was the main way of learning craft knowledge in traditional and industrial apprenticeships. Apprentices learnt their skills mostly through making and doing, thus they gained a high level of practical experience and knowledge. In formal education institutions, there was a separation of on-the job training and off-the-job training, and theoretical and practical knowledge (Fuller &Unwin, 1998). One person may know how to do a thing but not be able to clearly give an account of how to do it and vice versa. For example, a person may be able to give a good account of how a stunt is done, sufficient to teach others to perform it, but not know how to do the stunt themselves (Winch, 2016). Conversely, a person who does not know the conceptual and theoretical knowledge behind performing a task, can know how to do the task and produce objects. In traditional apprenticeships and factories, people normally did not possess theoretical knowledge of the general laws of, for example, chemistry, physics, or mechanics related to their activity. They did not concern themselves with the theoretical concepts behind their behaviours (Wallaert-Pêtre, 2001). However, they did know how to do the activity to complete specific tasks or make a beautiful craft object. This is known as know-how knowledge (Ryle, 2000; Winch, 2016). Knowing craft requires deep practical know-how knowledge, which allows craftspeople to make intuitive judgement and decisions about their next movement when they face unforeseen situations and circumstances (Apel, 2008). “Non-tacit know-how can be explained completely through context-independent propositions, while tacit know-how requires some context-dependent procedural description” (Winch, 2016, p.565).

Nowadays, especially due to increasing technological development, craftspeople are required to have more conceptual and scientific knowledge, for example an understanding of maths and physics, to adapt to the new work environments (Gamble, 2004a). This theoretical knowledge fully supports craftspeople to make professional decisions on the one hand and provides a professional basis to take actions and practise in various environments in another hand (Winch, 2016). This theoretical knowledge still needs to be acquired through practical work however (Gamble, 2004a). To equip students with adequate theoretical and practical knowledge, the ideal curriculum is arranged both in the college or university and the workplace. This allows students to acquire the conceptual knowledge and apply this knowledge to work practice through doing real work tasks.

2.3.1.2 The ideal curriculum in teaching and learning craft

In general, universities and colleges offer a formal curriculum for students to learn certain theoretical knowledge and provide some opportunities to allow students go to studios or factories to practise, via internships. Gamble (2001) described an example of this dual system curriculum using the learning of woodmaking. The dual system means that students attend school and the workplace on alternate days every week. Students mainly learn theoretical knowledge in schools and then practise in the workplace. In this way, students not only know how to do a thing, but also know what is behind their practice. There is a system of modules to improve students' skills. These modules are designed in a sequence from simple tasks to complex tasks:

First, we can see that it mainly focuses on the understandings of materials, tools, and how to work with them for practical making and construction:

> […] the characteristics and care of different kinds of wood and then on various kinds of tool usage (e.g. hand tools, pneumatic tools, electric tools); operational procedures (cabinet joints, hand cramping, screws and nails, fixtures and fittings); techniques for the construction of carcasses, doors and drawers; the making and use of jigs and templates; and, at the more advanced level, specialised construction processes such as veneering, laminating and wood bending, reproduction furniture, repair of furniture and furniture design. (Gamble, 2001, p.187).

It will take students over a maximum of four years to complete these modules. Students need to spend at least two-three weeks of institutional training at stage one and then spend the rest of the time learning in the workplace. Then in the final stage, students will be tested to check their capabilities in different cabinetmaking tasks. The learning is formally organised in universities or colleges with formal schedules and modules. Students are allocated to specific teachers who can teach them theoretical and practical craft knowledge and supervise their performance. Students can learn the properties of materials and how to use different tools through practice.

Guile (2011) summarised this teaching and learning curriculum in the following way. Different forms (theoretical and practical) of knowledge are organised, combined, and sequenced; the pedagogic process of teaching and learning different types of knowledge is designed by the theoretical lectures and workplace supervisors; and students are able to apply theoretical knowledge to practical situations and easily transfer between educational and workplace contexts. This dual system of craft education provides a very good model for teaching and learning craft knowledge in both theoretical and practical aspects. However, in the UK, the current craft teaching modules in formal education institutions have shifted towards a more conceptual pedagogical paradigm.

2.3.2 The current craft teaching and learning modules in UK formal education institutions and the decline in craft education

Between 2007 and 2012, the specialist craft disciplines in university and colleges, for example, ceramics or glass, experienced a big decline. In 2012-2013, there were only 31 (36%) courses which focused on a single craft discipline, 21 (24%) focussed on broad, multi-material craft courses (e.g. craft) and 34 (39%) interdisciplinary courses (e.g. design and craft, fine art, or visual art) (Crafts Council, 2012).

This phenomenon also happened in ceramics education and training. Ceramics specialist courses have largely been incorporated into interdisciplinary subjects, such as ‘fine art’ or ‘design’. Ceramics specialist courses have all but disappeared due to the cost of equipment and the required space (Crafts Council, 2014). In 2012/13, there were only two ceramics-specific three-year, full time undergraduate courses (Crafts Council, 2012). To see if these incorporated courses actually train and teach students to become skilled at hand making and complex ceramics techniques, I searched around 100 ceramics related courses and details of different qualification levels provided by UK universities and colleges. I found that most of the ceramics related courses share a similar three stage course structure at all qualification levels. In the first stage, students learn different techniques and how to use different tools. The courses provide chances for students to experiment using different skills, and practise across different disciplines in art, design, and craft. In the second stage, students already know different material qualities so they consider their strengths and interests and then decide on a specialism. In the third stage, students get the opportunity to do their own projects, finish and exhibit their objects, and make plans for the future.

However, at different qualification levels, the course modules and contents differ. It was difficult to get information about courses at Level 1, 2, and 3. However, according to what I have read, Level 1 courses focus mainly on an introduction to art, design, and craft, learning about different basic materials, techniques and processes, and developing basic skills and ideas. For example, in Kirklees College in Huddersfield, England, the mandatory units are developing a personal progression plan, working with others, and researching a topic.

Level 2 courses further develop solid artistic foundations and practical skills and knowledge. For example, Kirklees College has some mandatory units in Level 2 courses, which are exploring the work of artists and designers, learning about the key trends and movements in art and design, and how these have affected the development of artists and designers. Students learn art and design history and further develop their ideas and work styles through looking at the works of others.

At Level 3, this college (Kirklees College) provides theoretical studies which can support practical work. Students explore the innovative relationships between different disciplines, and the assessment varies from essays, presentations, reports, final examinations, and so on. For example, Kirklees College offers the mandatory units on researching, recording, and responding in art and design, media experimentation in art and design, preparation and progression in art and design, and a final major project in art and design.

At Level 4 and Level 5, students learn professional and employability skills, contextual studies to understand more about historical and contemporary cultural influences, growing awareness of the global economy, creative industries, politics and so on, and develop their own substantiated perspective. Most colleges provide lectures, small group tutorials, seminars, and other ways to let students explore and learn.

The first stage of a BA (Hons) Degree involves course modules, such as context and theory, historical debates, developing visual language, developing a critical and contextual language, theories of aesthetics and creative projects, interdisciplinary studies, material enquiry, and studio techniques for making. In the first stage, colleges allow students to develop an awareness of materials and critical ideas, and adopt more personal, informed, and responsive approaches that allow for diverse practices across a wide spectrum of craft, design, and art contexts. The second stage modules include contextual studies, visual and material cultures, and tradition and innovation of art and craft. Students can study a range of concepts to understand art, design, and media in its wider historical and cultural contexts. There are also courses covering an introduction to concepts and methodologies. In the third stage of the degree, the modules cover professional development, synthesis and resolution, realisation, and defining a self-authored, multi-faceted programme or project. Students need to produce a body of work for public exhibition, dissertation, or some institutions let students choose to devise a detailed business plan. All of these require the synthesis of critical, analytical, and practical skills combined with an independent, resourceful, and responsive approach to practice. Colleges assess students' work through coursework, such as portfolios, exhibitions, written papers, presentations, and so on. Students who pass the exam are awarded different levels of the formal degree qualification.

Most ceramics courses that are incorporated into art and design courses focus on delivering the historical background and aesthetic concepts in the field of art and design. Students choose one from several techniques to focus on. They then follow similar course modules about the development of art and design, rather than producing craft using their chosen technique. These techniques include how to build a wood kiln, how to throw or coil, how to use different tools, how to carve and turn, how to fire the pot, and so on. The historical and conceptual knowledge taught here can enrich students' knowledge about art and design history and development, and cultivate students' critical and creative ideas. However, learning craft knowledge and skills is not limited to knowing these theoretical concepts and having the ideas in the mind. These ideas need to be realised through the learner's hands working with materials, tools, and equipment. The knowledge arises and the learning occurs only when theoretical knowledge is practised in real craft activities (Ryle, 2000; Tsoukas, 2012).

In these formal institutions, there is a lack of facilities and infrastructure to allow students to practise (Iswahyudi, 2021). Most of formal institutions have lost their workshops for hand making (Marchand, 2021). It has been argued that students are not able to work “with their hands in a direct engagement with tactile art media”, for example, “crochet or model clay” (Weida, 2014, p.5). It seems that learning through practice and developing the practical knowledge of knowing materials and tools and how to make certain objects are difficult to attain in formal education in the UK. Therefore, under these conditions and paradigms it is difficult to pass on the craft knowledge and skills to the next generations.

2.4 Contemporary studios and workshops

In the late 19th century and in the early part of the 20th century, the Arts and Crafts Movement grew in the UK. It advocated using hands to produce materials and suggested the rejuvenation of traditional forms of craft making to oppose mass machine production (Krugh, 2014). Craft work discourses are linked with “questioning industrial capitalism in periods of rapid change” (Bell et al., 2018, p.5). There were few people, like John Ruskin and William Morris, who looked to the medieval guilds for the unity of creativity and production and criticised the division of labour between the design and making processes, the alienation of workers from craft, and the mechanisations through industrialisation (Crook, 2009; Krugh, 2014). The workshops of craftspeople were thought to be the ideal space for craft production and creation. Charles Robert Ashbee, a leader in the Arts and Crafts Movement, suggested that workshops were the best space for craft education (Triggs, 2014). He thought that craft education conducted outside the workshop of craftspeople was too abstract (Triggs, 2014).

This movement contained a particular philosophy about teaching craft knowledge in some colleges and universities. For example, some professors in the South Kensington School, which later became the Royal College of Art, thought that craft education should return to the traditional apprenticeship system (Cunningham, 2005). Within these apprenticeships, craftspeople can share their experience and knowledge with each other, learn from each other, and unite the craft process from the design stage through to the making stage (Krugh, 2014). The principles of this movement greatly influenced craft production and education in the later stage of 20th century and the beginning of 21st century. Some movements, for example, DIY (do-it-yourself) and the maker movement, developed from the Arts and Craft Movement, with craft in this sense being associated with the unity of creativity and production, and with human joy being included in the process of making (Browder, Aldrich, and Bradley, 2019; Garber, 2013; Kroezen et al., 2021).

The development of technology, especially social media, has made craftspeople's work process much visible to more people, then provides a broad space for people to understand, know, and appreciate craft (Bratich, 2010; Fox Miller, 2017; Luckman, 2015). People can learn craft knowledge through watching online videos, where the experienced craftspeople's body movements can be clearly seen (Hopwood, 2014). The curated platforms, such as, museums, craft markets, or galleries, have diffused the knowledge of craft to publics (Kroezen & Heugens, 2019). Many craftspeople, for example, the famous British potter Bernard Leach, were influenced by the Arts and Craft Movement and built up their own workshops, mostly at their own home. They took on some apprentices and passed on their craft knowledge to the next generation in the traditional way (Marchand, 2021). According to Heritage Crafts Association (HCA), some 1,500 professional studio potters still operate in the UK, together with 13,000 amateurs and leisure potters (HCA, 2017). These potters built up their own studios and most of them deliver ceramics short courses to share their knowledge with the public. For example, the Leach Pottery, one of the most well-known pottery studios in the UK, provide the materials, such as clay, tools, potter's wheels, and the studio space for people to practise and learn.

Generally, there is no organised structure or module to teach specific craft techniques. They mainly focus on certain making techniques, for example, throwing or coiling. Additionally, Craftspeople built up informal communities and networks, for example, some craft hobby clubs, where makers and learners share a physical space for making tools and working with materials (Kroezen et al., 2021; Marchand, 2021). These informal communities and networks have taken the role of traditional communities to share the craft knowledge, craft meanings and values, and identities. These craftspeople and craft learners practise together, help each other, and learn from each other. They are therefore, playing important roles in the teaching and learning of craft knowledge. It seems that craft knowledge in these informal spaces is taught and learnt effectively in modern society.

2.5 Summary of the chapter

In summary, this chapter shows that the teaching and learning of craft knowledge has been affected differently by contextual conditions. These social, political, economic, and technological factors have affected the constructions of different organisational systems in different time and spaces. These systems have organised the daily tasks and activities, structured the master-apprentice relationships, and (re)produced the communities. The training and learning of craft, then, was affected by these conditions and contexts. The eco-systems, once have built up in the traditional apprenticeship and supported the craft teaching and learning, have experienced shifts and changes. The organisational systems have been shifted towards the economic efficiency through mass industrialisation. This has broken part of the eco-systems and disrupted the teaching and learning of craft knowledge. Even though formal education once has taken the responsibility to effectively teach craft knowledge, the shifts of craft curriculums and institutions left the teaching and learning of craft knowledge struggling. Influenced by Arts and Crafts Movement and other social movements, craftspeople have built up their own workshops and connected with other makers and learners and gradually have formed some informal communities and networks. It can be seen that social and political movements, technology, craft communities, craftspeople's workshops, market demands, and curations all have provided social, physical, and material space for supporting craft knowledge to be shared and learnt. These play an important role of teaching and learning craft knowledge. This provides a great example and space for this research to explore the learning essence of craft knowledge and how this space can teach craft knowledge effectively. Therefore, I chose pottery studios and learning workshops as the sites to conduct my research and explore how craft knowledge can be effectively shared and learnt in these informal spaces.

Besides these contextual factors, the underpinning structure and nature of knowledge affect the process of teaching and learning this knowledge (Gamble, 2001; Wedekind, 2018), for example, explicit knowledge can be saved and recorded in texts, but tacit knowledge cannot be saved in formalised language, thus difficult to be shared and learnt (Cattani, Dunbar, & Shapira 2013). In the next chapter, I will discuss the nature of craft knowledge and the pedagogy of teaching and learning craft knowledge.

Chapter 3: The teaching and learning of craft knowledge-Understanding craft knowledge and craft pedagogy

In chapter 2, I outlined how showing, observation, and imitation have been the main methods of teaching and learning craft knowledge throughout history. In this chapter, I will explain why and how these ways are effective. The key theories, literature, and the main debates in the field of craft knowledge and pedagogical approaches to learning and teaching craft knowledge are outlined and discussed.

In the first section, I will examine the typology and structure of craft knowledge in order to discuss how craft knowledge was understood and classified in previous literature. This discussion of the nature of craft knowledge will provide the background to explain how to teach and learn this kind of knowledge. The pedagogical approach to learning and teaching craft knowledge will then be discussed. Here, historical theoretical developments and debates around key learning theories under different theoretical paradigms will be explored. Additionally, two aspects of teaching and learning craft knowledge will be outlined. Initially, the social dimension of teaching and learning craft knowledge, which includes the relationship between the master and apprentice and the social learning community will be discussed. Additionally, the material dimension of teaching and learning craft knowledge, which includes embodied practices and material space of teaching and learning craft knowledge will be explored. This supports the key argument of my research in response to the research question: ‘how craft knowledge is learnt through craft practice in certain spaces?’

3.1 The structure of craft knowledge

Historically, human knowledge has been known and examined by researchers using different approaches. These theories and discussions of human knowledge have been applied to the research of craft. They have provided the background for exploring and understanding the inner structure of craft knowledge and its teaching and learning. Within this discussion of craft knowledge, I will provide a brief introduction to three philosophers, Gilbert Ryle, Bernstein, and Michael Polanyi, who contributed much to the understanding of practical knowledge, specialised knowledge, and the tacit nature of knowledge. Ryle’s (2000) knowledge typology helps to understand craft knowledge through the perspective of know-that and know-how knowledge (Høgseth, 2013). Bernstein's (1967; 2006) knowledge structure provides a way of understanding particular knowledge in relation to other forms of knowledge and distinguishes craft knowledge from everyday knowledge and general knowledge. Polanyi’s (2009) tacit knowledge offers an understanding of underpinning mechanisms of human knowledge and the tacit nature of craft knowledge (Gamble, 2001; 2004a). In the next section, I will discuss the structure of craft knowledge through three aspects: craft knowledge as know-that and know-how knowledge, craft knowledge as specialised knowledge, and the tacit nature of craft knowledge.

3.1.1 Craft knowledge as know-that and know-how knowledge

Traditionally, conventional cognitive and intellectual approaches to knowledge resonate with Cartesian dualism, where the mind is separated from, and prioritised over, the body, and the knower is disconnected from embodied knowledge (Schlauch, 2020). Knowledge under this paradigm exists “prior to and independent from the knowing subject, who creates no knowledge in the act of appropriation” (Gherardi, 2000, p.212). Gilbert Ryle (2000) has contributed much to extending the understanding of knowledge and pointing out the existence of other forms of knowledge. He disagreed with the claim made in the traditional intellectual approach to knowledge that a person knows the rules and principles first, which are then saved in the mind. The mind then guides the body to perform tasks in an appropriate way. He argued that “knowing how to apply maxims cannot be reduced to, or derived from, the acceptance of those or any other maxims” (p.32). Ryle (2000) believed that the focus on the mind and scientific knowledge ignored the experience and practical aspects of how to practise a task. Therefore, he distinguished between the knowledge of rules and practical knowledge, which is known as ‘know-that’ and ‘know-how’.

Know-that represents theoretical, scientific, and abstract knowledge, for example, mathematics. Know-how means practical knowledge and how to perform a task. He pointed out that practice is prior to theory. To be able to practise, a person needs to appropriately convert knowledge into action. Know-that does not necessarily lead to the know-how to perform a task and know-how does not necessarily require a person to know the basic rules and principles (know-that). A person who is able to, for example, ride a bike, could not really tell others how they made the right moves and kept their balance. Know-how includes things that implicitly exist in actions but are ineffable. This kind of knowledge is tacit. Ryle (2000) outlined the structural distinction between different forms of knowledge and acknowledged the importance of practical knowledge.

Craft knowledge relies heavily on practical knowledge or know-how knowledge. It does not mean that craft knowledge only entails practical knowledge. It is the combination of know-that and know-how knowledge (Høgseth, 2013). Høgseth (2013) stated that know how involves the body movement and technical skills of craftspeople and know-that represents reflections on, and theoretical knowledge of, different techniques traditionally regarded as more intellectual and mindful activities. However, Ryle (2000) recognised that knowing the rules and theories is not sufficient to understand how to do a job well. Theoretical knowledge cannot replace practical knowledge, thinking and knowing are inseparable from making in any practices (Rowley, 1997, cited in Andrew & Kevin, 2017). To understand how to apply and utilise theoretical knowledge, or know-that knowledge, requires a person to have know-how and practical knowledge (Ryle, 2000; Winch, 2016). A person can perform craft work appropriately through only knowing how to do different jobs, for example, traditional apprenticeships did not really require craftspeople to know theories, principles, or scientific knowledge in order to perform craft tasks well. A person who possesses the theoretical knowledge cannot necessarily perform tasks well. To act appropriately, they need to integrate their theoretical knowledge into practice (Ryle, 2000). The process of gaining know-how or applying know-that to practise is embedded in the human body. It is learnt through embodied practice (Polanyi, 2009). In the next section the teaching and learning of craft knowledge through embodied practice will be discussed.

3.1.2 Craft knowledge as specialised knowledge

As previously discussed (section 3.1.1), craft knowledge is not general scientific and theoretical knowledge independent of contexts and individuals. It is also distinguishable from every-day, or common-sense knowledge even though it contains some of its features such as the know how to wear clothes, which is only situated in specific contexts and is independent of other contexts (Gamble, 2004a). Basil Bernstein's (1967; 2006) knowledge structure helps to explain the position of craft knowledge in relations with other forms of knowledge.

Bernstein (1967; 2006) distinguished every-day or common-sense knowledge from context-independent knowledge. Every-day knowledge is deeply bound within specific contexts that are independent from each other. For example, tying a shoelace is independent from wearing clothes. This type of knowledge can only be understood, shared, and learnt through our everyday experience within specific contexts.

Contrasting with everyday knowledge, Bernstein (1967; 2006) described another form of knowledge which is structured vertically and horizontally. Vertical knowledge structure is "a coherent, explicit and systematically principled structure, hierarchically organised" (Bernstein, 2006, p.47), such as knowledge of the natural sciences. This type of knowledge is unified by different concepts which are integrated and incorporated to generate higher levels of abstract concepts. This knowledge is hierarchically organised because concepts are built upon each other. A person cannot learn certain concepts if other concepts have not been learnt previously. This knowledge shares a mutual language to explain and understand phenomena, is independent from contexts, and can be generalised in different contexts. For example, the same understanding of concepts and equations in mathematics is shared in different countries.

Horizontal knowledge structure, used within social science, is “a series of specialised languages with specialised modes of interrogation and specialised criteria for the production and circulation of texts” (Bernstein, 2006, p.47). Here, knowledge runs parallel to each other and is characterised by different specialised languages to interpret one phenomenon. For example, in sociology there can be different understandings of the same concept based on different ontological and epistemological assumptions, such as social realism and social constructivism. This knowledge can be abstracted and theorised beyond the immediate experience. However, this knowledge is specifically tied to certain contexts and is produced from certain social contexts and conditions (Young & Muller, 2013). For example, different theories of curriculum are produced within specific social contexts and gaining an understanding of the relevant concept of curriculum requires understanding the specific social, political, and cultural context. Within the horizontal knowledge structure, there are specialised languages with very clear syntax and grammar. This knowledge can be shared in verbal and written form. When grammar is weak, this knowledge is tacitly shared and learnt.

Bernstein (1967; 2006) moved away from understanding craft knowledge as unsystematic, unstructured everyday knowledge. He considered craft knowledge as specialised knowledge with specific structures as it goes beyond specific contexts and everyday experience (Gamble, 2004b). For example, knowledge of working with stoneware clay is required before working with porcelain, which is more difficult to work with. The same structure of learning craft knowledge is used in different contexts. Bernstein’s (1967; 2006) recognition of the systematic and structured knowledge entailed in craft knowledge includes not only know-that knowledge, but also practical knowledge (Muller, 2014). This specialised and principled knowledge becomes meaningful when it is put into practice and can be interpreted differently in different contexts. This process of appropriation and recontextualisation of knowledge is also related to specific social communities; it requires humans to engage with it in specific contexts and circumstances. In chapter 2, it was recognised that teaching and learning craft knowledge requires particular structures. These structures were wholly or partially included in the pedagogy of traditional apprenticeships, industrial apprenticeships, and formal curriculum. Therefore, the process of teaching and learning craft knowledge is strongly embedded in different historical, social, political, and cultural contexts. Previous literature has recognised the importance of the social environment for teaching and learning craft knowledge, which I will talk about in the next section.

Bernstein (1967; 2006) distinguished craft knowledge from other forms of horizontal knowledge structure through the perspective of the rules of certain knowledge. Craft knowledge, for example, has weak grammar and rules. However, he did not explain craft knowledge in detail. In the next section I will explain how the tacit nature of craft knowledge was interpreted by Gamble (2001; 2004a).

3.1.3 The tacit nature of craft knowledge

3.1.3.1 Polanyi's tacit knowledge

To understand the tacit dimension of craft knowledge, it is important to consider Polanyi's (2009) discussion on human knowledge, which he called tacit knowing. This tacit nature of knowledge was broadly used by previous researchers to talk about craft knowledge. Polanyi (2009) identified the tacit nature of all forms of human knowledge, believing that even explicit knowledge has its roots in tacit knowledge. He considered tacit knowing as the process of integration of subsidiary awareness into focal awareness. For example, when a person tries to drive a nail into the wall by using the hammer, the feeling of vibration passing from the hammer to the person's hand is subsidiarily aware. At the same time, the focus is on the action of hitting the nail. This tacit knowing is the process of subsidiary awareness to attend to the focal aspect. Focal awareness and subsidiary awareness are exclusive of each other. If a person pays attention to subsidiary awareness, for example, how to hold the hammer rather than how to drive in the nail, they will not be able to finish the action of hitting the nail. The subsidiaries support the achievement of the task of the focal target or they would be meaningless. The person has to rely on those particular subsidiaries in order to attend to something else. The integration of subsidiary awareness into the focal aspect remains the tacit part of knowledge. We unconsciously incorporate any useful elements to help us to do certain tasks without identifying all particular subsidiaries that are in play, as they remain in our unconsciousness. Polanyi (2009) claimed that the experts always knew much more than what could be effable.

3.1.3.2 The tacit understanding of craft knowledge

Craft knowledge has been widely recognised as largely tacit (e.g., Gamble, 2001; Nasseri & Wilson, 2017; Temeltaş, 2017). This knowledge entails more than technical knowledge. Some researchers have had the debate in the perspective of transformation and conversion of craft knowledge. Nonaka and Takeuchi (1995) used knowledge in cooking as an example to show how craft knowledge can be formulated into different procedures and separated into the procedural knowledge. This knowledge can then be converted into explicit knowledge that can be taught to other people. It has been argued that this understanding has ignored the conditions of the conversion to tacit knowing (Hadjimichael & Tsoukas, 2019; Ribeiro & Collins, 2007). Tsoukas (2005; 2012) argued that practical knowledge, for example how to bake bread, is more than technical knowledge and beyond what is articulable. Even practitioners do not realise this inarticulable knowledge which can only be manifested in the doing of the actions. Craft knowledge is not explicit knowledge, it includes the tacit nature of knowledge. Gamble (2001; 2004a) explained why craft knowledge is tacit through Polanyi's (2000) theory of tacit knowing and extending Bernstein's (1967; 2006) knowledge structure and craft definition. She explained the tacit nature of craft knowledge from part and whole relation perspectives. In this section, I will provide an introduction to Gamble's understanding of craft knowledge to explain the tacit nature of craft knowledge.

Gamble (2001) drew on Bernstein's (2006) knowledge structure and applied Polanyi's (2009) theory of the integration of particular subsidiaries into the focal attention of the whole, to help to explain why craft knowledge entails the tacit nature.

Craft knowledge is not procedural knowledge devoid of the whole knowledge. As Gamble (2001; 2004a; 2016) discussed, craft knowledge is a combination of different segments in particular contexts and each segment is connected to form the whole picture of craft knowledge. When a person initially learns knowledge, they learn different aspects first, then knowledge of different parts will be combined together in order to perform the whole tasks. "A skilled person accomplishes a performance as a coherent entity, without conscious awareness of the constituent elements or particulars of the performance" (Gamble, 2016, p.192). For example, when we learn how to drive, we may first learn some separate tasks, such as how to turn the steering wheel, or how to reverse a car, but after you have learnt to drive, all of the 'particulars' are no longer observed in themselves. We cannot explain how to drive in words. Even though each particular task can be explicitly specified in the beginning of learning different aspects, the overall relationship between these particulars, which form the whole, cannot be explained in words. Gamble (2001) said that "the relationship between part and whole […] has become embodied […] it inheres in the body and cannot be articulated" (p.196). Gamble (2001) suggested teaching and learning craft knowledge through visualisation, where we can see in the visible that which is invisible, and it can "compensate for the lack of a clear syntax or grammar to regulate coherence" (Gamble, 2001, p.197). Hence, when masters want to let apprentices know, for example, how to draw a model, they do not tell apprentices in words, but draw a model. This shows the ineffable skills that are embodied in the master's body. Craft knowledge can only be learned by "aid of practical example and never solely by precept" (Gamble, 2001, p.192). This visualisation process will be discussed in next section of 'teaching and learning craft knowledge'.

Gamble (2001) believed that the relations between different parts of a task can be developed and embedded into one's body without one being conscious of it. Høgseth (2013) also pointed out that craft knowledge is tacit because it is developed into the unconsciousness after it is mastered. When learners try to learn techniques, they use their subsidiarily awareness. In the early stages, they are still conscious of what they are doing and try to 'think' consciously about what they need to do next. After practising, they do the task without consciously thinking about each step. The skilled action has already been absorbed in the person's body and moved into the unconscious (Polanyi, 2009). When craftspeople become masters, they do different craft tasks very well. However, they would struggle to tell others how they did it because they do not know explicitly what the elements of the task are or how they have integrated these into the whole, enabling them to perform the task appropriately.

It can be seen that craft knowledge is embodied in the unconscious, especially in the later stages of skill development. Craftspeople learn from their body's senses through touching, hearing, listening, and smelling (Marchand, 2007a; Polanyi, 2009). However, it is difficult for them to tell others about their sensual experience and feelings (Marchand, 2007a; Miller, 2012). This sensual practice relies on "sensory engagements with matter" (Bell & Vachhani, 2020, p.696). Through having materials in the hand, a form of tacit knowledge arises, providing a way to understand the craft practice itself. This understanding of embodied practice will be discussed in next section of 'teaching and learning craft knowledge'.

In summary, from what has been discussed above, craft knowledge is understood as specific knowledge which is contextualised and embodied in human bodies. It is very difficult to be present explicitly in (spoken and written) language. In this thesis, craft knowledge is not only ascribed to the human and social context, but the collective practice between the human and non-humans, the social and material. The understanding of craft knowledge aids the understanding of the mechanisms of teaching and learning craft knowledge, which I will discuss in the next section.

3.2 Teaching and learning craft knowledge

The nature of different knowledge affects how it can be effectively taught and learnt. Explicit knowledge can be codified, stored objectively and shared by written language without a knowing subject. As shown in last section, craft knowledge is not general knowledge, it is difficult to be shared through words in an objective, depersonalised and independent way (Gascoigne & Thornton, 2014).

Due to the tacit nature of craft knowledge, it is displayed and manifested in the expert actions embodied in certain craftspeople (Tsoukas, 2005). Therefore, it requires the master's professional actions to enable the sharing and teaching of craft knowledge to learners. The relationship between master and apprentice or between teacher and learner is key to training craftspeople to learn craft knowledge (Cattani, Dunbar, & Shapira, 2017; Coy, 1989; Wallaert-Pêtre, 2001; Wolek, 1999). Craft knowledge is situated in specific contexts and environments where specific languages and meanings are shared by communities (Høgseth, 2013). Craft knowledge is collectively constructed and this knowledge teaching and learning "conveys traditions and enculturation" (Wendrich, 2013, p.4). The community of producing and reproducing craft knowledge is important in the process of teaching and learning craft knowledge.

Craft knowledge relies much on practical knowledge, it does not have static and stable properties or dispositions but is enacted in embodied practice over time and across contexts. Learning this knowledge relies on knowing the subject through the experience of embodied practice (Lam, 2000). It requires craftspeople to practise a skill repeatedly with their body through working with materials, tools, and equipment.

In this section, I will discuss the teaching and learning of craft knowledge in two aspects which are considered as important to the learning of craft knowledge. The first is social relationships in the process of teaching and learning craft knowledge, which includes the relationship between master and apprentice, teacher and learner, and the wider social community. The second is the embodied and material relationships involved in the process of teaching and learning craft knowledge, which includes embodied practice (the relationship between body, materials, tools, and equipment) and the material space.

3.2.1 Social relationships of teaching and learning craft knowledge

3.2.1.1 The master-apprentice or teacher-learner relationship

Craft knowledge is manifested in bodily actions and movements which are difficult to treach through formulated language but can be visualised and shared through visual demonstration and observation (Gamble, 2001; 2004a). The master shows the apprentice how they perform specific tasks, the apprentice observes the professional movements of the master and learns through copying the right movements. Therefore, showing and observation of professional bodily actions play very important roles in the relationship of teaching and learning.

Body demonstration

Showing occurs in workshops when the master demonstrates proper procedures through action. Their display becomes the guide (Chan, 2015). Experienced craftspeople instruct learners how to comport themselves or how to do a particular task. In traditional apprenticeships, the master always showed apprentices how to do tasks through demonstration and this normally involved no direct verbal instruction (Portisch, 2010). Unless the apprentice was conducting unsafe practices and in danger, the master would not interfere with their work and just watch the apprentice work. When someone was doing a task in an inappropriate way, the master did not explain how it was incorrect, they just fixed it as an example of how to do it correctly (Gamble, 2001; Miller, 2012). Bamforth and Finlay (2008) described how masters even communicated with apprentices by guiding their hands to accomplish a task correctly, rather than using verbal instruction (Fowler, 1977). Sometimes, masters began making a craft object with some left-over parts and let apprentices complete it (Crown, 2007). For example, shaping a bowl and giving it to apprentices to paint, or asking apprentices to shape an object and help them paint it (Bowser & Patton, 2008).

Showing the bodily movement involved in undertaking a task is an important element in traditional apprenticeships method of teaching craft knowledge, but it is not the only way of the teaching craft knowledge. Craftspeople also communicate through a form of verbal language that is not the formulated language in books or taught in formal education (Høgseth, 2013). Craftspeople describe the properties of materials, the feeling of touching materials, and the actions of doing certain tasks through the use of metaphors. For example, I can feel the clay is not wet enough, it feels too heavy and lumpy in my hand, or I can see the clay is wobbling around the wheel if it is not centred. The master guides the apprentice through saying some instructive words, for example, ‘try to position your body in this direction’ (Tsoukas, 2005; Gowlland, 2012). This verbal language is shared in particular communities and can only be shared through the master’s flesh mouth (Eyferth, 2010). It means craft knowledge could lose its meaning without masters and specific communities.

Observation

Many researchers have discussed the importance of observation, imitation, and practice in the craft learning process (Wallaert-Pêtre, 2001; Wolek, 1999). An opportunity to observe provides access for apprentices to enter the practice of the community as proximal participants (Chan, 2013). It also contributes to the better understanding of the modes of communication involved in teaching and learning skills (Marchand, 2008). Through watching the master, the explicit and tacit rules of making, along with the skills that the master does not even recognise that they possess and therefore cannot easily be articulated in formalised language, will be learnt and assimilated by learners (Polanyi, 2009). Observation is not only required at the beginning of an apprenticeship, but throughout all phases (Haas, 1989; Singleton, 1989).

Portisch (2010) thought that there are two kinds of observation types. One is unobtrusive observation, where the apprentice discretely observes an elder's activities while doing other tasks at the same time. This kind of observation is especially undertaken within the traditional craft family. The children learned specialised techniques by watching their parents doing the same or similar tasks while they were doing other chores. These could include cleaning the floor or washing clothes. In this way, they 'steal' knowledge by watching while doing another task at the same time. The children tried to copy and do similar steps to achieve a similar outcome, then they developed their own way of making certain objects. The second observation type is obtrusive participation, undertaken within traditional apprenticeships. Here, apprentices are involved in performing tasks with masters. The apprentices try to do tasks in the same way as the master by emulating their techniques (Ünlühisarcikli, 2001). Watching and practising together helps to develop specific 'techniques of the body', and particular kinaesthetic understanding or bodily sensory understanding and abilities (Portisch, 2010). Repetition helps learners to fine tune their skills and improve their speed and accuracy (Marchand, 2007b). Due to minimal intervention and direct guidance from the master, learning craft knowledge requires apprentices to discover and solve their own mistakes and overcome any problems. Practice is an important way to learn craft knowledge and in next section of 3.2.2, I will talk about how craftspeople learn craft knowledge through repeated practice, and this becomes ingrained into their body.

3.2.1.2 Social community for teaching and learning craft knowledge

In terms of the process of teaching and learning craft knowledge, previous research has discussed social relationships embedded in the social environment and communities. Learning is situated in specific social and cultural contexts and enacted and constituted in social activities (Engeström, 2001; Vygotsky, 1978, 2004). Developing knowledge is organised in specific social and cultural contexts (Gamble, 2016). It is the process of socialisation and enculturation (Wendrich, 2013). Participation in practices, activities, and communities is the way to acquire knowledge through actions (Fuller, 1996; Stout, 2005). Thus, knowledge resides in social relations, and can exist and sustain the conditions necessary for practice to be continually reproduced and negotiated in such communities (Gherardi, 2001).

Lave and Wenger's (1991) situated learning theory has greatly influenced the understanding of craft learning in social environments and communities, which they called the 'community of practice'. They shifted the individual perspective of learning to "the concept of legitimate peripheral participation in communities of practices" (Lave & Wenger, 1991, p.94). Learners participate in social practice within the community of practice, taking up different social roles as their skills improve. Within this model, peripheral participation refers to the first stage of learning craft knowledge, where the master allocates simple and easy tasks. After continual practice, apprentices will be assigned more complex tasks and learn more complicated techniques through repetition. They move to central participation when they have acquired full knowledge.

Learning in the social community encompasses more than learning techniques, it also includes socialisation in the rules, standards, and norms within a specific field. The structure of community is so powerful that each member needs to obey its rules/regulations. Learning in this collaborative situation develops a sense of social relation. People assess the composition of the group and situate themselves in relation to them in a socially recognised manner through social negotiation (Lave & Wenger, 1991). Social identity and status are formed in this social community to ensure the circulation and (re)production of knowledge (Lave & Wenger, 1991). The learning of craft is "inherent in the growth and transformation of identities and it is located in relations among practitioners, their practice, the artifacts of that practice, and the social organisation and political economy of communities of practice" (Lave & Wenger, 1991, p.122). It is a dynamic process that individuals actively participate in within certain communities. They gradually become involved in the centralised performance and are awarded the community identity of becoming a member (Lave & Wenger, 1991).

In the process of learning knowledge in the social group, the social relationshipss between different members are also very important. There are always social collaborations and communications between the members in the community in order to undertake craft tasks. When apprentices encounter difficulties, they are assisted by more experienced fellow apprentices. This transforms the apprenticeship system from a relationship between the master and apprentices to a mutual social collaboration. It contains communication and support from the whole practice community (Lave & Wenger, 1991).

3.2.2 Material relationships of teaching and learning craft knowledge

3.2.2.1 Embodied practice

In this section, I will talk about how craft knowledge is learnt in the body through embodied practice. Before starting to explore the embodied learning practice, which will lead to my main argument, I first need to clarify my position in regard to the dichotomy between mind and body.

Mind, body, and learning craft knowledge

The traditional cognitive approach, habitually values the intellectual, spiritual, and mental sphere over the physical. This "elevation of mental over manual labour is merely a social preference for the skilful manipulation of symbols as a more respectable activity than the manipulation of objects" (Hyland, 2019, p.451). This view has influenced consideration of the nature of craft knowledge and learning. Craft work and craft knowledge are naturally deemed as physical activities, with physical knowledge separated from so-called intellectual activities, for example, thinking and reflectivity (Stolz, 2015). In this thesis, learning craft knowledge is "the integration of sensory bodily and mental processes" (Rodaway, 1994, p.19–20). Every good craftsperson conducts a dialogue between concrete practices and thinking. This dialogue evolves into sustaining habits, and these habits establish a rhythm between problem finding and problem solving (Sennett, 2008). Learning craft is not only a way of making things by hand, but also a way of thinking through practices (Adamson, 2018; Nimkulrat, 2012). Sennett (2008) also stressed that craft knowledge is the unification between hand and head, between body and mind. Trying to separate them is detrimental to the nature of craft, craft knowledge, and craft learning. The knowledge here is embodied in human bodies and includes, rather than excludes, the human mind (Pyrko, Dörfler, & Eden, 2017). Thinking and reflection in this thesis is not exclusively mindful activities purely going through our mind but developed through embodied practice.

Embodied learning

Learning craft knowledge is not just guided rational and intellectual but is also experienced within the body as it communicates with the environment (O'Connor, 2007; Page, 2018). Researchers have realised the importance of the body in producing and learning craft knowledge. Learning craft occurs in the immediate bodily responses and reciprocal, mutual actions that occur in the whole body and within corporeal communications between different people (Hindmarsh & Pilnick, 2007). They are developed in specific social and material contexts (Maapalo & Østern, 2018; Strati, 2007; Yakhlef, 2010). Expertise and proficiency are embedded into the body through repetition (Polanyi, 2009; Pyrko, Dörfler, & Eden, 2017; Tsoukas, 2005; 2012). Here "intuitive reactions replace reasoned responses" (Dreyfus & Dreyfus, 2005, p.786).

This embodied practice and the importance of communicating with materials and tools in the process has been shown often in craft practice and production. Craft production involves the synergy between human, tools, and raw materials within a changeable environment (Ingold, 2001; Jones, 2022; Nasseri & Wilson, 2017).

Craftspeople have an intimate relationship with materials (Jones, 2022; Shiner, 2012). Materials in their hands do not “feel separate […] but an extension of the mind, body and emotions subtly integrated to one another” (Nasseri & Wilson, 2017, p.202). Materials are not purely controlled by humans, for example, potters cannot always control clay in the process of making, glazing, and firing, the clay has its own awareness and life. The natural characteristics of clay need to be respected especially “its plasticity when wet, its fragility when dry, its tendency to wrap, crack and lump during the drying and firing process” (Adamson, 2018, p.50).

Within craft making, a tool is used by the hand to manipulate a material with the intention of creating something (Risatti, 2009). The development of skills to work with tools involves knowledge of its purpose and function and the competent use of the body in terms of for example, grip, stance, and leverage (Rose, 2005). Using tools effectively demands competent manipulative skills. The quality of the performance is directly dependent on the ability of user’s hands and arms to control the tool (Risatti, 2009). The sharpness of the knife or the length of the needle all influence the physical movements required to achieve the required outcome (Warnier, 2001). The design, mechanics, and function of most tools is physically similar to human ‘bodily mechanics’. Tools become extensions of limbs, hands, and fingers and regular practice results in coordinated integration of mind, body, tool, and material (Marchand, 2008; Risatti, 2009). Working “intensely with tools harmonized the thoughts and actions and heightened the sense of coordinated control over the task at hand” (Marchand, 2008, p.261).

Previous research has already shown that materials and tools play important roles in craft practice, to understand materials and know how to work with tools and equipment are key to the learning of craft knowledge. Learning certain craft knowledge and learning how to work with materials and tools rely on different body senses, for example, touching, hearing, smelling, and seeing (Gherardi & Perrotta, 2013; Strati, 2007). Learning craft knowledge relies on bodily "sensory engagements with matter" (Bell & Vachhani, 2020, p.696). Here, "embodied knowledge [is] the basis for practically and skillfully transforming lively and inconsistent materials into useful objects" (p.682). Brown, Greig, & Ferraro (2016) explored the knowing of craft knowledge though body senses. This included tasting the cones to tell if clay is matured, touching clay, and listening to the materials. O'Connor (2009) explained that she used her hands to feel the heat of glass in glassblowing to learn how the glass moves in the process of heating up. In this process of knowing and learning through bodily senses, it can be seen that intimacy with materials and tools is very important to enable craftspeople to learn (O'Connor, 2009).

Previous research on embodied knowing have acknowledged the importance of materials in the learning process. The theoretical interest in materials is also now starting to be viewed from a material perspective in different fields, for example educational research (Fenwick, Edwards, & Sawchuk, 2015; Fenwick & Landri, 2012; Fenwick, Nerland, & Jensen, 2012). This perspective goes further in resisting the traditional Cartesian dualism between human and non-human, culture, and materials. It repositions materials in the centre of analysis, together with human social elements. Knowledge here is not just produced inside the individual's body or in the relations between individuals within their social and cultural surroundings, it is also sourced from the active engagement with materials. The phenomenon of learning happens in the relationship between human and non-human elements. This learning perspective provides a space to focus on the role of materiality of both humans and non-humans, in the process of producing knowledge and learning. Though this perspective of learning has already started attracting more research in education field, the agency of materials in engaging in the knowing and learning activities is still overlooked. This thesis will build on this perspective and contribute to the craft learning approach. It will draw on this perspective and explain the learning process through exploring how humans and non-humans are involved in the learning practice. Additionally, it will consider how craft also provides a good space to explore the role of non-human elements in knowing and learning craft knowledge (Bell & Vachhani, 2020; Brown, Greig, & Ferraro, 2016). This relationship between the body, material, tools, and equipment and the relationship between masters and apprentices are affected not only by social communities and environments, but also by physical and material spaces. I will explore this in the next section.

3.2.2.2 Material space in teaching and learning craft knowledge

Before I start to explore the material space where the teaching and learning of craft knowledge occurs, I want to clarify the definition of material and physical space in this thesis, as it is different from the traditional understanding.

The understanding of material space for learning

In the social science tradition of materialism, space was not recognised as important (Morgan, 2000). In recent years, educational researchers have started to realise its importance and pay attention to space and time (Gulson & Symes, 2007a; Middleton, 2013). Within the positivist paradigm, space is understood as a geographical concept, that is physical or material (Law, 2002; McGregor, 2003) and is measurable (Hubbard & Kitchin, 2010). It is “a set of geometrical arrangements” (Pile & Thrift, 1995, p.45) and is described in terms of physical infrastructures, distance, boundaries, and movement (Stephenson et al., 2020). These physical measurements include, for example, the height and length of a wall, or the distance between two points and can be measured objectively. Researchers have expected patterns of practice, actions, behaviours, and communications (Taylor & Spicer, 2007).

Based on this quantitative approach in the early educational research, space has been treated as something merely physical, such as building plans, floors, and layouts. It is considered as stable and fixed and separates the pedagogical activities happening in the body from the life embedded inside the physical environment (Gulson & Symes, 2007b).

In the traditional cognitive pedagogy, knowledge is considered as objective and out there in the world. It is processed, inherent, and located in one space – isolated from an individual’s mind (Hultman & Lenz Taguchi, 2010). The traditional classroom is designed as a closed space with walls, doors, and windows, a teacher’s desk, and blackboard or whiteboard. These are arranged and positioned in the front and centre of the whole classroom and student desks are organised and fixed in different sequenced lines facing towards the teacher and black/whiteboard (Roehl, 2012). This designed space is used to teach knowledge directly from expert educator, such as teacher, to less experinced educator, such as students in organised spaces and time slots. Learning and teaching practice is limited by the constraints of space and time towards one-way linear flow (Edwards & Clarke, 2002; Neill & Etheridge, 2008). Ideas around the design of physical education spaces have experienced a shift due to the influence of social constructivism theory, which considers learning as stemming from social participation and negotiations. This transition has led to research into learning space design in order to expand the patterns available in closed classrooms towards a more open and flexible space to enable a more cooperative and communicative approach. This would encourage learners to become the agents of learning and engage in knowledge construction through social communications (Brown, 2005). Boundaries, such as walls, are knocked down to enable more flexibility. The students' desks are grouped together to enable greater communications and encourage conversations (Blackmore et al., 2011).

This new approach to the design of space is based on social learning paradigms, where there is still a clear-cut difference between the physical space and human activities within the building (Mulcahy, Cleveland, & Aberton, 2015). Space is referred to as a mere container and reservoir being appropriated and used for human and social activities. It is just simply where the activities take place (McGregor, 2004; Morgan, 2000). Space is an independent phenomenon, separated from social practice and influence on patterns of teaching and learning. It is taken to be predesigned and prearranged in advance (Mulcahy, Cleveland, & Aberton, 2015). Space is "fixed, dead and immobile" (Taylor & Spicer, 2007, p.325). The space changes only through the rearrangement or re-distributions and modification of objects, materials, and artefacts, for example, tables, chairs, machines, and equipment (Jacklin, 2004).

This enables a change in the teaching and learning pedagogy. In this sense, space stays stable with the absence of temporality and the lack of movement (Vásquez & Cooren, 2013). Time is separated from space and understood as clock based (Moss, 2004). It is a mechanical system, or a linear, irreversible, objective model, moving from one stage to the next (Massey, 2009; Slattery, 2012). It can be controlled, handled, and rationalised through scientific time management for increased efficiency of teaching and learning (Slattery, 2012).

In this thesis, the understanding of material space is not based on the traditional paradigms about space for learning, it is configured as multiple and heterogenous relationships in many different forms, including social, material, living, and non-living entities (Acton, 2017; Massey, 2005). Here, the space contains "a set of interconnected material entities […] humans, artefacts, organisms and things of nature" (Schatzki, 2010, p.129). It is not seen as purely encompassing social relations and human accomplishment, and its material aspect are not just for assisting the unfolding of human activities. It also communicates with humans to establish spatial practice, as well as space itself (Orlikowski & Scott, 2008). The social and material aspects constitute each other. For example, the arrangements of tables and chairs in a café creates a space for people to sit, drink coffee, and talk to their friends, colleagues, or families. Conversely, how the human activities that happen regularly in a café space provide the meaning for the café beyond a space for drinking coffee and produce a social space for communications or a business space for formal meetings (Cnossen & Bencherki, 2019). Eventually these social activities become routinised in a café space and reproduce shared communal meaning (Edensor, 2010).

Although this view emphasises the importance of material aspects of space, it does not return to the traditional perspective of space, which was considered as separated from human activities, fixed, and dead. Instead, the material space is “relational, enacted, and fluid” (Acton, 2017, p.1442). Time in this thesis is not considered as standard time that can only be measured objectively and divided into linear units (Crang, 2003; Edensor & Bowdler, 2015; Simpson, 2012). Instead, time refers to the lived experience in specific space and the embodied perception of surroundings and the environment here (Edensor & Bowdler, 2015). Materials are considered important elements who play important roles in affecting the lived experience of time and the human and social activities (Hernes, Feddersen, & Schultz, 2021).

Material space for teaching and learning craft knowledge

In this thesis, the learning and teaching emerge and unfold continually in the mutual negotiations and transactions between time, space, humans, bodies, materials, and others (Mulcahy, 2013). The layout of physical environments and different arrangements of materials and objects, such as furniture and equipment, are considered important constituents of teaching and learning activities (Brown & Long, 2006; Kemmis et al., 2014). Maapalo and Østern (2018) illustrated how materials and tools in the woodwork studio guide teachers and students' development of woodworking practice. Some arrangements of the material space made different teaching and learning practice possible. Showing and observation, as the main ways of teaching and learning craft knowledge, require close physical proximity between more knowledgeable individuals and less experienced learners (Gamble,2004a). This physical proximity “enables mutual visual access to the work of master and apprentice” (Gowlland, 2012, p.364).

The physical distance in a space can affect the process of social and embodied communications and affect the practice of learning craft (Amin & Roberts, 2008). The space itself needs to be conducive to new knowledge creation. Leclair (2022) explored how embodied relationships between the makers and materials emerge in the physical studio space, where new knowledge is created.

Although there is an increasing interest in material space within research, it is still comparatively under-developed and under-theorised (Gulson & Symes, 2007b; Harrison & Hutton, 2013). The power of the material aspect of space needs more attention in education and craft pedagogy. This research applies this perspective to contribute to spatial studies through discussing its physicality and materiality, as well as social communications within the material space of learning craft. Additionally, it considers space as a process rather being fixed in order to explore how material space is enacted, initiated, and engaged in the process of learning.

3.3 Summary of the chapter

In this chapter, I have outlined the discussion of the structure of craft knowledge based on the previous theories of Ryle, Polanyi, Bernstein, and Gamble and showed how craft knowledge is understood in this thesis. Craft knowledge is understood in this thesis as a combination of know-that and know-how knowledge; specialised knowledge with systematic structures and weak grammar that is constructed within specific social and cultural contexts; and largely tacit structured knowledge. In each section, I have explained not only what craft knowledge is, but also why craft knowledge is understood from these perspectives. Based on the understanding of the nature of craft knowledge, I discussed the teaching and learning of this kind of knowledge through two relationships: the social relationships and material relationships. As discussed in the second section of this chapter, within social relationships importance is placed on the micro master-apprentice relationship and the macro social relationships in wider social communities. I have shown the importance of the inner relationships between human body, materials, tools, and equipment in the process of learning craft knowledge through embodied practice and the outer relationships shown in the material arrangements in the material space. Additionally, I have outlined that the focus of the thesis is on relations between humans themselves, humans and non-human elements, and non-humans themselves as well in an exploration of the process of craft learning and how material space and learning practice are constituting each other.

The social relationships between masters and apprentices and the wider social communities have been discussed in previous research about teaching and learning craft knowledge. Their role is concentrated on craft learning and the formation of social identity, the importance of observing and copying movements, and gestures of more experienced members. However, researchers seem to over-emphasise the social over the physical and material (Stephenson et al., 2020). It “leaves invisible the agency of spatial selves in working with material spaces to create new dynamics, new relationships” (Acton, 2017, p.1441). The physical and material effects in these spaces have slipped away from view (Mulcahy, Cleveland, & Aberton, 2015; Taylor & Spicer, 2007). The engagement of non-humans, such as materials, tools, and equipment, and how social communications are materialised are, however, under explored. Some recent research has started to pay attention to non-human aspects, such as the material space and environment, tools, and materials in human social communications and activities (Chan, 2020). This research will take this perspective and contribute more to this field, which allows exploration of how materials are embedded in the practice of learning, the social communication between the masters and learners, and how material space and environment is organised to generate and produce craft knowledge.

In next chapter, I will introduce the theoretical approaches that draw on new materialism to provider a deeper understanding of materiality, space, and time and how these concepts can help to explore the active participation of non-humans in and the material space of producing and generating knowledge.

Chapter 4: Thinking with New Materialism

This chapter outlines the learning of craft knowledge through a theoretical lens of new materialism. The role of this theory is to enable the researcher to think about the craft learning process through and with an existing concept rather to be applied directly. There will be three sections unfolding in this chapter. I will discuss the development of my theoretical framework and explain why I chose new materialism as an analytical approach first. In the second section, I will introduce the basic concepts of new materialism and in the third section, I will talk about how to understand craft learning through and with new materialism.

4.1 Why new materialism?

Before going into the research field, I was trying to apply Cultural Historical Activity Theory (CHAT) to my research as the analytical framework (Engeström, 1987; 2001; Foot, 2014; Jonassen & Rohrer-Murphy, 1999). CHAT was developed through the first generation of Activity Theory, which is based on Vygotsky's (1978) social cultural theory. The first generation of activity theorists mainly focused on three elements in a triangular, reciprocal relationship: subject, object, and mediating artefact. However, its analysis was limited to individuals. To overcome this, the second generation of CHAT took cultural and historical contexts into consideration, which was seen as a revolution. In this system, all individuals and actions are viewed as embedded into communities, and cultural and historical contexts (Engeström, 2001). This approach is useful when analysing the relationship between learners, communities, rules, artefacts, and social and historical backgrounds in learning activities. One of my research aims is to understand the relationship between potters, tools, materials, and the learning space. Therefore, this second generation of CHAT could be useful to my analysis.

Based on the understanding of the second generation of CHAT, I went to my research participants' studios, listened to their learning experience, and their relationship with materials, tools, and spaces. I found that all of them were talking in a particular way about their materials and objects. For example, 'you need to listen to the clay, follow the flow'. The materials and objects in their eyes were alive and played very important roles in their learning process. Though CHAT considered artefacts as an important part of sharing knowledge, it saw them as mediators of human communications and actions in social and cultural activities (Moura & Bispo, 2020). The focus was still on human social communications in the practice of learning, which is not where my data led me. Therefore, I turned my attention to 'material' and 'materiality', which directed me towards Tim Ingold's (2006; 2007; 2011; 2013) works. His views on the agency between the animate and inanimate and the perspective of the flow of materials felt exciting and aligned with my data. Through reading his works, the data itself gradually become clearer and clearer. I started to understand new materialism and how it explains the relationships through its special perspective.

New materialism challenges the traditional way of teaching and learning and allows consideration of materials and objects as not simply mediators for human intentions. Instead, they are actors participating actively in entanglements (Toohey, 2019). New materialism posits that knowledge is not just produced by humans, the materials, objects, and other matter are important participants in the co-construction of knowledge. Learning here is not just passive knowledge taught from teachers to learners, it is contained in intra-actions (explained in the section of 4.2) between different entities, including humans and non-humans. Therefore, new materialism provides a very good lens to consider and explain my data. It allows me to focus on human and non-human bodies, and engage these non-human actors, for example, materials, tools, equipment, time, and space into the learning process.

In the next section, I will introduce the basic concepts of new materialism and discuss the connection between my research and this theoretical approach.

4.2 What is new materialism?

Even though this theory is called new materialism, it does not mean or announce that this approach is totally new (St. Pierre, Jackson & Mazzei, 2016). It can be seen as a renewed interest in materials and materiality (Davis, 2014). It alerts us to think about our world and how we humans participate in the world which includes other non-human things differently (St. Pierre, Jackson & Mazzei, 2016). In Barad's words:

> […] creativity is not about crafting the new through a radical break with the past. It's a matter of dis/continuity, neither continuous nor discontinuous in the usual sense. It seems to me that it's important to have some kind of way of thinking about change that doesn't presume there's either more of the same or a radical break. Dis/continuity is a cutting together-apart (one move) that doesn't deny creativity and innovation but understands its indebtedness and entanglements to the past and the future. (interview with Barad, cited in Juelskjær & Schwennesen, 2012, p.16)

New materialism is built on the criticism of the previous hierarchical intellectual traditions which privilege human agency instead of recognising the agential forces of things (Bennett, 2010). New materialists reject the anthropocentric Cartesian dualism, which prioritises mind over body, human over non-human, separates nature from culture, and material from discourse (Barad, 2007; Bennett, et al., 2010; Braidotti, 1994; Coole & Frost, 2010; Fox & Alldred, 2015; Van der Tuin, 2011). New materialism emerges as a "new metaphysics" (Dolphijn & Van der Tuin, 2012, p.13) with its focus on ontology of being and epistemology of knowing. It critically re-thinks about matter, materiality, and the relationship between the material and social worlds, which humanism and social constructionism insufficiently understand (Lemke, 2015; Markula, 2019). Linguistic and social cultural constructionism reduces bodies, matter, and materiality to "a network of discursive regimes" (Schaefer, 2015, p.112). It does this by privileging humans, language, and discourse. By contrast, new materialism focusses its interest on the "dynamic interplay between language, sensing bodies and things in the world" (Schaefer, 2015, p.112). This redirection shifts the ontological, epistemological, ethical, and methodological orientation to consider how matter comes to matter, the relationship between animate and inanimate, and the power of things (Barad, 2007; Bennett, 2004; 2010).

In this section, I will introduce the ontological, epistemological, and ethical changes that new materialism brought to critique the traditional paradigm. Based on the understanding of the philosophy on which new materialism stands, I will introduce its important concepts (including agency, intra-action, matter and materiality, and time and space), which will help to understand how I considered and analysed my data.

4.2.1 Ontology and epistemology

In terms of ontology, new materialism challenges empiricism and positivism, which think that there is something existing out there which can be independent of other parts of the world (Markula, 2019). It also challenges social and cultural constructivism, which place emphasis on human communications, human social and cultural life, and language and discourse (Pennycook, 2020). Additionally, it considers non-humans as just in the background or there to accomplish and achieve human's purposes and goals (Toohey, 2018). New materialism argues that this anthropocentric paradigm focuses solely on what humans do, how humans communicate with other humans, and how social and cultural meanings are generated by human activities. It ignores that materials also act as forces in our world "to exclude, invite and regulate particular forms of participation" (Fenwick & Edwards, 2010, p.7).

Within new materialism, there is not a separated world out there as humans can never separate themselves from others. Additionally, humans should not privilege themselves over other non-humans. The world is not only represented in language owned by humans, but is rather dynamic relationships between different entities and materialities (Pennycook, 2020). There is no prior ontological essence, our society, culture, humans, animals, matter, and objects are all considered as relational. Studying matter involves thinking about what it does and how it acts with others, "what associations it makes", what agential capacities it has to affect others and to be affected by others, and "what consequences derive from" these interrelationships rather than what it is (Fox & Alldred, 2017, p.24). The being of everything is in the relation with others (Toohey, 2019). The world (including humans and non-humans) should be seen as dynamic interrelationships and entanglements without any priorities (Barad, 2007). Barad (2008) reconfigures it in terms of phenomena, which are described as "dynamic topological reconfigurings/entanglements/relationalities/ (re)articulations" (p.130). The human in the phenomenon is not theorised as "either pure cause or pure effect" (Barad, 2008, p.130). Humans can never stand outside of the world, rather they are implicated in relational materialities and these multiple relationships are within the complex causal structure (Barad, 2008). For example, when you sit and type, the phenomenon is taking place in the different materialities of the computer, desk, chair, your hands and body, light bulb, etc. (Hood & Kraehe, 2017). This relationship is dynamic and could be social, cultural, political, physical, psychological, and emotional (Fox & Alldred, 2017).

The practice of knowing cannot be isolated from the being and becoming, as Barad said,

> "Practices of knowing and being are not isolable; they are mutually implicated. We don't obtain knowledge by standing outside the world; we know because we are of the world. We are part of the world in its differential becoming. The separation of epistemology from ontology is a reverberation of a metaphysics that assumes an inherent difference between human and nonhuman, subject and object, mind and body, matter and discourse. Onto-epistemology – the study of practices of knowing in being – is probably a better way to think about the kind of understandings that we need to come to terms with how specific intra-actions matter." (Barad, 2007, p.185)

For new materialism, it is a misunderstanding to think that we can remove or isolate ourselves from the world in order to observe and learn as traditional positivism claims. Learning is not acquiring the objective knowledge produced separately. Knowledge is not exclusively produced by humans, produced in specific social and cultural contexts, and represented in the form of language and discourse. Knowledge is produced when we engage with our surroundings and the world (Ingold, 2013). Knowing cannot only be claimed as the privileged practice of humans, with nonhumans under their control to be used by humans (Davies, 2018). The entanglement between humans and non-humans produces change, dynamics, and new knowledge in unpredictable ways (Toohey, 2019).

In summary, new materialism challenges the traditional philosophical standing of positivism and social constructivism, which separates humans and nonhumans, privileges human power, and reduces materials to something just being used or mediated by human intention and human society. Its ontology and epistemology afford things the same status as humans and rethinks the agential power of things to participate in the process of knowledge production and sharing. Objects do not pre-exist as fixed entities to be observed. The boundaries between different bodies and entities are co-constituted and generated in their relationships. These relationships are not fixed and pre-determined, but change and "shift from within" (Haraway, 1988, p.595).

Ontology, epistemology, and ethics are inextricably entangled in new materialism (Barad, 2007). When conducting research, ethics is a very important issue to discuss. Next, I will introduce new materialism's ethical stance.

4.2.2 Ethics

New materialism regards everything in the world as related to each other ontologically and epistemologically, including humans and non-humans. We humans need to consider ourselves as always entangled and not separate entities with superior privileges. This is a re-consideration of ethics to destruct humanism, nature/culture, and humans/non-humans binaries (St. Pierre, 2013). Ethics, then, is how we listen to others and attend to responsibility to others through the production of 'intra-actions' (I will explain later in the section of 4.2.4) (Dolphijn & Van der Tuin, 2012; Nelson, Segall & Durham, 2021).

Barad (2007) introduced the word 'agential cuts' to explain how humans are entangled with non-humans and become responsible for these intra-activities. We are all part of the world but can only participate in part of the world, so there is always something that is excluded from these entanglements. The agential cut does not cut the world into binaries, instead it cuts it apart/together (Barad, 2007). It does not “seek to disentangle phenomena into discrete units but rather provides a temporarily stability to be studied within the frame of analysis or the conditions of study” (Sheridan et al, 2020, p.1279). How researchers decide to make these methodological cuts influences what is seen. New materialism asks researchers to take responsibility for the impact of research in the world they are part of (Haraway, 2016). Researchers can never put themselves outside of the world and act as innocent bystanders, they are responsible for the ongoing process of the world. They need to consider human and non-human’s complex entanglements and “recognise our methodologies as ethical acts that temporarily stabilize what and how we research through agential cut” (Sheridan et al, 2020, p.1279).

Barad’s (2007) ‘agential cuts’ suggest that research should be conducted and considered in terms of materiality and social conditions and situations in a particular time and space. Researchers cannot cut themselves off from or out of other entities (e.g., non-human elements) in the world. Researchers need to take responsibility for research through reflecting and rethinking all decisions that are made during research projects because they influence the findings and results significantly. Researchers need to reflect and be responsible for not only “the choice of a method to generate data and a method to analyse them but also the decision concerning whom to include in a sample and the decision to use a specific theoretical framework and method of transcription” (Höppner, 2017, p.6). This approach influences research ethics in practice.

It is not an independent or separate individual following fixed sets of rules and applying them into practice, “the realization of one’s identity, through establishing the moral values (or indeed measurements) with which to judge oneself and others, is no longer the point" (Davies, 2018, p.120). We are urged to think ethically about 'others', non-humans, animals, plants, material artefacts, etc., as what have been actively involved in reciprocal encounters (Coole & Frost, 2010; Thorpe, Brice, & Clark, 2021). Ethical practice needs to be considered in specific social and material situations beyond the already known and instead be regarded as including the open encounters with other humans and non-humans in the present moments (De Schauwer & Davies, 2015; Wyatt, 2014).

New materialism regards 'things' as powerful and agential entities, which were traditionally treated as passive and dead objects. When thinking about the power of humans or non-humans, there is always some discussion around 'agency'. It is therefore, worth discussing what agency is and who possesses agency from a new materialism perspective.

4.2.3 Agency

Through history, humans have constructed themselves as "a conscious, stable, unified, rational, coherent, knowing, autonomous and a historic individual who is endowed with a will, a freedom, an intentionality which is then subsequently 'expressed' in language, in action, in the public domain" (Butler, 1995, p.136). Humans were thought of as having agency as an inherent and innate attribute. They have the intention and ability to produce knowledge and the power to initiate action and take effect in the world (St. Pierre, 2000). It was taken for granted that humans had the ultimate power (or agency) over all other things, which we call objects (Hood & Kraehe, 2017). Objects were considered as inert, lifeless. They were possessed by humans (Nelson, Segall, & Durham, 2021).

Rather than reserving agency purely for humans, new materialists regard matter as powerful things with capacities to affect and be affected (Bennett, 2010; Carstens, 2019; Ivinson & Taylor, 2013). If humans can act on 'objects' or 'things', then 'objects' or 'things' can act on humans and push back, which in turn, influences humans to act and behave differently (Ingold, 2011). Nothing (human or non-human) can "possess agency", they "are rather possessed by action" (Ingold, 2011, p.97). For example, the practice of making pots is not comprised of materials being thrown by the potter before they act, it is in the action of throwing (Ingold, 2010). The agency is not independent capacities that humans or non-humans have and it's not related to human intentionality and awareness. This action of throwing is the process of intra-actions and entanglements (Barad, 2007). For example, a walking stick is not just simply used by humans, it has the thing-power to support humans and it becomes an extension of the human hands/body. The agency emerges in the intra-actions (explained in more detail in next section) between the walking stick and human, and unfolds in the walking stick's human-supporting intra-activity (Barad, 2007; Bennett, 2010; Tsing, 2015).

No matter what new materialists call themselves, post-humanist, agential realist, vital materialist, they all reject human centralism within the question of human subjectivity (Bennett, 2010). Additionally, they recognise "agency as being distributed across a far greater range of entities and processes than had formerly been imagined" (Coole, 2013, p.457).

While introducing the ontology, epistemology, ethics, and agency, I mentioned a word 'intra-action'. For clarity, I will now explain 'intra-action' as opposed to interaction.

4.2.4 Intra-action rather than interaction

Barad (2007) came up with the word 'intra-action' to replace 'interaction'. For her, interaction is situated in the paradigm of the traditional dualism, which implies that things are independent and separate entities and necessities the pre-established existence to take part in the actions with each other. Alternatively, intra-action is a "conceptual embrace of difference, of the multiplicitous possibilities embedded within the universe's unfolding" (Nelson, Segall, & Durham, 2021, p.4). It is a "participation with/in and as part of the world's differential becoming" (Barad, 2007, p.361). Intra-actions recognise that distinct and separate agencies are not pre-existing, but emerge through entanglements (Barad, 2007). These entanglements are not just separate entities joining together, rather meaning is constituted within the entanglements and intra-actions between human and non-humans (Kuby, 2019a; Rowsell & Shillitoe, 2019; Wohlwend & Thiel, 2019). Within this understanding of intra-action, agency is not a specific inherent property of human or non-humans (Hickey-Moody, 2020). Instead, it is a "dynamism of forces" (Barad, 2007, p.141). For example, when drivers are driving on the road and encounter a speed bump, "the coalition of forces that shape the structure of action is not limited to the driver's sense of agency; the activity of driving—and of being-in-the-world in general—always involves our transactional relation with the artefactual environment in which we act, and acts with us" (Ransom, 2019, p.34).

Intra-action in new materialism implies the entanglement between different materialities. The concern is not setting up the boundaries between humans and non-humans, but in the relations where things can happen without humans' direct engagement (Barad, 2007). It opens the exploration of multiple possibilities in the relationship between different entities including humans and non-humans. For new materialists, humans and non-humans all intra-act in their own materiality. It is important to know what materiality is in new materialism. I will talk about 'matter and materiality' in the next section.

4.2.5 Matter and materiality

New materialism recognises matter as an important aspect in our everyday life. Barad (2003) argued, that "Language matters. Discourse matters. Culture matters. But there is an important sense in which the only thing that does not seem to matter anymore is matter" (Barad, 2003, p.801).

Matter is defined by Barad (2003) as a "substance in its intra-active becoming—not a thing, but a doing, a congealing of agency. Matter is a stabilizing and destabilizing process of iterative intra-activity" (p. 22). It is not "an inherent fixed property of abstract independently existing objects of Newtonian physics" (Barad, 2003, p.822). It is rather always in relational and constant flux (Bell & Vachhani, 2020). The historical, dominant view that considers things as in a fixed form fails to acknowledge the agential power, the dynamics, variability, and vibrancy of matter (Ingold, 2012). Matter here is not viewed as an inert, static, passive, and dead substance or the mere backdrop for human activity. Instead, it is alive and active. Matter acts, affects, resists, and remembers (Dolphin & van der Tuin, 2012, p.16). Acting on and affecting others are not the preserve of human's special characteristics and capacities, but are also influenced by matter and emerge and are produced through intra-actions with matter. New materialism invites us to rethink the vital forces of matter (Bennett, 2010). For new materialists, everything is material, people are things too. Humans are also always in the process of becoming and entangled with others all the time (Pollard, 2004). Just as matter and things are. There is no ontological difference between humans and matter.

There are many interpretations of the concept of ‘materiality’. Tilley (2007) defined materiality as brutal, for example, a stone is a lump of formless matter. This brutal materiality is a process of form and meaning given within specific social and cultural contexts (Tilley, 2004). Jones (2002) considered the notion of materiality as “the material or physical component of the environment” (p.168) and emphasised how the physical and material components are “enrolled” in human lives (p.182). Boivin (2008) uses materiality to describe the physicality of the material environment which provides opportunities and potentials to humans’ activities. All these explanations of ‘materiality’ focus on how matter and materials are just used and appropriated by humans (Graves-Brown, 2000). Through new materialism, materiality is understood as “always something more than ‘mere’ matter: an excess, force, vitality, relationality, or difference that renders matter active, self-creative, productive, unpredictable” (Coole & Frost, 2010, p.9). It is never just fixed physical and material properties and components, “but an ongoing material formation and discursive construct, co-constituting in reference to its material environments” (Höppner, 2017, p.2).

As already discussed, materials or matter were historically considered as dead, passive things used by humans within social activities. By contrast, through new materialism, matter and materials are regarded as active actors in intra-actions with humans. New materialists posit that “the vitality, wilfulness, and recalcitrance possessed by non-human entities and forces” enables them to “act as quasi agents or forces with trajectories, propensities, or tendencies of their own” (Bennett, 2010, p.47 and viii). New materialism pays attention to what bodies and matter do, not what they are. The focus is on matter or a body in motion (Fox & Alldred, 2017; Markula, 2019). It emphasises the process of materials taking different forms and what happens during this process, rather than the end result (Ingold, 2012). Every material has an ongoing historicity, they are not just attributes, they have their own historical trajectory of becoming (Ingold, 2011; Ransom, 2019). What needs consideration is the process of becoming, rather than just its potential or final form. The relationship and process are "not between matter and form, but between materials and forces" (Deleuze & Guattari, 2004, p.377). These relationships emerge through spatially and temporally dispersed encounters between human and non-humans (Masumi, 2002). In the next section, I will discuss how space and time are understood in new materialism.

4.2.6 Space and time

For Barad (2014), before intra-actions, nothing pre-exists or is pre-fixed. Everything is an ever-present and vibrant becoming entity and all possible relations and specific entanglements emerge within specific phenomena. The present is not just simply here-now, it starts from the past and is constituted in the future. In Barad (2014)'s words:

> Now is […] an infinitely rich condensed node in a changing field diffracted across space-time in its ongoing iterative repatterning. (p.169)
>
> […] the past was never simply there to begin with and the future is not simply what will unfold; the "past" and the "future" are iteratively reworked and enfolded through the iterative practices of spacetimemattering. (p.181)

Within new materialism, there is no determinate relationship between the past, present, and future. Time is not thought of as a linear connection which can be set out in an ordered fashion. Chronological time is replaced by temporality which entails more complex relationships (Braidotti, 2010). Space in new materialism is understood as not being pregiven and fixed, rather involved in different intra-actions. It plays an important role in “the unfolding of events” (Barad, 2007, p.224). Space is a “sphere of relations, negotiations, practices of engagement, power in all its forms” (Massey, 2005, p.99). Space becomes meaningful through these intra-actions (Jones & MacLeod, 2016). New materialism considers space as something we engage with, rather than something we already have which “affords acknowledging the multiplicity, mutability and mutual inclusivity of spatial and pedagogic practices” (Mulcahy, 2018, p.13). This way of thinking supports my analysis of space through its consideration as a relational and embodied practice, embedded in reciprocal and multiple intra-actions between humans and non-humans. This allows me to involve the agential power of material objects and artefacts and how they are engaged in the learning space. It expands the field for “the possibility of the existence of multiplicity in the sense of contemporaneous plurality” (Massey, 2005, p.9).

I have introduced the philosophical standing and some basic concepts of new materialism, to aid understanding of how new materialism is used in this research. In the next section, I will talk about how new materialism understands learning through intra-actions, the relationship between different entities and their encounters, and learning in particular times and spaces.

4.3 How to understand learning through new materialism

New materialism allows us to rethink and reimagine the conventional ontology about teaching and learning, subject and object, discourse and matter, language and practice, time, and space (Juelskjær, 2020). The learning process, through new materialism, is understood as the ongoing intra-actions between heterogeneous bodies and materialities rather than appropriating specific knowledge (Johansson, 2016). It involves the competence, skills, and knowledge shift from something that can be acquired to the entangled becoming between forces without pre-existed beginnings or a fixed end (Johansson, 2016; Juelskjær, 2017). Learners "do not superimpose meaning on a world ('nature' or 'physical reality') that pre-exists apart from ourselves, for to live we must dwell in the world, and to dwell we must already relate to its constituents. Meaning inheres in these relationships" (Ingold, 1994, p.222).

Art theorist Barbara Bolt (2013) discussed how this new concentration on the material relates to the creative arts, since its "very materiality has disappeared into the textual, the linguistic and the discursive" (p.4). She points out that "art is a material practice and that materiality of matter lies at the core of creative practice. Dance, theatre and fashion, as embodied practices, engage the matter of bodies" (Bolt, 2013, p.5). This material turn draws attention to the active participation of materials in the creation and production of art and craft works, which were traditionally considered as social and cultural transformation and expression of artists' and craftspeople's inner thoughts. Craft production involves the synergy of human, tools, and raw materials embedded in a changeable environment (Ingold, 2001). The practice of craft happens when craftspeople communicate with tools, materials, and the environment in a particular mode (Nasseri & Wilson,2017). The learning of craft focuses on the intimate connection between hands and materials. Craftspeople have contact with certain materials, tools, and specific equipment every day in their practice. They have specific conversations with these materials and feel their materiality. Materials, tools, equipment, and other non-human elements are essential for their daily practice, social activities, and the teaching and learning craft knowledge.

Materials and bodily practice are entangled and cannot be treated separately (Le & Spee, 2015).

When making things with their hands, craftspeople have contact with materials through body senses which includes the relationship between gestures and meaning behind the moment of making (O'Connor, 2017). Contrary to human dominated agency, both human and non-humans are all agential forces within the entanglements. Non-humans affect and are affected, and as well as humans. We cannot always see the forces of visible things, we need to feel how their agential forces affect our body and are affected through embodied intra-actions (Chen, 2012). There is feeling and sensation when craftspeople engage with materials and tools in the making process. Through this embodied practice, there is a flow through the body to the matter and through the matter to the body. New materialism provides a lens to explore this sensory experience, which is "held to occur below the threshold of consciousness and cognition and to be rooted in the body" (Ley, 2011, p.443). This is what Fuchs and De Jaegher (2009) called the 'participatory sense making process', which is the resonance between makers and materials so that they participate in each other's sense making, and the active engagement and entanglement of materials in the whole process.

New materialism considers human body senses as important sources to produce knowledge. This provides a lens for craft to explore the embodied learning through body senses.

> The most compelling contribution of the new materialisms is not conceptual or analytic, strictly speaking, but sensory. The attempt to attend to the force of liveliness of matter will entail not just a reawakening or redirection of critical attention, but a reorganizing of the senses, departing from the limitations of the Aristotelian model. (Dana Luciano in interview, Roudeau, 2015, p.7)

Here, matter is various and always in flow. To know materials better, we need to follow their flow, listen to how materials ‘speak’, to resonate with them, and in the process of resonance, use our sensory body to ‘feel’ and ‘sense’ them. This embodied engagement with matter is involved in the flow and circulation between objects and humans. It surpasses “thinking-humans” or human consciousness, and instead considers “a being of sensation” and a becoming in relationalities (Grosz, 2009, p.86). New materialism stresses on something “which is felt before it is thought…[which] brings the sensory capacity of the body to the fore…[which has]…the capacity to disrupt habitual and entrenched ways of thinking” (Hickey-Moody & Malins, 2007, p.8). It is not only humans who have the capacity to affect others, matter also can affect humans (Ahmed, 2001). Materials have the intricacy to engage us in exploring deeper meanings regarding materials, the self, the world. Makers and learners construct and produce new knowledge through experiencing the vibrancy and movement of materials, where the first-hand sensitivities are developed to help them find the “causal structures underlying what they do” (Garber, 2019, p.7).

New materialism provides a good way to take into account both humans and active materials when thinking about how the phenomena of learning occurs through body senses, how craftspeople share their embodied knowledge with each other, what roles different non-human elements play in the learning process, how the intra-actions between craftspeople and non-human elements affect their learning process, and how craftspeople become more experienced in craft practice. In the next section, I will explain my research through new materialism and how this aids understanding of the dynamic encounter between different bodies and materilities in the learning process and how it helps to explore entanglements in particular moments and spaces to make certain learning happen.

4.3.1 The dynamic relationship between different bodies and materialities

New materialism offers a tool to re-examine and re-think human agency and the relationship between humans and non-humans by "paying attention to corporeality as a […] series of emergent capacities" and focusing on the active non-human matter to arouse "visceral responses and prompt forms or judgment that do not necessarily pass through conscious awareness" (Coole & Frost, 2010, p.20). New materialism also produces an alternative way of thinking about non-humans as sites of knowledge by focusing on their relations with others (Bell & Vachhani, 2020). Knowing and sensing here is not just produced by humans and therefore situated in human practice, it is distributed in different entities between humans, non-humans, and objects. Materials, objects, and other matter all embody knowledge. They all have a form of agency and actively participate in the process of learning (Bruni, Gherardi, & Parolin, 2007).

This perspective allows the consideration of human physical and experiential bodies and non-human matter as active actors to be engaged in the phenomenon of learning. It helps to understand how bodies and materials are mutually intra-acted in repeated intra-activities to produce knowledge and influence the learning process (Barad, 2017). It is pedagogic between these entanglements, humans learn with matter and materials (Page, 2018). The properties of materials cannot be identified as fixed components, "they are neither objectively determined nor subjectively imagined but practically experienced. In that sense, every property is a condensed story. To describe the properties of materials is to tell the stories of what happens to them as they flow, mix and mutate" (Ingold, 2007, p.14). Rather than perceiving the world from the perspective of form and shape, it is experienced as a series of gestures and actions (Ingold, 2011). It provides a perspective to explore dynamic encounters between different actors, including humans and non-humans.

4.3.2 Learning within time and space

Learning is the phenomenal effect in the present, situated in a specific space, and occurring within the particular entanglements between different actors (Taguchi, 2009). This phenomenon is "material entanglements enfolded and threaded through the spacetimemattering" (Barad, 2010, p.261). Learning is always enacted through specific entanglements and is specific to "the experience of the corporeality of the body's time and space [in the process]" (Ellsworth, 2005, p.4). There is no linear relation between cause and effect, the indeterminacy keeps the door open for lots of possible effects and causes. Learning knowledge is never to just repeat the prior knowledge. It is re-constituted from past knowledge in the intra-actions between different entities happening 'now' and providing more opportunities for future re-constitution of the knowledge. The "past is not closed, that temporality is not given or fixed, that each materialization in its specificity is re-membered" (Interview with Barad, cited in Juelskjær & Schwennesen, 2012, p.21). The learning here is not an individual affair. It is not fixed in one phenomenon that happened in one moment of time, located in one fixed place. It helps to understand learning and sensing as multiple, specific spatio-temporalities or space-time-mattering (Juelskjær, 2020). The phenomenon of learning is ongoing re-configurations in space-time-mattering.

Learning “does not simply take place in space, but rather is produced with space; as an interactive, connected field” (Hickey-Moody & Malins, 2007, p.10). What and how we learn is related to “how we are touched by what we are near” (Ahmed, 2010a, p.30). The effect is determined by how our bodies are oriented towards certain things and the “proximity between bodies and objects as things that matter” (Ahmed, 2010b, p.235). The learning outcomes in specific spaces are not pre-determined but are open to change. They include longitudinal entanglements in specific phenomena with particular entities, for example, clay, tools, and equipment. Knowledge is renewed and re-constituted in every entanglement and a habit is formed. The process of forming a particular habit is the effect of co-constitution through specific space-time-matter intra-action. New materialism does not think habits are mechanical behaviours in response to a stimulus. They are meaningful (re)configurations containing the specific situation of particular entanglements through certain time and within certain spaces. If we do not understand habits as fundamentally meaningful and coming into being with specific significance, then we miss the point of material culture and the intra-actions between different entities (Ransom, 2019).

In summary, new materialism allows the consideration of learning as the forming and reforming of phenomena through active intra-actions in specific spatio-temporalities (in particular moments and space with specific entanglements and different materialities). Time and space are never fixed. Learners learn their skills and renew their knowledge through repeating specific intra-actions with others. This provides a perspective to explore how craft knowledge is learnt and developed in the studio space.

4.4 Summary of the chapter

Within this chapter I introduced new materialism's ontological and epistemological understanding of humans and non-humans. I explained the main concepts of new materialism's approach: agency, intra-action, matter and materiality, and space and time. New materialism considers humans and non-humans as having relational encounters, which are entanglements. Non-humans are not considered as inferior to humans or as objects to be used exclusively for human benefit. They have agential capacity to affect humans and the world. This perspective affords a special lens to understanding knowledge and learning as co-produced and co-generated in the entanglements between humans and non-humans. It allows the discussion of how non-humans actively participate in learning activities and processes. Here, the encounters are not only limited to humans themselves or humans and non-humans, there is consideration of the relationship between non-human themselves. This provides a good explanation to explore the dynamic relationships produced in the learning process, which are easily ignored by humans but are important in learning particular knowledge. Space and time, under new materialism, are not prefixed and predefined, rather they are a process constituted in the entanglements between humans, non-humans, and space itself. It goes beyond human social relations, allowing the exploration of how knowledge is produced in certain material spaces, for example, the potter's studio.

In conclusion, new materialism affords greater opportunities to answer my research questions from multiple perspectives, humans, non-humans, time, and space. New materialism not only provides a theoretical framework within which to analyse the data, but also offers a way of thinking and reflecting during the research process. It made me consider how researchers and humans habitually make decisions and take responsibility for cutting ourselves off from other parts of the world and how we could think differently within contexts that include humans and non-humans and the social and material world (Barad, 2007). It keeps the result open and affords more possibilities to what the research can become. It changes and transforms through the relational entanglements between humans and non-humans, between the social, cultural, and the material. This gave me more confidence in my research, especially when I considered changing the method of data analysis. New materialism provided greater potential for the generation of different data, hearing different voices, and the transformation of methodology and methods. This transformation will be discussed in next chapter of research methodology.

Having introduced new materialism, and explained its theoretical approach, I will now discuss my research methodology and explain how new materialism affected the process of data collection and data analysis.

Chapter 5: Research methodology

This research methodology chapter does not unfold in the traditional fixed way of following a trajectory of linearity starting from the research design, through to data collection, then ending with the data analysis. Instead, I show the (re)constitutive trajectory of my research and how my research methodology, positionality, and specific research methods shifted and changed through the research process, which affected data generation and analysis. There was no fixed beginning or end. The whole process was a journey of constant construction and deconstruction. In this chapter, I will start with my shifting assumption of ontology and epistemology, which influenced my methodology consideration. Then I will introduce and discuss how the methods were affected by the process of conducting the research itself, how different methods were used to generate different data, and the ethical issues around doing this research. Later I will show how I, as a researcher, positioned myself differently through the whole process. Finally, I will show how I worked with my data.

5.1 Ontological and epistemological tensions

Assumptions about ontology and epistemology are considered methodological issues and are concerned with how researchers conduct research using particular methods (Cohen, Manion, & Morrison, 2011). Ontology and epistemology make up the foundation of how to explore the research questions and design and conduct research. Therefore, this section will clearly state the philosophical position underpinning this research.

In last chapter, I outlined my journey of finding a theoretical approach for this research and introduced new materialism and its ontology and epistemology. As explained, I underwent a process of considering different theories to understand my data and through that journey my theoretical position was transformed. Here, I will discuss how my research position was transformed, how this transformation affected my research, data generation, and analysis.

5.1.1 The transformation of my philosophical position

Ontology is concerned with theories about being. It raises basic questions about the nature of reality and the nature of human beings in the world (Denzin & Lincoln, 2011). It is the study of things that exist and the study of what exists (Latsis, Lawson, & Martins, 2013). In regard to 'being', the following questions need to be answered: is there a fact or truth that exists separate from human mind and what is that fact or truth?

When I started to think about my research positionality, I was influenced by the paradigm of being, and I spent lots of time thinking about whether facts or truths exist in the world or not. I tried to find one suitable philosophical position, for example, social realism, or social constructivism, for this research. I felt that in doing so I would get strong 'support' from that theory and develop a convincing research methodology and methods to conduct my research and collect and analyse my data. Then I discovered post-realism. In that moment, I realised that there was a fact/truth that existed in the world outside of the human mind. For example, a stone exists in the world with a spcific colour, pattern, and shape outside of human thinking. However, we live in the human society where the reality exists and connects with social actors, both participating in the construction of the social world. Based on this ontology, full appreciation of truth is difficult to gain as understanding is influenced by hidden variables and a lack of absolutes in nature. My philosophical position at the start of my research was based on this understanding of reality and the world. However, when I started to conduct the research interviews and talk to experienced potters, my thinking began to slowly change.

When I visited my first participant, he told me his thoughts and stories. He took out a stone (see image 1) from his drawer, and said:

> This is new, you can see the layers, it's very smooth, and you can see the different layers, and those layers were elementarily laid down for over hundreds and thousands of years in the sea. This is from the sea until they were broken up and then eroded. (It was) just a big rock but became this pebble for me. I found it on the beach, and I think it's really a quite beautiful thing, and the hole, I didn't draw a hole, it's already there. It's an original one, you can see that, it must be a little vegetable material or something, that got into it and laid down in the sentiment, and then over years, its worn away, it came out. I think the processes involved in what make that piece of stone in that shape over time, that narrative is its own story about what happened to it... it has value, not imposed value. It has value in what it is, what it says.
>
> (Participant Q)

Image 1: The stone with its own historicity and stories

This conversation made me realise that this little stone was not just an object lying on the beach waiting for a human to pick it up, interpret it, and find its value and beauty. It always had flow and movement through its connection with the sea, sand, some non-human creatures, and/or materials over time. It has its own stories and historicity distinct from any human interpretation. During the process of conducting my research, I heard lots of different stories from research participants and observed their making processes. These conversations made me think differently and I could not ignore this materiality and the connections in the world anymore. Then I met new materialism. New materialism opened up a new way of thinking and made me consider the basic philosophical questions of doing research differently. Through taking a new materialism stance and thinking through the data, my position gradually transformed. This was then reflected in my methods of generating data in the later stages of my research, which I discuss in the section of 5.2.

New materialism prefers a ‘flatter’ ontology (Hultman & Lenz Taguchi, 2010; MacLure, 2013a). They believe humans are “not separate from the world. Being in every sense is entangled, connected, indefinite, impersonal, shifting into different multiplicities and assemblages” (St. Pierre, 2013, p.653). Here, assemblage refers to humans and non-humans as what always assemble with and connect with others. They reject binary logic and consider humans as rational beings who can represent reality objectively. Instead, they consider the world through the logic of connection and of ‘becoming’. Through new materialism, ‘what it is’ becomes an “instituting question of philosophy” (Spivak, 1974, p.xvii, quoted in St. Pierre, 2013). It is the “basis of objective descriptions” (p. lvii). New materialism advocates connections, movement, and becoming rather than opposition, categorisations, and being (St. Pierre, 2013). New materialism influenced how I thought about ‘being’ and ‘knowing’. New materialists believe existence cannot be separated from the materiality of our world and existence from the perspective of whether it is separated from human mind is viewed as problematic (Barad, 2007). Everything in the world is entangled and relationships are not reliant on humans. I started to think about 'becoming' rather than 'being', how everything connects to other human and non-human elements, and what they do in these connections. "The material is not purely produced by human intention, nor does human agency pre-exist or transcend the material: they mutually constitute one another" (Jackson, 2013, p.744). There is a need to give up linearity to "encounter zigzagged multiplicities" in the world (Singh, Southcott, & Lyons, 2021, p.13). Predefinition of existence before its intra-activities is problematic. For example, it is not possible to predefine what is a woman/man from sexual, cultural, historical, or political determinations as it depends on what the woman/man is doing or how they are intra-acting with other materialities.

My understanding about being and knowing was, therefore, affected through engaging with the data and new materialism. Thinking and rethinking about the concepts around philosophical paradigms allowed me to produce something different that was an "improvisational inquiry" (Carlson et al., 2021, p.154). This transformation affected how I continued generating my data and how I considered the data and analysed it. In the next section, I will introduce the research methodology through the lens of new materialism.

5.1.2 New materialism methodology

New materialism is a theory, methodology, and political position that provides a way of exploring the entanglements and intra-actions between different materialities, (Van der Tuin, 2014). Based on its onto-epistemology, new materialism is not aligned with the rigorous and objective hypothesis tools that underpin quantitative methodologies (Markula, 2019). It questions whether data can be purely unbiased, rational, and objective, through the removal of the researcher (Brinkmann, 2014; Toohey, 2019). New materialism also argues for the inclusion of the co-implications of non-human and humans in the world. This places it at odds with conventional qualitative research. For them, the traditional qualitative methodologies did not “break with many of the assumptions of a methodological positivism” (Steinmetz, 2005, p.45) or give up the “representational and binary logics” (Lather & St. Pierre, 2013, p.630). It failed to discuss the “vague, diffuse or unspecific, slippery, emotional, ephemeral, elusive or indistinct” which are constituted in our daily life (Law, 2004, p.2). The traditional paradigms privilege humans and language as research tools over non-human elements, separates “the researcher from what s/he observes”, and the “rational/powerful researcher” dominates over the “subordinate, passive object of research” (Davies, 2018, p.115).

New materialism resists this linear relationship of cause and effect through fixed and scripted methodologies (Kuntz & Presnall, 2012). Rather it rethinks “causality as entanglements with surprising effects” as “unpredictable novel possibilities are always emerging” (Fenwick et al. 2015, p.123–124). It also emphasises the non-human actors in research, viewing researchers as just a part of the research (Ruck & Mannion, 2020). “The pedagogic and methodological potency is in the relationality of the research assemblage and not the centring of humans’ interpretations of it” (Charteris, Nye, & Jones, 2019, p.921). The “researcher, research apparatus, participants, and virtual audience intra-act in non-prescriptive ways” (Wolfe, 2017, p.431). It is problematic to have a prescriptive procedure or guidance that imposes the researcher’s point of view on the data to make sense of it through the so called scientific, logical, and reasonable inquiry (Coleman & Ringrose, 2013; Fox & Alldred, 2013; Masny, 2013). Focus should not be on what things are but on intra-actions and capacities to act that things can produce through their affective flow (Deleuze, 1988). Therefore, researchers should consider what strategies can "adapt its methods to attend to affective flow" (Fox & Alldred, 2015, p.402). Research should not "refer to or repeat an existing structure, essence, truth or judgment…it does not exist prior to its arrival; it must be created, invented anew each time …" (St. Pierre, 2019, p.9). The notion of methodology here is enquiry without "strict boundaries or normative structures—methodologies that might begin anywhere, anytime, but by doing so can create a sense of uncertainty and loss (or mourning of stable, fixed, pre-conceptualized, or historical knowledge)" (Koro-Ljungberg, 2016, p.1).

This critical enquiry allowed me, as a researcher, to rethink the research methodology by "re-assessing who and what are at the research scene […] and how we study these" (Sheridan et al, 2020, p.1279). Here, the research does not only focus on or hear one voice as the essence (Rousell, 2019). The voice is no longer an "innate attribute of an individual human being" (Mazzei, 2013, p. 734). This methodology creates more opportunities and alternative approaches to consider the entanglements between researcher, participants, research tools, images, videos, and other research apparatus in the research scene. Conventional qualitative methodologies normally do not fully provide such affordance. Through this process of (re)thinking, research "becomes a transindividual and impersonal enactment of process, a becoming-research that always exceeds human intentionality and consciousness" (Rousell, 2019, p.892). This methodology encourages researchers to be active in the research and consider the dynamic relationship between humans and non-humans in the process of researching with uncertainty (Carlson, 2021). This is different to conducting research within a fixed, stable, and pre-conceptualised order. Instead, things and relationships are indeterminate which involves difference and connection. This enables the explanation and discussion of "what might be rather than what will be" (Carlson et al., 2021, p.155). It does not deny the important roles that conventional methodologies play in conducting research, but invites consideration of how to "think and do inquiry outside the normalized and taken-for-granted practices so common within humanist research methodologies" (Lester, 2021, p. 220). It allows room and space for producing something new by considering the affective flow between all human and non-human assemblages (Andersson, Korp, & Reinertsen, 2020).

The shift in my methodological position affected how I conducted my research, the different ways data was generated, and how I analysed the data. In the next section, I will discuss data generation and demonstrate how this was gradually transformed and changed.

5.2 Research methods

Before I understood the new materialism methodology, I began my process of 'collecting data' based on the ontology and epistemology of post-positivism. At this point I understood truth as something that existed out there in the world that was limited to specific social, cultural, and historical contexts. This made it difficult to know what the real truth was. Under this approach the researcher endeavours to not project their values onto the research participants, and tries to understand the relationship between the research participants' values, history, power status, cultural, and social background to get closer to the truth. At this point my research was a social process of discovering the underpinning social and cultural structures behind the learning of pottery skills. Guided by that assumption, I planned to use qualitative methodology and ‘collect’ the data through interviews, observations, and documents/texts. Therefore, I started to conduct my research and produce data according to that research design and plan. However, the process was affected by multiple elements. I did not strictly follow a pre-planned research design, rather I kept methods open through the ongoing encounters between different human and non-human assemblages. In this section, I will show how my thinking and therefore, my data were transformed through new materialism.

5.2.1 Intraviews

5.2.1.1 Intraview rather than interview

In chapter 4.2, I introduced new materialism and how interaction is understood differently from intra-action. New materialist researchers started to reflect on the use of ‘interview’ and shift it to ‘intra-view’ (Kuntz & Presnall, 2012). Under the traditional approach of interviews, the conversations between the researcher and participant are stressed. Interviews are recorded then transcribed in the form of texts that are visible and can be seen (Kuntz & Presnall, 2012). Language was considered as a tool and medium to construct reality and produces knowledge (Jónsdóttir, 2011). Techniques for a ‘good interview’, represented in textbooks, were, for example, probing, questioning, and listening carefully to understand what participants think and have experienced (Ezzy, 2010). This logic interviewing was legitimated and normalised in daily research practice. It became the rule and norm that researchers needed to follow (Kuntz & Presnall, 2012). This traditional way of thinking was criticised and challenged by new materialists.

New materialists think ‘interviews’ do not capture what is beyond the narratives of human conversations between researchers and participants (Juelskjaer, 2013; Renold & Mellor, 2013). In new materialism, researchers and participants are no longer regarded as the only subjects, but assemblages within multiple relationalities and encounters (Kuntz & Presnall, 2012). New materialists “acknowledge all the components present in the doing” (Johansson, 2016, p.457). Intraview is used to challenge the traditional ‘interactions’ between discreet elements in the “system of separations and divisions” (Hultman & Taguchi, 2010, p.529). This logic of thinking and knowing with new materialism “foregrounds the embodied and emplaced nature” of research (Kuntz & Presnall, 2012, p.733). Research is a lived experience and data is alive. We researchers are engaged in the field with our whole self, including our body and emotions, as well as our logic and rationality (Sergi & Hallin, 2011). During intraviews, researchers are always affected by others, including human and non-humans. This goes beyond what can be seen and told through verbal and written communications. What is sensed by researchers in the process always affects actions, and therefore, influences the data and knowledge co-created (Ezzy, 2010). This process is not a linear step-by-step procedure but always goes back and forth in the multiple entanglements (Sergi & Hallin, 2011).

My knowing and doing in the field was not a process of following the preplanned structures strictly. It was always affected by various entanglements between me, the participants, the material, the space, and others. I have experienced a transformation of knowledge during the process. In next section, I will introduce the journey of myself changing in the process.

5.2.1.2 My journey of transformation from interview to intraview

This research expects to explore the experience and process of craftspeople learning craft knowledge. To find out how potters develop craft knowledge and why particular type of knowledge has been formed, I intended to use 'interviews' to listen to craftspeople's stories. I mainly focused on their educational and work background in pottery, the development of their craft knowledge, and their teaching experience if they have (please see details in appendix 5).

The voice of the pottery learning experience was initially drawn from the semi-structured 'interviews' conducted with 20 UK studio potters. I began recruiting participants through the introduction and contact details of ceramicists within a brochure from an Arts Council of England funded ceramics exhibition. I viewed every ceramicist's website and sent them emails introducing myself and my research and invited them to be part of my research. I got seven respondents who were very happy to have a conversation with me. I also asked if they were willing to participant in my research and additionally, if they could provide some names of experienced potters' they were familiar with who might be a good fit for this research project.

All participants had at least 5 years' experience in making ceramics, with most having more than 15-20 years' experience of working in the ceramics field. They all had their own studios independently or collaboratively with other ceramicists and made their living through ceramics rather than ceramics being their hobby. They all had their own special stories and multiple journeys of learning and teaching ceramics (see table 3 in appendix 7). Six participants had undergone industrial apprenticeships in ceramics factory. Two participants had learnt pottery in their families since childhood. Four participants had been trained through being apprentices of experienced potters and working in their studios. 13 participants had attended formal craft-based courses. Two participants learnt their skills through attending different short courses. All of them kept developing their skills through learning from other potters, through videos and TV shows, and through practising in the studio. 13participants taught different forms of ceramics courses: eight taught short courses in their own studios; two taught part-time or full-time courses in formal higher education institutions; one taught in a school; and one offered apprenticeships in his studio.

Before talking to each participant, I checked the participant's website, and any relevant online information. I had already emailed them the participant information sheet and consent form which introduced my research and their participation requirements and rights. I had a list of a few broad questions to ask the participants, which they were given in advance (see appendix 5). The questions covered where and how they learnt their pottery skills, the relationship between them and the people they learnt from, and what influenced their learning experience (socially, culturally, politically, historically). The questions for each participant were slightly different according to what I had learnt online about their experience and dependent on our conversation during interviews (see appendix 5). Thirteen were conducted in participants' studios and seven were conducted online due to COVID-19 restrictions. Each lasted for around one hour and was recorded and subsequently transcribed.

I started my first 'interview' underpinned by conventional inquiry theory which focuses on communications between researcher and participants. I went to my first participant's studio and tried to engage in conversation with him. My expectation was that we would sit down together and I would ask questions and listen to participant's answers. However, things turned out differently. As we were in his studio he was excited to talk to me and show me his pots, tools, materials, and the photographs he took when learning pottery. I noticed a broken pot (shown in image 2) and was very curious about it. He started to show me the process of dealing with this situation. He told me that he did not see it as a disaster or a failed pot and so did not throw it away. It had its own history and value even though it probably would not be seen as acceptable by the public. It could still express itself in a different way. The participant illustrated how the process of making a pot is not a static procedure of 'printing' the idea/design into the clay. Something unexpected could happen at any time. It is a process of potters listening to the voice of the clay and each pot and communicating in that moment. Both the potter and the pot are being transformed through the conversations between them. For this participant, this broken pot was not a failed pot, instead he deconstructed the traditional standards by which the value of a pot is judged and opened up a new perspective and space where something new and meaningful was created.

Unexpectedly, this was never a static process of sitting on a chair and communicating through spoken language, but a flow between the researcher's and participant's bodies, tools, and objects in the space of his studio. It was this special experience that allowed me to notice the constitutive forces of non-human elements in affecting the making process in ceramics and the research process. During those moments, I felt I needed to take pictures and videos of what he showed me to catch the process and moments happening in the 'interview'. After I got the participant's permission to take photographs and videos, I recorded these processes on my phone, and the participant subsequently sent me a lot of pictures about his work and some articles about him that had been published in ceramics magazines and journals.

Image 2: The broken pot

The first experience made me rethink what counts as data and how data is generated. It was not just a dialogue between me and the participant, but affected much by the space, materials, tools, equipment and so on. Everything carried its past historities and memories, such as, the broken pot, the participant, me, the space of the participant's studio. Those engaged into the present moments of multiple entanglements and data was generated. It was in various relationalities. This showed when I talked to my other participants as well. For example, one participant told me in the middle, "I just thought that (a reflection on potter's learning experience) while we are talking, thank you for coming". The data generated here was not the representation of an objective memory about past experiences, with the researcher as an objective listener. It was the result of the mutual communications between the researcher, participants, materials, artefacts, and others. The conversations with the researcher reshaped their memory of experiences with their teachers, materials, and tools. The data was constituted and produced through the researcher, the participants, and the non-human elements in that specific time and space.

The relationships that I, participants, matter, the studio constructed in the process made me start thinking that attention should not be restricted to spoken conversations between participants and researchers, lots of non-human things were participating in the conversation as well. For example, the first one involved the studio, pots, tools, materials, pictures, books, and so on. There was a flow in the conversation between me, as a researcher, the participant, as an experienced potter, and other non-human elements. Everything they showed me contained some important moments in the process of learning pottery. I could not always lead the conversations in the direction that was prepared and pre-planned. These gradually turned my attention to non-human aspects, like tools, materials, pots, the studio, and so on. I also reflected on the tools I used in the process. The dictaphone I used could clearly record spoken conversations. However, it could not capture the voice of non-human elements and their involvement in the process. Therefore, I decided to take more advantage of a camera for visual recording during the process.

Although I was not yet familiar with new materialism methodology, during the first few I tried to keep everything open to leave space for data to emerge. It was not a process that I, as a researcher, took full control over. I provided space to allow participants to talk about their learning experience and stories, their feelings towards materials and tools. I always gained a new perspective from different conversations. The first thirteen were conducted in the studio of each participant. This allowed me to follow the participants' flow when connecting with non-human elements in the studio. It allowed me to experience the embodied feeling of the objects, materials, or tools through sight and touch, and observe and feel the connection between non-human elements and participants.

However, the explosion of COVID 19 made it difficult to visit participants' studios and have face-to-face conversations. I had to turn the meeting into virtual conversations (through MS Teams and my university email). Not being able to visit their studios meant that I could not touch, see, and feel the objects, materials, and tools used by participants. Additionally, the participants could not physically show me their studios as they told their stories. It was lack of embodied experience I previously generated in the studio through the screen. Therefore, some of the flow between me, participants, and non-human elements may have been lost. However, on the one hand, this transformed my research method to an embodied approach which I decided to immerse myself to the learning environment to learn pottery after Covid; on the other hand, some new data about learning craft through technology emerged because of the pandemic. For example, due to COVID-19, all of the studios needed to be closed to learners and visitors, and lots of potters found a new way to teach ceramics through online platforms like YouTube and Zoom. This made me curious about the changes the impact of this virus brought to ceramics teaching and learning practice and how these new online ceramics teaching and learning activities were processing. Therefore, I added a new question to my previous schedule and asked subsequent participants to share their experience of these new training methods. Covid-19 became an important element in the later stages of research.

5.2.2 Observation and embodied research

In this research, learning was not limited to activities in formal education settings, potters also learnt craft knowledge through doing daily work tasks and solving problems over time. Intraviews can help to understand participants' previous learning experience and observations can help to understand how participants learn from their daily work and practice. Therefore, in addition I observed how potters learnt from their work (see appendix 6). I asked the participants' permission for me to observe, and three participants agreed. I spent a full day (8 hours) with each participant to observe their daily work process. These participants showed me the whole process of making, trimming, and firing pots while explaining what they were doing. I recorded some of these processes, watched the videos afterwards, and transcribed each video into words and pictures. After each observation, I made notes to reflect what I had observed and what participants had explained to me about their process of solving problems and learning from them.

After I have conducted observations within participants' studios, I found that all the potters were experienced and most of their work was undertaken independently. They only consulted other experienced potters when they had a problem that they could not solve themselves. During my observations there were no communications between potters and knowledge was developed mainly through connection with materials and tools. As an outsider in the field of pottery, I was not attuned to any sharp sensitiveness between potters, materials, and tools. It was difficult for me to catch the moments of learning that participants considered important. With the influence of Covid, I felt more strongly that I need to immerse myself to the environment to understand the process of learning pottery. Therefore, I decided to learn this knowledge myself to experience the embodied feelings and sensations involved in the pottery learning process. Additionally, this allowed me to observe how pottery was taught and the conversations between me, as a learner, the teacher, and other non-human entities in a learning studio space.

I went to a studio in the UK which was created by one of participants a few years ago. Full-time and short-time courses are organised in this studio to teach craft knowledge and techniques. The aim was to bring traditional pottery knowledge back and pass it down to the younger generation. The participant invited me to visit these classes whenever I wanted. I registered for the part-time courses and began to learn pottery knowledge myself and observe the learning experience through my own body. I went to this part-time course firstly which lasted for six weeks. Then I registered another two part-time courses in another studio which lasted for twenty weeks (details in table 4, appendix 8).

In advance of the class I introduced my research briefly to the teacher and got his approval to observe the teaching and learning process happening in this studio. This included conversations between me, as a learner, and him, as a tutor, and the embodied communications with materials, tools, equipment, and the studio. There were a few other students in the same class and I did not get their permission to observe their behaviours, so I did not use any recording tools (including the dictaphone and the camera) or include them in any stages of this research. I completed field notes after every observation and informal conversation with my tutor. Within new materialism, observation is used to "identify assembled relations, the affects and the capacities produced in bodies that together make an assemblage work" (Fox & Alldred, 2015, p.407). During this process of observation, I was aware of new materialism and had experience from the research intraviews. Therefore, my focus was not only on human communications through spoken language between me, as a learner, and the teacher. It was also on the entanglements between humans and other non-human entities through embodied gestures and movements, my bodily sense, and so on. In fact, due to the nature of ceramics, during the teaching and learning process there were not many verbal conversations. Communication was mainly through body and hand gestures to explain where the body and hand should be positioned to get a feeling for the clay, equipment, and tools. Therefore, I made detailed notes regarding the flow through all elements involved in the process. These included:

- the bodies of the teacher
- me
- clay
- equipment
- the chair
- the table
- studio space
- other non-human entities
- how every element was arranged in relation to each other
- how my embodied sensation and feeling about specific teaching and learning activities unfolded and developed through time in that space.

I also took some photographs about the work I did in each stage which portrayed the embodied relationships between me, the clay, tools, and other non-human entities in different learning stages.

5.2.3 Documents, images, and videos

It is problematic to rely on (spoken and written) language alone to know and understand affective flows with new materialism (Beyes & Steyaert, 2012). "Language cannot produce a representation of a world that is unstable, fluid, organic, and constantly in flux" (St. Pierre, 2013, p.650). During the research process, it is crucial to attach importance to "ensuing and following…rather than rushing in to interpret and represent" in language (Pacini-Ketchabaw, Taylor, & Blaise, 2016, p.157). Language and written words are not the only way to produce and generate data regarding a phenomenon (Kuby, 2019b). In this research, the data was not limited to the texts and documents shown in public websites, instead the images and videos were also used as a source of data.

I collected information from participants' websites when available. This included biographical information, examples of their works, and their ideas, stories, and experiences presented as transcripts and videos given to media outlets, for example, Ceramic Review and the Channel 4 show 'The Great Pottery Throw Down'. Some participants told me that they learnt a lot from YouTube videos and other online resources, so I searched for YouTube videos about how to teach and learn ceramics knowledge.

With new materialism images can afford the possibility and potential to communicate the unsayable beyond the representational and to "engage and mobilise a range of responses and effects in research encounters" (Coffey, 2021, p.5). Here, images were not the stable representation of reality (Bell, 2012;

Vannini, 2015) from the voice of a “singular, individual, speaking subject” (Higgins, 2014, p.215). Therefore, I also took videos and photographs of some of the participants’ pots, equipment, and studios during my observations as part of the data. . During my own embodied learning process, I took the photographs of me working with materials, tools, and equipment. The videos and images were used to understand potters’ sensory state and the encounters between them and materials via their bodily gestures and movement.

In conclusion, the methodology of new materialism is oriented to openness or open-ended ongoing configurations (McCoy, 2012). Initially, I did not consciously conduct this research in alignment with new materialism inquiry. However, I did leave space for the possibility of matter to become part of the data and I loosened the power of the researcher. I did not fully control the process and allowed the encounters between participants and other non-human entities to generate data in the moment. I privileged more indeterminacy, ambivalence, and multiplicity over pure singularity, determinacy, structure, and order through listening to a multiplicity of voices emerging in a particular time and space. Through the whole process this means that it is not possible to completely rely on pre-planned structures to inform and determine the process of doing research. This shift “calls into question what will count as ‘data’ and […] our relation to those data” (MacLure, 2013a, p.660). Researchers should reconsider their relationship with participants and other matters in flux and consider different methods where humans and language are not viewed as superior to materials and do not dominate the process of generating data (Lester, 2021). The participants’ stories “are enacted and understood in multiple affective interchanges…rather than researcher descriptions” (Wolfe, 2017, p.429).

5.3 Ethical considerations

Ethical issues play a very important role in dictating when the researcher can start and continue research. Their consideration differs depending on the research ontology and epistemology. Positivists consider ethics as following preconceived rules and regulations, whereas constructivists consider ethics to be constructed in the research process. Ethics guided by the traditional quantitative paradigms is institutionally mechanised and this system affords research ethics committees the power to regulate, supervise, and oversee research ethics (Carter, 2019; Mauthner, 2018). Researchers are required to submit different forms including participant consent forms, information sheets, and research proposals and plans (Mauthner, 2018; Romm, 2020). Following approval from research ethics committees, participants' rights and privacy, the security of data storage, and protection of participants' physical, mental, and emotional health are perceived to be assured (Mauthner, 2018). This fixed and one-off consideration of research ethics is challenged by the social constructivist approach. This approach considers that the subjectivity of researchers, historical, cultural, and social research contexts, and believes that research participants have influence over research ethics (Bozalek, 2020; Mauthner, 2018; Pihkala & Huuki, 2022).

New materialism considers research ethics differently to traditional quantitative and qualitative paradigms. It neither reserves ethics to prefixed ethics regulations to be implemented or imposed on research process, or restricts them to exclusively human concerns related to researchers and research participants. It includes non-human elements and material environments as constitutive forces that effect research ethics practice along with ethics committees, researchers, research participants, and social and cultural contexts

(Bozalek, 2020; Carter, 2019; Mauthner, 2018). This does not mean that new materialism attributes ethical agency merely to non-human elements and rejects the traditional ethical approaches. Ethics in new materialism is open to more opportunities to act ethically in the various entanglements beyond the habitual traditions in different ways (Davies, 2018; Søndergaard, 2019).

In this research, ethical issues were considered as an ongoing process of negotiation, rather than a one-off activity (Klykken, 2021). This negotiation is not only situated in human relations and social and cultural contexts, but also in the relations with non-human elements and material environment. Ethics was considered within specific situations and the social and material were included. The aim was not "to lay down a law about what is right and what is wrong but rather to explore continually the dynamic and relational grounds upon which relations [between researcher, researcher participants, and other social and material research assemblages] are played out" (Rose, 2016, p.343). It was an open-ended ongoing process.

5.3.1 The initial consent

In order to promote informed consent, I developed a research information sheet to introduce my research and outline participant involvement details (Appendix 3). This information sheet gave a broad introduction to this research (the research purpose, methods, data confidentiality, dissemination, storage, and participants' rights) and explained why this research is important. It also mentioned the potential benefits and risks of being part of this. The aim of the information sheet was to provide enough information about my research for participants to decide if they wanted to be part of the research.

Besides the information sheet, I produced a consent form to explain issues of confidentiality and anonymity (Appendix 4). This consent from explained that all data generated would be only used for research purposes, personal information would be anonymised or pseudo-anonymised, no personal information would be accessible by others, and all participants would be allocated a code number or pseudonym. Therefore, this research would protect participants' privacy as much as possible. I also informed participants of their rights to decide whether to take part in the research, to not answer every question, to withdraw from the research at any time, and ask for more details about this research, me as researcher and my supervisors. Additionally, they were informed about the research complaints procedure. The information sheet and the consent forms were approved by the University of Nottingham's Ethics Committee in advance of conducting the research. Before visiting participants I sent them the information sheet and consent form and asked them to sign the consent form to officially state their approval for their participation in this research and their agreement to my recording the interview and observation.

5.3.2 The ongoing consent

Initial consent cannot be assumed to remain static during the research process, especially when my research methodology and methods were transformed through the ongoing process of conducting the research. During the research I gained ongoing consent by always asking for participants' permission to take photographs of their studios, work, and tools and to take videos of their process of connecting with materials and tools. At the end of each interview and observation, I showed the participants the photographs and videos I had taken and again asked if I could use these pictures and videos for my research. I mentioned again that I could turn off the dictaphone anytime if they did not feel comfortable with it on. Additionally, when I conducted observations in studios, I only observed the communication between me, the teacher, and other non-human entities. The data was only generated from those who had agreed to participate in my research.

Besides the communications between me and participants during the process of generating data, non-human elements were involved in my consideration of ethics. During the interviews the dictaphone was involved in the process. Even though participants had already been informed that the interview would be recorded and the data used solely for my research, the dictapone still had influence on our conversation, to a greater or lesser extent. Some of the research participants avoided mentioning the names and stories of other potters. They considered the security of the data when talking about more than their own experience when the dictaphone was turned on. Therefore, visibility and involvement of the dictaphone aroused certain ethical considerations.

The physical and material environment of the interviews and observations also influenced the process. Research participants appeared to be more open and comfortable about sharing their experience with me in their own studios when there were no other people present in the same space. There were potential ethical issues about the anonymity of participants and the privacy of data if the space of interview and observation was open to others. I focused on the flow between me and participants in order to avoid the potential ethical risks to participants.

In the later stages of the research process, COVID-19 arrived. This could not have been predicted or planned for in the research proposal. This virus severely transformed certain ethical practices in general. The UK Government's lock-down policy instructed people to stay at home. It meant that interviews in person were impossible. Therefore, technology became involved in order to conduct interviews online. This technology integrated approach forced a reconsideration of other ethics. Some online platforms are considered to be secure for talking to participants and recording conversations, for example, MS Teams and Skype business. Some online platforms are considered to be less safe to conduct interviews and record the conversations, for example, Zoom. Therefore, I adjusted my information sheet and participant consent form and added the details of which technology would be used for interviews, how it was recorded, and how data was saved (Appendix 3 and 4). I then reapplied for ethical approval from the university's ethics committee. Once I had gained this approval from School of Education, University of Nottingham I began conducting interviews online using Teams. The unexpected virus and technology were part of the relational assemblages, together with the research ethics committee, the researcher, and the research participants to constitute ongoing research ethics practice.

5.3.3 Ethical issues about visual data

In order to protect anonymity, within the interview transcripts I replaced every participant's real name with a coded number. However, while this can protect the privacy of the participants in the written records and field notes, anonymity is still a big concern with visual data. The participants were potentially recognisable to the public through the visual data and more vulnerable to be judged by the public (Flewitt, 2005). This is especially true for ceramicists, as every person has a strong personal style which can be seen in their work. It is quite easy to identify them through the pictures of their work. As a researcher, I reconsidered the potential risks that the research might bring to participants and decided that, where possible, not to use the photographs which could identify participants. Additionally, I gained consent from participants to use particular photographs in my thesis and more broadly in the conference and publication. There was another issue that required ethical consideration in the visual method: copyright. In this research, I used some pictures and videos downloaded from online websites as data. To avoid problems with copyright, I will use these pictures in my thesis and include the original source information.

5.4 My shifting and moving research positionality

The position of the researcher shapes how participants engage with the research and influences all field work (Nast, 1994). Through the whole research process, I did not remain rational, objective, and neutral through the process. I could not distance myself from being affected by all other human and non-human research participants (Lenz Taguchi, 2013). Once I started the research, I was already entangled with the research and connected to and affected by all the research assemblages (participants, materials, tools, artefacts, space and so on). I was not in a static state through the whole research, but always in intra-action, entanglement, becoming, and changing within each moment (Barad, 2017; Østern, et al., 2021). My positionality was relational and constituting, and shaped and shaping through relations with other research entities. Therefore, I considered "the multiple trajectories and relations that influence […] subject formation, and show how that multiplicity can affect different aspects of [my] research, from the ontological to the methodological, from the theoretical to the empirical" (Crossa, 2012, p.115-116).

Initially, I positioned myself as an outsider in pottery, who did not have experience or knowledge about pottery and wanted to know more about how potters develop their knowledge. I would not judge whether their work was good or not and I would talk to them without any bias. Participants were open to answering all my questions and willing to share their experience. During the interviews, I felt that our communication was quite comfortable and flowing. As a researcher, I knew I was an outsider in this field, so I was not in full control of the process of interviewing and observation. Rather I tried to leave enough space open to allow participants to share and talk. As I did not have much pottery experience I was curious about different entities and relations and could hear other voices that might be blocked for someone with more experience (Cloke et al., 2000). This led me to pose new questions and find more possibilities and directions. This was also why I considered the involvement of materials and objects in the learning process.

After I talked with more participants, read more pottery documents, and looked at more videos and photographs, my outsider position gradually became blurred. As I developed more knowledge about pottery I had more embodied feelings for the materials, tools, and the process. This led to a more affective connection when I considered images, videos, the process, and even when I talked with the participants. There were no clear-cut boundaries between my position as an outsider or insider anymore. Once I encountered my research and talked with participants I was already becoming a part of the process, aligning with participants and entering the ceramic's world, the participants' world. I gradually developed my material sensitivity through relations with participants, materials, tools, and other things, especially when I went to learn and observe the teaching and learning practice in a studio. I slowly entered the pottery field and became an insider. I was still a researcher who needed to observe the whole process at the same time and reflect on my observations of my embodied experience. Through that time of learning and observing, I developed more sensitivity for materials, tools, equipment, etc. That sensitivity as an insider enabled me to look at the transcripts, images, and videos in a different way. I now had a deeper understanding when potters were talking about their relationships with materials. I now had a more embodied experience about sensing the agential force from clay through touch. There was no clear ‘positionality' to position myself in one side or another, I had multiple identities which were always (re)constructed through negotiations all the time and the contexts. It was always shifting and moving.

5.5 Analysing data

In the last chapter, I outlined my journey in trying to fit my data into the theoretical framework of CHAT and how this did not work so well. In this section, I will explain the issues I had with analysing data and how I transformed my thinking and adapted it to a new method of data analysis.

5.5.1 Embodied sensory experience

New materialism challenges the notion that data analysis can be pre-planned and prescribed. It warns against relying purely on theory and the dangers of returning to rationalism and foundationalism which questions sensory experience (Phillips & Burbules, 2000). The process of analysing the data is a “transcorporeal process of becoming-minoritarian with the data, the researcher is attentive to those bodymind faculties that register smell, touch, level, temperature, pressure, tension, force in the interconnections emerging in between different matter, matter and discourse, in the event of engagement with data" (Taguchi, 2012, p.267). When I was analysing the data, I was aware that I was part of the process and I was working/thinking with data all the time. I did not think and write from "a distant, disembodied position", instead I became "a present, sensing and relating researcher" (Østern, et al., 2021, p.13). As the researcher I could not choose the data alone or fully control it. Rather data has the agential force to engage with the research analysis, powering up or resisting the process (Lenz Taguchi, 2013). I went through "pain, joy, despair, moments of flow, relief, grief and pride" as the data "play[ed] tricks" on me (Østern, et al., 2021, p.13). The data and I were affecting and being affected by each other in constant becoming through the analysis. By encountering the transcripts, images, videos and so on, these entanglements required me to "enter into the midst of things, attune to bodily sensations and relate" (Marston, 2020, p.12).

Originally, I planned to construct my thesis through the framework of CHAT and follow traditional coding methods to categorise and reduce the data to a specific structure (Schadler, 2019). The map illustrating the relationship between community, artefact, subject, object/outcomes, rules, and division of labour was already rooted in my mind. After I generated some data, I tried to fit it into the CHAT framework. However, I was struggling and felt uncomfortable. There was always something missing. My data looked dull and dead and waiting for me to give it meaning. My supervisors suggested that I leave the planned theoretical framework behind, and just look at the data. This was really helpful strategy for the analysis. I used the analysis software of NVIVO 12.0 and a big white board to help me see the data again. I could then see the whole picture of my data. Through this process, some data began to catch my attention. Materiality became active in the whole process. Some data started to stand out and themes became clearer within the entanglement of me, as a researcher, and the data itself.

5.5.2 Rhizoanalysis, tracing, and mapping

Traditionally, qualitative analysis condenses and stabilises the data into essences through categorising, grouping, and structuring. It strives for and produces regularity, order, and structure (Jackson, 2013). This process of analysis tries to find closure and a right answer, or to represent a static concept driven by certain theories. However, to move beyond these questions need to be asked to challenge habits of thinking beyond prescriptions (Chappell et al., 2019). There is advantage in "looking at this from the perspective of the mangle is that […] it allows us to stop expecting to separate the elements of the mangle and find the 'right' answer. The right answer is that we are in the mangle" (Hekman, 2010, p.26). The aim is to discover what is still unknown, rather than something that is already known (Singh, Southcott, & Lyons, 2021). Data analysis is "an open-ended and ongoing practice of making sense" (MacLure, 2013b, p.171).

Rhizoanalysis extends from the concept of 'rhizome' from Deleuze and Guattari (2004). A rhizome can begin from anywhere, there is no beginning and end. "There are no points or positions in a rhizome, such as those found in a structure, tree, or [vertical] root. There are only lines: molar lines, molecular lines and lines of flight" (Deleuze & Guattari, 2004, p.21). Connections are horizontal and heterogenous. Within rhizoanalysis, the analysis departs from the hierarchical way of considering the logic of cause and effect and opens up more possibilities for analysis and thinking. The discourse and materials are read through each other. These include texts (transcripts, field notes), images and videos, and artefacts which are all entangled in the process of analysis.

After I realised that my data resisted being explained through the traditional ways of data analysis, I decided to de-centre myself trying to impose an already-known theoretical framework, like CHAT, on my data. I flattened the relationship between human and non-human, between researcher and the researched and went back to read my data horizontally. I adopted several strategies to de-centre myself and the language:

I went back to read, listen, and look. I not only focused on reading the transcripts and field notes, but also listened to the recordings again, which could draw me back to the embodied and visceral encounters through the voice (Chadwick, 2021). And I looked at photos/images and videos many times, which could support me to analyse the tactile and embodied relationship between human and non-human elements and catch the role of materials in acting in the entanglements (Malone, 2016).

I focused on the relational encounters in the process of teaching and learning craft and how different elements associate with each other. I traced the different voices of the researched (including human and non-human participants) in the process. I tried to draw the stories from each participant and myself with other potters, tools, materials, equipment, the studio, and other non-human elements, and then looked for the common topics. The relationships between these elements in the learning practice were never hierarchical. For example, potters never had full control of or power over the clay. Clay has agential power and capacities to push back. Through the data I realised that on the learning journey, one of the most important points that potters need to learn is how to listen to the voice of the clay and tools in their intra-actions. Having discovered these relationships, I then mapped out different relationships in the process, which include relations between humans, for example, the master and apprentice or teacher and learner; between humans and non-humans, for example, the learner's body, clay, tools, equipment, and the studio; and between non-humans, for example, glaze, fire, air, and others in a kiln. Two themes were generated through this process: relational encounters between learner's body, materials, tools, and equipment (chapter 6); the intra-actions between more and less experienced potters (chapter 7). While mapping out the relational encounters among all those human and non-human entities, I found that the space that participants and I all learnt pottery was the pottery studio with similar settings and layouts. Our knowledge about pottery developed through practice over time in such physical and material settings. Another theme of intra-actions between materiality of the studio space and learning was then generated (chapter 8).

While mapping out multiple relationships in the process of learning pottery, I did not consider the relationships as fixed and never changing. Instead I focused on movements, dynamics, reciprocity, and how changes emerged in those relationships. I traced the movements in the relational entanglements, paid attention to the reciprocal forces that humans and non-humans exert on each other and the (re)negotiations between them in the process. For example, how clay and the body of a learner resist, adjust, and adapt to the forces between them. My own embodied learning experience also told me that my expertise was improved through practice over time in the environment of studio. Thus, I also attended to the changes of the relations between humans and non-humans in terms of the level of expertise. I looked at how, for example, the roles of potter and clay in craft practice has changed and shifted through potters getting more experience and increased expertise. These movements, changes, and shifts will be shown in each chapter of findings (chapter 6, 7, and 8).

5.6 Summary of the chapter

In this chapter, I have explained how my philosophical assumptions were transformed through encounters with participants, materials, studios, tools, the research itself. I introduced the perspective of new materialism methodology, and how this approach opened my thinking around conducting this research, and how the process of data generation and analysis were deconstructed and reconstructed constantly within the research process. Then I explained how ethics was constituted in the ongoing process of encountering participants, non-humans, and socio-material environment and how my research positionality shifted consistently. Later, I explained how I worked with and analysed the data. The materials, tools, technologies, researcher, participants, data, and other research elements, even the virus, were all assembled in relations and intra-actions, and co-produced the emergent phenomenon (Barad, 20007). This encouraged me, as a researcher, to not only focus on verbal language and discourse (e.g., transcripts), but to also hear more voices from participants and other non-human elements. I, as a researcher, was an affective body who always affected and was affected by my research participants, materials, tools, equipment, the space, and other matter.

This methodological approach allowed me to be part of the whole research as a rational, embodied, and affective human and recognise the active role of non-humans and material space in the process of doing research. This greatly influenced my findings. Even though general themes have been generated through the data analysis, writing up was not a linear process of imposing structures rigidly (Bell & Vachhani, 2020). The writing was influenced by the literature, the data, colleagues, supervisors, space of writing, or even researchers themselves. Therefore, it frequently gets changed. Writing my findings was an ongoing process of constructing structures and de-constructing structures, formation and de-formation. The findings I present in the next three chapters are the result of communications between myself, as a researcher, and other humans (includes participants, colleagues, and my supervisors) and non-humans (including materials, material spaces, tools and so on) in a particular space and time.

In the next chapter, I will present my findings in three themes generated through data analysis: relational encounters between learner's body, materials, tools, and equipment; the intra-actions between more and less experienced potters; and the space-time of learning craft knowledge.

Chapter 6: Relational encounters in learning pottery: Learner's body, material, tools, and equipment

In this chapter, I will explore the entanglements between the learner's body, materials, tools, and equipment and how these relationships shape the learning of craft knowledge. There are generally several procedures for making a pot: making (e.g., throwing), trimming, glazing, and firing. There are several elements besides potter's hands who play important roles in each procedure. First, clay is always the key material in each stage of craft work, who plays important roles in engaging learners into the process of learning different techniques. Second, some craft work is often assisted with the use of different tools for extending potter's hands' functions. Third, clay and glaze respond to each other in the stage of firing, where potters cannot fully control the process. Therefore, learning through working with clay, using tools, and from the entanglements between non-humans (clay, glaze, and fire) are important to learn craft knowledge. Therefore, this chapter will be presented in three aspects: the relationship between the learner's body, clay, and equipment; the relationship between tools, materials, and the learner's body; and the relationship between non-humans (clay, glaze, fire, and kiln); .

In each section, I will have an introduction of the properties of clay, tools, and glaze individually in order to explore what materials and tools do and how they associate with learners and other non-human elements, for example, equipment, in the process of learning pottery. Then I will discuss how to learn pottery through engaging with materials and tools in each section. As craft knowledge develops, these relationships get changed accordingly, thus, the changes and shifts within the process will also be discussed in each section.

In the first section, I will discuss how the potter's body and hands contact with clay and the moving equipment (potter's wheel), how knowledge about clay is learnt, and how relations with clay and equipment change through experience.

6.1 Learning with materials: Intra-actions between the learner's body, clay, and equipment

When participants were asked about the most important element in learning pottery, all their answers, without exception, were related to getting to know the materials, especially clay:

> It would be impossible to produce functional ceramics without knowing the properties and therefore, the suitability of the clay you choose to use. You eventually get to a point where you know the materials that you are working with, and their capabilities and limitations, and problems become a rarity.
>
> (Participant C)

Developing knowledge about materials continues throughout the pottery learning process. Knowing more about materials creates more possibilities for potters to make pots differently, as participant Q mentioned:

> You can look at the idea and know whether or not your material can do it. And the more knowledge you gained about your material's properties, and what they can achieve, the more (they can) inform your work what you can go on and you can take into.
>
> (Participant Q)

Participant C and Q mentioned two important aspects here about knowing materials in the process of learning pottery: the knowledge of embedded properties of materials and what they can do; the changes of relationships of them with materials with the developed expertise. In order to understand the intra-actions between the learner's body and materials, I will first introduce the properties of materials (mainly clay in this section) and how materials and potters affect each other in the process of learning.

6.1.1 The materiality of clay and the reciprocal forces between clay and potters

I summarised three properties of clay through combining the data from online documents, interviews, observations, and my own embodied learning experience, which include: plasticity, variety, and dynamics. These properties allow the clay to move, change, and transform, which impacts how potters learn and work with them. I will now outline each property of clay, and their important role in affecting how potters the making of pottery.

6.1.1.1 The plasticity of clay and its intra-actions with potter

The plasticity of clay means clay is a very plastic and responsive material because it is soft before it dries out completely to the 'bone dry' stage and is then fired. The softness of clay makes it stretchable and alterable with potter's hands in the process. It allows the potter to form the shapes in diverse ways through contacting with their hands. Therefore, when potter's hands move, the clay responds and gives feedbacks to the potter, which process shapes how the pot becomes.

When I went to learn how to work with clay, the teacher told me that I was actually dealing with invisible forces between my own body and the clay. When I touched the clay and added some pressure it exerted forces back to me, and I could feel this force against my hands. Exerting pressure on the clay in different directions affects how clay moves. For example, as image 3 shows, when trying to lift the clay vertically, the participant's fingers applied the pressure up and down vertically. As image 4 shows, when pressure was applied through the participant's fingers to the clay at a 45° angle the clay will move accordingly at a 45° angle.

Image 3: Lifting up the clay vertically

Image 4: Pushing the clay into 45°

Though clay is stretchable which affords many possibilities of potters working with it, it does have its boundaries. When I was learning pottery in the class, once I added too much force to the clay and stretched it too much, the clay body always collapsed, then I had to recycle it and remake it from beginning. In order to know how much forces I should add and which direction I should work towards, I had to look for the answer through touching the clay and feeling its movements with my hands.

> Clay is a very responsive material, and there are many possibilities about how clay will become. However, clay still has its boundaries, which will limit the possibilities. For example, it's very flexible, but I once just stretched it too much, the clay wall became too thin, then it collapsed in the end.
>
> (Field note, pottery short course)

6.1.1.2 The variation of clay and its intra-actions with potters

Different clay is conceived in terms of different combination of minerals and other elements, which resulted in each clay having its own special characteristics and attributes (e.g., kindness) that affected how the potters worked with the clay and encouraged them to explore different possibilities. When I was learning in the pottery class, the teacher suggested us to start with stoneware clay who is more stretchable and entails the ‘kind personality’. However, Kaolin a form of china clay, which is usually used for porcelain, was not as plastic as other clays and ‘full of inertia’, so it was more difficult to learn how to work with it. This was also mentioned by participant M:

> Particularly when I started throwing a little bit with porcelain, the porcelain was awful all the time. All the time it cracked. So, I prefer the stoneware clay. It's just kind to me. Porcelain is very hard to throw … it's plastic, it doesn't stretch, it shrinks a lot. It can be very thin, but much more difficult to throw, much harder, and then if you look at it here, it's so hard. It is really, really hard.
>
> (Participant M)

In other instances, potters often add specific ingredients to different clays in order to make better pots. For example, bone china contains a minimum of 30% phosphate derived from animal bone for superior whiteness and translucency. Working with bone china brought a different feel from other clays to one of the potters on the TV competition show ‘The Great Pottery Throw Down’:

> The clay (bone china) is like…wet chewing gum. One minute it won’t stick to your hand, the next minute it is stuck to your hand, hence, potters need to use a little oil in case of the sticky hands.
>
> (The Great Pottery Throw Down, 2021)

Potters who threw porcelain (image 5) and those that threw stoneware (image 6), used similar body positions and hand gestures. For example, when potters pull up the clay, both hands were similarly positioned inside and outside the clay wall. As with stoneware or other clay material, it was only by touching the porcelain itself that potters were able to learn how to throw. Potters needed to feel the different clays, and take into account the different personalities of the clay, and then they could find the appropriate answer in a process of repeated and adjusted practice.

Image 5: Throwing porcelain [copyright Jo Schoppet, 2011]

Image 6: Throwing stoneware [copyright Gadsby, 2021]

6.1.1.3 The dynamics of clay and its intra-actions with potters

Clay is not in a static status. Before firing, the condition of clay is not stable, it always changes. It can become too dry after long exposure to air or too wet after adding too much water. There are a number of clay drying stages (table 1):

Table 1: The clay drying stages and the status of clay in each stage

Clay drying stages	The status of clay	Images
The wet stage	The clay is soft and pliable. The pot is just cut off from the wheel in this stage.	
The leather soft stage	The clay is still a little tacky and moist.	
The leather stage	The clay has dried slightly and is no longer tacky, some shrinkage has taken place, but there is still some softness and flexibility. This stage is perfect for trimming the pot.	
The leather hard stage	The clay is harder to be molded but it still does not dry completely. It means that there is still a space to trim the pot in this stage	

The bone dry stage (right)	The clay is lighter in colour and feels hard. When you knock the surface, you will hear more ‘crispy’ sound. Clay cannot be trimmed any more in this stage, even when you spray more water onto the surface, more moisture will make the clay crack conversely.	

Note: Pictures from: [Copyright Earth Nation Ceramics, 2018]

In my learning practice, different conditions of clay at different stages asked me to work with them in different ways. When throwing or coiling, the clay needed to remain wet, so I always added water to the clay. At the trimming stage, the clay was better to work with trimming tools when in the ‘leather stage’, where it was too dry or too wet. The changes of clay and how it affected the craft practice were also mentioned by participant R:

> The material is always changing, and you have to work with it to make your right consistency for what you want to do. So, we wedge the clay in order to make it more malleable. If it is too soggy and you have to leave it. And so, the material goes through change all the time and you have to try and control that.
>
> Once I’m working on the mesh part, the drying of the piece also needs to be carefully considered, as it dries quickly due to the air circulating through it. In the summer the mesh dries in about a day and I spray (water into) the piece frequently to keep it damp. One has to be careful with spraying, however, as if the mesh is over-sprayed, it will collapse.
>
> (Participant R)

Participant R mentioned that clay dries differently in different seasons, different sizes and thickness of pots also affect different drying times. A small pot, like the one shown in image 7, needed approximately a day and a half to dry. However, a pot the size of the one shown in image 8 took approximately one week to dry. When the wall of the pot was thick, it took more time to dry. In the beginning of learning pottery, I always made thick walls for the pots. Once, the surface of my pot looked dry, but the inside of the pot was still wet, which caused problems when I was trimming:

> When I trimmed one pot, outside was fine and in good condition to trim. Then I went to the inside of this pot and I could feel that the clay was too soft. When I was trimming a big chunk of clay was just cut off from the pot and my fingers bumped up and down in the process. Because I left the bottom of this cup too thick, it needed more time to dry the inside. It therefore, dried unevenly. Either the outside was dry, but inside was not dry enough, or the inside was in a good condition, but the outside was too dry after being exposed to the air for too long time. Neither status is good for trimming.
>
> (Field note, pottery short course)

Image 7: Small pot

[Copyright Earth Nation Ceramics, 2018]

Image 8: Big pot

[Copyright Earth Nation Ceramics, 2018]

Clay is always in the process of becoming drier. I needed to learn how to identify the different drying stages of clay by looking and touching it to feel how soft the clay was.

As discussed above, clay moves and responds, each clay has its own ‘personality’, and the status of clay changes over time. To gain a greater understanding of clay and its movement, Potters were asked to touch and look the clay and use their body and hands to feel or sense how the clay behaved and moved. This is especially important in the shape forming stage (making and trimming).

Having showed the importance of understanding materials in the process of learning pottery, it is important to explore how to develop the embodied knowledge of clay, and how the clay is entangled in the process of learning. Overtime, the relationship between the potter and clay gradually changes, which I explore in the next section.

6.1.2 Learning with materials: Changes of relationships with experience

When I went to the first class to learn pottery, the teacher kept reminding me to keep my body, arms, and hands stable. For example, when throwing, I was asked to sit close to the wheel, on the edge of my seat, put my elbows on my legs for stability, lean forward, and use my body strength against the clay. This was because my strength of working with clay comes from this stabilisation against the wheel (Image 9). When observing the throwing process of participants, I could also see that one of their arms was always on their legs for stability and to make sure their force was steady.

Image 9: Sitting closely to your wheel

(Copyright Earth Nation Ceramics, 2019)

When throwing, the speed and direction of the wheel also matters. The teacher told me that the wheel should turn very quickly when I was centring the clay and then the speed should be reduced to enable my hands to feel the clay's movement slowly and carefully after it was centred. The direction of the spinning wheel is also important. For example, initially I turn on the wheel anticlockwise and tried to lift the clay. I put my right hand inside the clay and my left hand outside and pushed it together. However, I felt the clay going against my hands and I did not know why. Then the tutor saw and suggested that I turn the wheel clockwise. I did and the clay felt just right in my hands (Image 10). My body position, gestures, the forces from the body, the speed of the wheel, the direction of the spinning wheel, and the movement of the clay all needed to be in the same rhythm and to be attuned. My hands needed to stay stable and follow the movement of the wheel. When the clay was pushed in the opposite direction to the spin of the wheel the clay was just distorted by my hands.

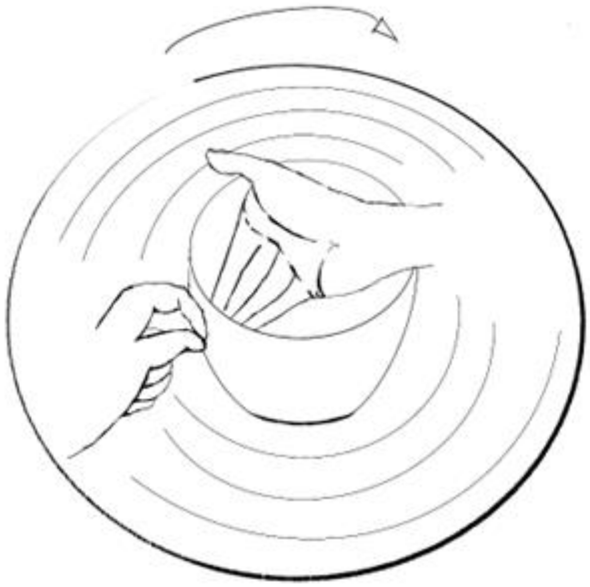


Image 10: The wheel spinning clockwise and the hands gesture

What I have mentioned above has shown the importance of the potter's body keeping in harmony with the movement of clay and the potter's wheel in the process of learning. The attuned relationships require learning experience, where clay and potter's roles get changed over time. In this section, I will discuss the changes of the relationships between clay, the potter, the potter's wheel, and tools.

6.1.2.1 Attuning with clay and equipment

When I was learning how to throw a pot on the wheel, the first thing I learnt was how to centre it on the wheel. In the beginning, my body was always not stable, the force being added to the clay was accordingly uneven, and the force coming from the clay was not stable and consistent. I was not in tune with the clay and the clay went against my hands and force.

During the research interviews, participants were asked to remember the first-time they learnt to work with clay and how they felt about their relationship with clay. When participant M described how it was when she initially tried to throw a pot, it was the same experience as me for her:

> It was very hard to control the whole thing on the (potter's) wheel, (the clay) couldn't be centred!
>
> (Participant M)

At the same time, she used her body to show me how the clay was 'wobbling around' and went into every direction. Participant A also shared her learning experience and what her teacher told her about centring the clay on the potter's wheel when she was learning to throw a pot for the first time:

> (I) tried to centre, but you don't know what centre means, you don't understand where you have to go and the guy (the teacher) kept yelling at me and saying, 'You are clay! You are clay! You are clay! You have to feel it! You are clay!'
>
> (Participant A)

Here, it can be seen that the relationship between the learner and clay in the beginning was not so smooth. Participants and I could feel the centrifugal force from the clay spinning on the potter's wheel, however, this force was mostly acting against the forces from our hands. When the clay was pushed harder, it responded with its own forces. The clay in our hands went 'crazy', and we felt that the clay was out of control. This meant the relationship was not in harmony. The teacher tried to tell her (participant A) to merge with the clay, to break the boundaries between herself and clay. When merged with the clay, she could think of herself as clay, then she knew where and how to move and behave, and how to centre herself. Here, learning how to throw a pot is about potters becoming clay and therefore, understanding what clay is 'thinking and doing'.

During the learning process, the relationship between participant potters and clay was not always 'in tune', as participant T said:

> Sometimes, the clay will be squishy because you're not in tune with it. And sometimes it can be restful, and you tune into it. And everything works,

> your tools behave themselves, and the clay forms a piece. (But) sometimes it just goes against you.
>
> (Participant T)

It shows that the forces that potter exerted onto clay and the clay's response needed to be balanced, especially when throwing a pot on the wheel. If this balance was broken or cannot be maintained during the process, the form of the clay would collapse immediately, which I have done it in the beginning. Participant C mentioned the importance of learning how to keep the balance of forces through feeling the clay:

> I concentrate on how the clay feels in my hands, and how my hand pressure needs to adjust to accommodate it and to maintain an even walled vessel.
>
> (Participant C)

The relationship between potters and clay became gradually more fluent and attuned through the process of adjustment. As participant Q said, his relationship with clay and the potter's wheel became more comfortable with practice:

> He (his tutor) told me that I was natural on the wheel. But I've never thought part of what I do is. Straight away I could throw, I never found it natural, I don't feel it is natural. I just feel comfortable. The more you throw, the more comfortable it becomes.
>
> (Participant Q)

6.1.2.2 'Clay and potters become one'

In the later stage, this technique was acquired when small differences in the relationship between the potter and the clay was understood and accommodated. Participant M stated that every time she threw a pot, she could 'feel if it flows naturally or not'. She showed me two pots that she had thrown (Image 11 and 12). She said when she was throwing pot 1, she could feel her relationship with the clay was very fluent. However, when she threw pot 2, she did not feel the relationship was so good. She could feel the minor differences in the relationships between herself and the clay which I, as a beginning potter, could not recognise.

Image 11: Pot 1

Image 12: Pot 2

At this stage, the clay, participant M, and spinning wheel were not separate individuals anymore, but have merged. Participant N told me that he could even feel how clay behaves and moves when watching other potters working as they already knew the material and have tacit knowledge of working with it:

> A strange thing (is) when I watched a YouTube video, I watch them. And if I pay attention, I concentrate and then I can feel here what they can feel there. I know what that clay feels like. It’s strange. I can almost feel it in myself in my hands, the roughness of clay or the smoothness of the clay or when you make it narrower, I can feel it on my hand, that’s really weird…So, I am watching a video of someone, because I've got the

> experience and the tactile knowledge. Therefore, I know what that person feels like when they're doing this with the clay, I can feel. It's really good.
>
> (Participant N)

When potters have gained certain level of tacit knowledge about materials, they feel comfortable working with clay. The clay and their body become one. They feel what the clay 'thinks' and where clay 'wants to go'. Their hands follow the flow of the clay's movement, and the clay works fluently with them.

6.1.2.3 Letting clay 'take in control'

Through the process of learning, the roles of clay and the potter playing in the practice get changed and shifted. When the teacher taught me as a beginner how to throw a pot in the class, he always emphasised that the body needed to be steady and positioned close to the potter's wheel, gestures needed to be adjusted, forces needed to be exerted in a balanced way (harder or more kind), and the focus should be on the response of the clay. This initially took a lot of concentration. Experience of the material's properties made the process more mindless. It can be done 'without thinking' and the form just develops naturally. As participant N mentioned, he was no longer consciously trying to control the clay with his hands. Instead he and the clay were merged into one body without thinking about who was pushing whom.

> That's what I was talking about earlier is the mindlessness without thinking, I can make lists. I can shop in my mind well, and the pots that come out are really, really nice, because they have an honesty about them. They are there. They're not forced and they're not…I don't have to try hard. If you've got the skill, the shape will come, and the idea will come without thinking really. It's kind of mindlessness.
>
> (Participant N)

It shows that the role of clay in the process got shifted through experience. In the early stages of learning to work with clay, learners were trying to know how to 'control' the clay. Here, control is not a hierarchical relationship where potters have the absolute power over clay, it is the knowledge of how clay flows and moves, as participant I mentioned:

> I feel like I have some vast idea of how the raw material is going to behave, so I feel quite in 'control' when I'm working with the clay, when I touch it, I kind of know how it goes.
>
> (Participant I)

When participants got to this level, they tried to loosen up any feelings of 'controlling' the clay and leave space for clay. Participant C said she tried to let the clay control her mind and body in order to explore more making possibilities and to push the boundaries.

> As time has gone by, my work has become more refined. I can throw thinner forms and straighter walls etc, to the point that I want to be able to loosen up and loose a bit of control over the clay. I sometimes feel that I am not always allowing the personality and character of the clay to show through, but hopefully this will come during my next 20 years of making!! My second 'style' of work is much looser and is something I am not yet entirely happy with. It needs to be further developed, but I strive to create forms that show the nature of the clay, i.e.. are 'softly' thrown.
>
> (Participant C)

In summary, no matter how experienced potters are, they always need to listen to the clay. Beginners did not always feel the smoothness of the process, the clay did not seem to listen to them and the force from clay was against their body. However, after practice, they knew the clay better, and the connection with clay became more natural and smoother. The clay and their body became one, they were able to feel each other's movements. Then the clay and the potter shifted their role, the potter started to ask clay to 'control' them to expand the potentials of clay.

I have discussed the materiality of clay and how it affects the relationship of it with the potter and the potter's wheel. The changes of relationships in the learning process have also been explored. There is another element important especially in learning making and trimming: tools. In the next section I will more about the use of tools and the relationships between the potter, tools, and clay in the process of learning pottery.

6.2 Learning through incorporating tools into the learner's body

The human body has its own limitations and sometimes needs the aid of tools to finish a piece. For example, participant M and N mentioned that the size of a pot thrown is dependent on the arm length of the potter:

> I'm trying to make something very, very wide or very, very tall. I have (quite small hands), this size that you see here (she pointed to one of her pots) is the limit. (Image 13)
>
> (Participant M)

> Sometimes you can't reach, so you have to have a stick and throwing stick (to help).
>
> (Participant N)

Image 13: The pot that participant M threw

It is very important to know more about the functions of different tools and learn how to apply different tools to the process of embodied practice, which will be discussed in the following section.

6.2.1 The use of tools

During pot making, potters use some tools for certain purposes. When I went to learn how to throw a pot, the teacher introduced me to the basic tools for making. I was shown how to use those tools (Image 14). These basic tools and their functions were also introduced by participant C:

> I began using them out of necessity, or rather because I was taught that it was necessary. I use a rib for removing slurry from the surface of a pot after throwing, this also compresses the clay and makes it stronger. I also sometimes use it as an aid to shaping the pot. I use a metal pointed tool (not sure what it's called) to remove clay from the foot, giving a sense of 'lift' to the pot. Finally, a piece of chamois leather for smoothing rims. So, these tools have the purpose of ensuring that a pot remains structurally sound.
>
> (Participant C)

Image 14: Tools for throwing and trimming (from left to right)

: sponge, wire, pear tool, loop tool, metal rib, wood rib

In the beginning, I was told to use some basic tools in specific ways for a particular purpose. As participant C said, she did not get full sense of using certain tools as a beginning learner. She used different tools for realising certain functions because she was told by her teacher. She did not connect herself with the tools to work with clays flexibly and dynamically yet. Therefore, the functions of tools were limited in my and participant C's hands as beginners.

The connection between certain tools and their functions was built up after having gained much experience. Through practice, the knowledge of how clay behaves in relation to different tools was gained. This knowledge informed the correct prediction of the results of tool usage on different clays. Over time, different uses for the tools were found. This happens when participants were using tools from their normal life to replace specific pottery tools that their tutors taught them to use. For example, participant T used combs to carve clay into certain patterns or forks rather than the proper needle tool to slip for better connection between the pot body and the handle. Tools were adapted by her, and she collected the tools which she thought was the best to fit for her own purposes:

> And then this little thing like the pen top, that is a pen top. That's a really good pen top. It makes the most beautiful little, tiny circle. That's very important to get a beautiful shape. And that's because I've had this for years and it's worn down over years of use to be perfect and exactly what I want. If I lose that, I have to spend ages melting one down and shaping it to create like 5, 10 years of use. This is my sacred [tools], it’s only a scruffy box, but it's sacred to me…So it just has a different function. And it becomes something that you need in your collection. A little, you know, little bits, keys, or this is brilliant, it is very important, that makes my bat and rat tails. I roll it into the clay to create a nice rat tail. And without that, I'd have to use another tool and do loads of little lines that would take me ages. So, if I lose that I'm like, no, where’s my mouse making tail machine. So, they're all precious.
>
> (Participant T)

Image 15: Potter's own tools

Image 15 shows that participant T found new ways of using the tools which are socially and culturally recognised as something different in our normal life. For example, the extended function of the comb or a toothbrush to craft ceramics work.

Sometimes, the available pottery tools in market do not make the required patterns and so participants as experienced potters made their own tools for specific tasks. For example, participant Q always made his own tools for his work:

> If I was going to achieve my goals, I would need to make my own cutting tools as there were no tools even close to what I wanted, that I could find…I can't make one today, but I can talk about it. If I want to do the carving, you can't always buy the right tools to do the carving, so I just make my own (tools), and each tool I make, you use it time and time again, or make a tool that is specific for that job, and I make one for rolling and I make another one for a different job.
>
> (Participant Q)

It can be seen from above that experienced potters were able to recognise different functions of tools, make good use of tools from daily life, and even design and make their own tools. The recognition and use of different tools comes from the relationship built between the potter, tools, clay, and pots. Beginning learners still could not feel the appropriateness of tools, or recognise what tools can afford without the teacher and master telling them. After becoming familiar with the different functions of tools, potters gradually develop the sharper bodily sensations that aid the understanding of what tools could achieve and enable the creation of their own tools. In next section, how to build up the relationships and how relationships change through experience will be discussed.

6.2.2 Embodying tools: incorporating tools into the body

The use of tools does not just reflect the relationship between the potter and tools, it underpins the dialogue between the body, material, and tools. Understanding the specific properties of materials provides an important information when using tools. For example, as participant E said, it is very different to paint on clay, canvas, and paper. This is because clay has different reactions with colours, so she needed to use the brush to paint on clay in a different way from painting on the other materials:

> So, you pick up the colour with the tea brush, when you paint on canvas, you pick up the colour like this (she showed me the ways through her hands). So, you have got the colour in here on your brush. And you paint it on, because you do a bigger surface. So, for porcelain, you have to have a colour on the brush in this little area (she pointed to the brush). So, you have to wiggle colour in and just get it on the top of your brush. And then once you, kind of, pull a straight line, you're going to release your colour evenly. If you pick up the colour in here (she showed me different ways), you have zero control of it where you put it. [There are] totally different ways to even pick up the colour.
>
> (Participant E)

The position, gesture, or angle of tools needed to be changed and adjusted not only according to different status of clay as participant E said, but also the movements of and responses from clay in the momentary practice.

When I was learning how to use tools, I applied tools onto clay in a way that was spatially discrete from their bodies. I could not feel close or intimate with the tools, and it also interrupted my body's feeling of the clay. My focus was mostly on the tools separately, for example, how to hold the tools, and at which angle. Therefore, I always felt that the use of tools hindered my conversations with clay, so I could not feel how clay behaved:

> How to hold the tool: while trimming, I always can't control the tool, I felt not so close to the tool, especially while trimming on the spinning wheel, the tool always went to the wrong direction, then the surface of the pot will be destroyed a little bit by tools.

(Field note, pottery short course)

The feeling of being distant from tools in the beginning was also shared by participant C:

> Tools put a bit more distance between hand and clay and I was never satisfied with the result.
>
> (Participant C)

After practice, the embodied experience enables learners to feel the clay through incorporating tools into their bodies or extending their bodies into the tools. Learners' attention is no longer on how to hold the tools, it is on the connections with clay. When I was watching the pot making process of participant N, he threw a big piece to show me how he was shaping the form and how he used tools. I observed that he was using the tools very fluently. I could not see him hesitating to think about how to hold the tools, or which angle he should apply force to the surface of clay. He just picked up certain tools whenever he thought he needed them. His hands, the clay, and the tools were fluently coordinated into the making process.

For experienced potters, they can also easily feel if a tool is good or not in their hands to work with clay. When I was in the pottery class, the teacher wanted to show us how to trim and he used one of the students' trimming tools. He held the tool and touched the clay for few seconds, but he could already tell that the tool was not good as it was too clumsy to trim the pot. However, for me as a new learner, I could not tell if this was the right tool. It is similar to the process of playing a musical instrument. Expert violinists can tell the difference between good strings and bad strings by touch and sound.

For the teacher and other experienced potters, it seems that their body, material, and tools were not separate anymore. They have expanded the area that they can reach with the use of tools. Tools seemed to have disappeared in the potters' hands. Their body, tools, and clay were in the same area of sensation. They could directly feel the movement of clay and listen to its voice clearly through the tools. Therefore, tools functioned as a part of their body in the relatedness between the body and material. The human body can still sense the closeness of the clay and incorporate this feeling into the process of understanding materials.

I have discussed the relationships between the potter's body, clay, tools, and equipment in the last two sections, potters learnt pottery through directly touching, looking at, and listening to the clay. Beside the immediate engagement of learner and non-humans, the learning also occurs in the moments of communications between non-humans themselves, especially in the firing stage, which I will have a discussion in the last section of this chapter.

6.3 Learning from the encounters between materials (clay, glaze, and fire)

Having shaped the clay, potters generally add glaze to introduce more colour or make the pot functional. This stage requires knowledge about glazes and how they communicate in the kiln with different clays:

> Any surface treatment needs to be fit for purpose and mustn't cause a health hazard. Therefore, some knowledge of glaze constituents, colourants, oxides, etc. is important.
>
> (Participant C)

The techniques for glazing are quite simple, mainly including pouring, dipping, and brushing. Pouring is where glaze liquid is poured in the inside of the pot to coat the internal wall. Dipping is where the whole pot is submerged in glaze liquid. Brushing is where different glazes are brushed onto the pot. The challenge with glazing is to envisage how the glaze will look after coming out from the kiln. The greater the knowledge about the relationship between the clay and glaze on firing, the more predictable the results. The glazing process is more out of potter's control than the shaping stage:

> So, some pieces have been glazed like 10 or 15 times each piece and then you just build up the clay. The actual surface of the glaze changes each time you fire and all sorts of things happen in the kiln. You just aren't in control though. So, you know, you don't know what you're going to get.
> (Participant S)

I will now discuss the relationship between clay, glaze, kiln, and fire and how they intra-act with each other first in this section. Then I will explore how potters learn from the encounters between clay, glaze, kiln, and fire.

6.3.1 Entanglements between materials

Different clays contain different combinations of minerals and other elements, this affects the way potters work with them, the specific temperature required for firing, and the results, for example, the colour. For example, Kaolin (Image 16), is usually used for porcelain, its original colour is whiter than other clays. This original colour influences the colour of the finished pots, resulting in porcelains being translucent, white, and bright. Compared to kaolin (porcelain), stoneware requires a lower firing temperature, and its colours are more red, orange, and grey.

Image 16: The variation in different clay

(Source from: Ashley Nicole DeLeon. © The Spruce, 2018)

This was also mentioned by participant C. When the same glaze was applied to different clays, the result would be different:

> I left visible throwing rings in this one (see image 17) because this speckled glaze gives a slight bluish tone where it sits a bit thicker within the rings, giving a feel of waves or ripples in the sea. This also dictated the choice of clay, as the same glaze over a white clay has different results.
> (Participant C)

Image 17: Glazes on pot

Additionally, the colour of glazes before being fired and after is normally different, and different combinations of glazes produce different colours, which are difficult to predict. When my pottery teacher showed me how to glaze, he put different layers of glaze on. When I asked how it would look after firing, he told me that he was not exactly sure, because different glazes have different reactions between them. Image 18 shows a pot before being fired. The pot was glazed with a white glaze on the bottom layer and another darker glaze on the top layer. It appeared to be a black or grey colour and the white underneath colour was invisible. However, after being fired the green colour showed up (Image 19). Although the light colour was not clearly visible, little white and red spots can be seen, which was unexpected. It would show different colour when the pot was glazed with a darker glaze on the bottom layer and a white glaze on the top layer.

Image 18: Glaze before firing

Image 19: Glaze after firing

Besides the change of colour after being fires, the shape and design could possibly change as well. Each clay absorbs liquid to different extents. Participant E applied the glazes to clay, the glaze was soaked up and dried very quickly:

> Painting on porcelain (is) basically totally different from (painting on) any other material. Because the (colour) soaks in and you are just pushing it around on the surface, because it is hard to kind of push the colour and it kind of stays there.
>
> (Participant E)

Glazes always shrink when fired, so straight lines before firing became curved after being fired as participant E described. Therefore, she could not see the exact final patterns on the pot before firing:

> Because the glaze is fired at 5260 or (52)50, °F so it was actually straight before, but then it shrinks and of course, you know, kind of, the shape moves a little bit. They are kind of looking really round before I fired them, and during the firing, the form is kind of moving back, so you don't see before how it's going to move. So, I wasn't expecting this shape before I put it in.
>
> (Participant E)

Clay and glaze can also react differently in different kilns made from different materials. The types of kilns widely used by potters are electronic, gas, and wood kilns. The electronic kiln (Image 20) is easier for potters to control but cannot be adjusted to very high temperatures. When set up by potter it operates automatically, so potters do not need to check it very often. Usually, potters leave the electronic kiln on through the night and open it the next morning. As the kiln is covered there are no external variants from outside environment which will influence the outcome of the final pots.

Gas and wood kilns allow the temperature to get to extremely high. The amount of oxygen in the kiln determines whether the kiln is firing in oxidation or reduction. The chemical processes that clay and glaze go through in an oxidation or reduction firing are quite different and produce different outcomes in terms of colour and texture. For example, if there is copper in a glaze it will turn red in reduction. However, the same glaze will turn green in an oxidation atmosphere. Wood kilns (Image 21) are built in the traditional way. Firing pots in wood kiln requires lots of physical work as potters need to watch and check the fire during the one to three day process. The length of the firing process depends on the size of the kiln. Participants normally needed to move bricks to ensure air circulation (Image 22). This process of firing within wood kilns happens in a more natural but unpredictable way. Through wood firing, wood ashes can be added to the surface of pots, and the way the flames and ashes hit the pots being fired determines the final patterns.

Image 20: The electronic kiln

Image 21: The wood kiln

Image 22: Moving bricks in the process of firing

There are thousands of possibilities for what will happen between clay and glaze when fired. This is often out of the potters' control and the results are frequently unexpected. Therefore, learning the relationship between materials is important and will be discussed in the next section.

6.3.2 Knowing the encounters between materials

Learning about how (material) clay intra-acts with other materials (glaze) and equipment (kiln) is different from the process of making, as there is always an element that cannot be fully controlled. As participant M said, she could never fully control the process and the result:

> There's glazing and how to apply and how is it going to look and when you're glazing it, whatever you're putting on, it never looks like what it's going to look like. And then there's firing. I always, always… so there are so many distinct stages where things can both change or go wrong, every single point.
>
> (Participant M)

Many experiments were required to learn from these relationships. as participant A said below, after many experiments, she got to know better the properties of clays and glazes. It became possible for her to envisage the dynamic relationship between clay, glazes, and fire, and to more accurately predict what would happen in the kiln. The properties of clay and glazes, the elements or factors that might influence resultant pots, and the possibilities between their reactions have connected and formed a more complete map of outcomes for participant A's practice.

> The more I've been doing it, the more I've learned to control it a little bit. It's not like I'm painting, so I don't have 100% control, but at least I learned, like, if I put it here, it's (probably) gonna happen,. If I put it there, it's (probably) gonna happen.
>
> (Participant A)

Participant A also showed me her early pots and some once she had improved (Image 23). The pot on the left is very translucent and bright, which means she knew better about how porcelain worked with glaze and firing. The one on the right is not bright and the surface is not smooth. This was due to the wrong mix of some chemical elements, thickness of glaze, firing temperature, or firing time which she assumed.

Image 23: Comparison about how clay comes out from kiln

Therefore, with experience gained through conducting experiments, potters know the expected result of firing. However, the process is never fully under control, even after many years of practice. Participant R, who had more than 10-years experience in this field, talked about her concern about the firing process:

> What I love about clay is that you never are in control. You think you are, sometimes something can happen that you really don't understand why. Like with a glaze, for example, the recipe, sometimes when you're sure you've measured it the same, it comes out completely different. I can't understand why. I tried to (do many experiments), there's lots of testing and you're thinking what's going wrong? You know, there's so many different things that can happen. Like if it's in a hotter part of the kiln, if the glaze is too thick, or if it's too thin, or all sorts of things.
>
> (Participant R)

Other participants also said that they felt stressed at the moment of opening the kiln. The fired piece can be cracked, and the colour can be far away from what was expected. This can feel like a total disaster. Alternatively, the pot can be surprisingly beautiful, and the colour can exceed expectations. More experienced potters often elicit unexpected surprises through adding extra flux or spraying soda inside the kiln. Here, the dynamic relation between materials, kiln, and potters mean even experienced potters are constantly learning more about pottery and discovering more possibilities in the relationships between different materials and equipment. Knowing these specific relations can only go through experimentation, where the materials can show potters different ways of combination and different knowledge.

In this section, I have discussed the relationship between clay and glaze under different conditions of firing, and how potters learn to understand this relationship through practice. Clay and glaze all have specific properties, how they intra-act with each other will influence the appearance of the final pots. Due to the high temperatures involved in firing, potters cannot touch the pots or use their eyes to watch the whole firing process, so they have to learn from their mistakes. Even master potters cannot accurately predict how the pot will come out of the kiln, so the relationship between potter, clay, and glaze is always dynamic. It is always in the process of becoming. Therefore, potters, even experienced potters, can still expect to learn from the flux of materials.

6.4 Summary of the chapter

In this chapter, I discussed three dynamic relationships between the body, materials, tools, and equipment. I outlined how these relationships evolve through practice and experience. In the process of developing craft knowledge, these encounters are not limited to relations between humans and non-humans. They also incorporate the relations between non-humans, clay, glaze, and kiln, for example. This is recognised as important for learning craft knowledge and creating new knowledge.

Clay is encountered by the potter's body or hands in a dynamic process. Each type of clay has its own 'personality' and properties. Potters need to get their hands on clay and feel its flow. There is a reciprocal force between clay and potters. The potter exerts force onto clay and the clay responds and the potter will feel this force through their hands. The relationship between potters and clay is not static during all process, it is in a state of constant change. As potters acquire more knowledge about materials and understand more about how clay behaves through embodied experience, the relationship becomes more fluent and natural. Potters then allow more space for the clay's personality to come through. In this relationship, the clay 'speaks'. It is not just an inert thing to be controlled by humans. There is a conversation existing between potter and clay. The clay is always changing and moving. The process of learning this knowledge is not to know what the properties are, but to know what different clay can do and engage in a process with them. It is not possible to learn how to do pottery through knowing the clay's properties alone, for example, how to throw. The learning starts from the moment the learner's hands touch the clay.

Potter's tools become an extension of their body which is informed by the relationship between the body and materials. Different tools have different functions. Initially, the tools that potters choose to use is limited, and the tools, body, and materials are separate from each other. The tools are felt as an object outside the body. After more corporeal experience of applying different tools to clay, potters gradually develop more knowledge about the different affordances of different tools. They find new tools or even make their own. Potters learn how to feel the clay through these tools, so that they are embodied into their body. The meaning of the tool is accounted for its relations with other things and humans rather than its own appearances (Marchand, 2021).

Additionally, when clay meets a glaze before and during firing in the kiln, there are many different possible outcomes. The glaze could be soaked into clay and the pattern could be changed after firing, or the colour combination could be diverse at different times. During and after firing, potters cannot use their hands to touch the clay due to the high temperature in the kiln. Pottery beginners learn about the reactions between materials through lots of experiments. They can then envisage possible outcomes which are closer to what they expect. Potters then understand the relationship between materials, however, they cannot completely control the process and the result. These different possibilities show different intra-actions between the clay and glaze during firing. The understanding of such intra-actions embodies more knowledge about clay, glaze, and fire, and enables potters, even experienced potters, to have more opportunities to learn.

Learning with and from intra-acting with non-humans not only requires repeated practice, but the guidance and teaching from more experienced potters. In next chapter, I will discuss the relationships between the learner and more experienced potters.

Chapter 7: The guiding hands/body: Corporeal intra-actions with more knowledgeable potters

In last chapter, I discussed the relationships between the potter, materials, equipment, and tools. Masters, teachers, and more experienced potters understand materials, they know what materials can and cannot do. They have developed a 'comfortable' relationship with materials, tools, and equipment over many years of embodied practice and experiments. How masters, teachers or more experienced potters share this knowledge and the understandings of materials with learners and how they communicate with the learners through their bodies becomes important, which will be discussed in this chapter. Before discussing how pottery knowledge is learnt from other more knowledgeable and experienced potters, I will start by illustrating who the knowledge is learnt from in order to show how the relationship between teaching and learning can be developed in various ways.

7.1 Who to learn from?

Participants learnt pottery from teachers, masters, or more experienced and knowledgeable potters who taught them how to do pottery in different settings formally or informally. They all mentioned the importance of having someone with more experience or knowledge available to guide or supervise them through their learning process. The relationship between the teacher and learner was not always a formal one between teachers and students, or masters and apprentices. It was also informal, for example, between parents and children, or between friends where one person had more experience in particular techniques.

Some participants went to the formal universities and colleges and learnt pottery directly from their course tutors and supervisors who were experienced potters and got lots of helpful suggestions on how to solve their problems:

> X [a potter] is, really, really experienced and she does know a lot about ceramics. So, when I had any problems, kind of the glaze wasn't right or firing went wrong, I could go to her. I could go to [her] and ask question[s]. She will help me, so it's really, really good to, kind of, have people around you [who] have more experience in certain areas in ceramics and you can actually just go to talk to about it, sort [the problems] out.
>
> (Participant E)

Some participants learnt their craft when situated in a workplace through apprenticeship with many experienced workers around them. This afforded opportunities to learning pottery from them:

> There were 16 staff, 16 mould makers in XX [a British ceramic factory]. I was the youngest, basically. I started between the older people who've been there for 20 years. They do [work tasks] with experience and basically, they kept me under their wing, and then they showed me the way, showed me how to do it.
>
> (Participant B)

Some participants learnt pottery from their families who worked in pottery industry for generations. For example, participant F was immersed in the pottery culture, tradition, and atmosphere. He watched what his parents were doing on daily basis. He helped to do some small tasks for his parents when he was young and directly went to pottery industry in adulthood. He often played with clay and tools.

> Basically, I am from Stoke-on-Trent, which is like the heart of ceramics industry. In my family, [they] all do ceramics, my nan, my gran, my mom, my auntie, all do ceramics. So I've kind of brought up to be in that industry. my auntie was to make flowers for XX (one of the leading ceramic companies), which I would sit and do with her when I was young, when I was 14, 13, 12 years old. Actually I went to the factories quite a lot on Saturday with my dad. He would always say people in Stoke-on-Trent, who were in the industry knew the job before they knew how to chat, the parents or the grands would teach them before they actually went to the factory itself. So you kind of got ahead already […] I only do some bits

> and bobs, with watching and be with my parents and grandparents while they were at work or working from home.
>
> (Participant F)

Additionally, participants developed their knowledge in an informal way from their friends who had more experience with certain techniques. They went to their friends for some helpful advice:

> And then of course [I learnt by] going around with my eyes open, my ears open, talking to people, talking to colleagues and we all help each other. So, you know, if any potter wants to learn anything, I'm always available to help if I can, and if I need help, somebody will help me, you know. If I'm trying to do something [and I don't know how to do it], I probably know a potter who does that very well. You know, so I ask how to do it and we usually [help each other] you know.
>
> (Participant G)

Besides learning from other more experienced potters, the participants learnt a lot from objects made by other experienced potters. In chapter 6, I mentioned that the potter and pots they made actually became one, they have merged to each other. When the participants worked with materials through their hands and body, there was a continually exchanged subjectivity between materials and potters. The materials and potters were in the same rhythm of sensitivity. This being of the pots and potters was constituted in the intimate intra-actions between potters, materials, and tools. As participant N said, he and his pots shared the same identity, personality, and energy, so the potter can be seen and recognised from the pots they made:

> Every potter has their thumb prints on the pots, it can represent that they existed, in another way, they can live forever, for hundreds and thousands of years…I am in that pot. My energy's in that pot. My personality is in that pot, you know, a little bit of me. A little bit of me is in every piece that I make, which is why some people say, 'I don't know why I like that. Gosh! If I have pots, I like to have met the person who made it!'
>
> (Participant N)

Pots made by the participants conceived the specific entanglement of the potter with materials and tools. Through looking at different handmade pots, potters learnt the different ways specific hands work with materials and tools. When I went to participants' workshops, most of them used other potters' pots for eating and drinking (Image 24). Participant N said he developed different conversations with different experienced potters through talking with the pots made by them. It was also a specific way of learning from others.

> I don't use my own pots. If I use my own pots, I can only communicate with myself every day. So, I buy other potters' functional pots and use them. Then I can communicate with other potters, I can have a conversation with different people, that's learning from other people. Pots are part of potters.
>
> (Participant N)

Image 24: Use other potter's pots to learn

No matter where they learnt pottery and who they learnt this knowledge from, participants always had one important relationship that existed in their learning process. This was the intra-action between them, as less knowledgeable and experienced learner, and more knowledgeable and experienced potters.

Next, I will discuss how and what the more experienced potters teach in order to share the knowledge.

7.2 How to learn from the experienced potter?

Due to the tacit aspect of craft knowledge, this knowledge is conceived and passed on through potters' bodies. This learning takes place in the actions of observing and copying the bodily gestures of another and incorporating them into the learner's own body over time and through practice. This teaching and learning are not conducted through written language. From last section (section 7.1), it can be seen that participants mostly leant pottery through watching others work, working with experienced potters, and getting feedbacks, guidance, and advice from experienced potters. Therefore, I will present this section in terms of embodied demonstration and imitation and supervision and guidance.

7.2.1 Embodied demonstration and imitation

When participants were learning pottery, it was very useful for them to see, watch and observe closely the whole pottery process. Tutors or more experienced makers showed and demonstrated the process of how they made things:

> And she [the tutor] took me to her studio once because I was really struggling with making forms. She showed me how she made things. So, I actually observed her making one of her pots. And it was quite good because she, sort of, did things very slowly, and she taught me a few techniques for slabs because I worked a lot with slabs. And that was really nice to, sort of, see your tutor making things.
>
> (Participant S)

When masters were showing participants their process of making certain objects, it was not just a random process of showing their daily making practice. What and how the masters showed and discussed with the participant learners was very important.

When I attended the class about teaching beginners how to throw pots, the teacher just introduced himself, as a potter, for a few minutes and provided basic information about the course. He then did not talk about anything else, he directly went to his potter's wheel, sat closely to it, and asked us to stand around his wheel and watch his body and finger movements carefully. Then he explained that he would throw a cup, and he took a wet clay ball, threw it in the centre of the wheel, turned on the wheel, and started to put his hands into the clay ball. While showing us his finger movements, he explained what he was doing, for example, trying to centre the clay. He showed what it looked like when the clay was not centred. He put his hands into the uncentred clay and told us to see that his hands were pushed against by the 'wobbling' clay. He showed us that 'uncontrolled' process because he wanted to explain the importance of keeping our arm stable on our leg and our body steady. After having centred the clay, he opened up the clay and kept his right hand steady on the clay body, moving the fingers of his left hands to open up the clay (Image 25).

Image 25: Opening up the clay

When he was lifting up the clay, he reminded us to watch carefully how his fingers moved. He put his left hand inside the body of the clay and put his right hand outside the clay body. The fingers on both hands were moving upwards together (Image 26), and he said to us, ‘your fingers on both hands need to feel each other, and also feel that the clay wall is becoming taller’.

Image 26: Lifting up the clay

The teacher also showed me and the rest of the class when and how to use certain tools, like the sponge, the metal rib, and the wire and talked about their functions. For example, he bent the metal rib into a round shape and put the round surface of the metal rib onto the surface of the clay to smooth the surface of the clay. He kept mentioning that we should look carefully at how his fingers and hands were moving and how the clay body became after his movements. After the demonstration, he told us to go to our own wheels and try to copy what he had done during the demonstration. This was the process my teacher used to teach me to throw a pot during my first class. In the later classes, teachers also used demonstrations to illustrate different techniques and they explained their body movement in the similar ways.

My experience in pottery class showed the importance of demonstrating the whole process involved in a technique. The teacher’s use of words was to assist the demonstration of his body’s movement. What the teacher was saying was what he thought was very important for learning each technique. The verbal explanation was an embodied way of teaching skills, rather than abstract language. He explained how he was feeling when he communicated with the clay using the tools in his hands and with his body. He illustrated what would happen to the clay if his hands moved in different ways and he used his body and finger movements. This showed the class how to use feelings and sensations, experienced through their eyes, hands, and ears, to feel the properties of materials, changes in the clay, and the movements in the process. This teaching practice was not only in the intra-actions between teacher and learners, the clay, tools, and equipment all played very important roles. If the teacher had just used oral language to explain to students what they should do, or the teacher had just showed bodily gestures without touching the clay and holding the tools, it would be very difficult for learners to understand what to do. The teaching practice would then be meaningless and learning would not emerge.

When the teacher showed me the making process, **what I, as the learner, needed to watch** was very important. It was important that I did not focus on the potter nor on the clay, tools, or equipment separately. I needed to focus on the intra-actions between potter, clay, tools, and equipment. For example, when the teacher was using tools, I needed to make full use of my eyes to pay attention to how the teacher was holding the tools. For example, the turning tool has two different sides, one side is narrow and the other side is wider and round. I needed to watch how and when the teacher used the tools differently, how his hands changed positions and angles while using the tools, how different ways of using the tools left different marks on the clay body. As a learner I needed to watch the movements flowing between the teacher's hands and body, the clay, and tools and remember these body positions and movements in each step. This allowed me to then imitate these actions and gain understanding of how these body movements brought changes to the body of the clay. When I was observing the teacher's making process, I paid complete attention to the teacher's body positions and actions. For example, I focused on how to hold the tools and how the angle of the teacher's hands was changing. However, I neglected to connect these body movements to the changes of clay and how different positions were shown differently on the clay body. Therefore, I had some problems in my own pottery practice, for example, in the process of trimming the pot:

> I always couldn't trim a bowl rim with the same tool that the teacher used in the class. I copied the same positions of the teacher's hand holding the tool and moving around the pot, but I still could not make a rim by myself. The surface was always too round (shown in image 27) and not sharp enough to make a rim. I asked the assistant, and she showed me again and watched me trimming. However, she still didn't know what was wrong, so couldn't find the reason, or explain it to me. Then I tried to get some help through watching YouTube videos about how a professional potter was trimming a bowl. I observed how the potter held the tool at a certain angle during the trimming process, and most importantly how the body of the clay was changing and moving with different body positions and actions. I found that I needed to keep the tool almost parallel to the pot, and use the edge of the tool and not the middle part, then the clay will respond to you in this vertical way and the shape will come out in the end (shown in image 28).
>
> (Field note, pottery short courses)

Image 27: The failed rim

Image 28: The successful rim

> There's just something which is, kind of, once you've seen someone doing it, you just, you kind of mimic their bodily actions. So, the way you hold the tool, you know, the kind of, the do's and don'ts, you, kind of, pick up quite quickly……so you have it in your mind that you've got to do it properly and you've got to feel, kind of, holding things in a certain way [in practice].
>
> (Participant L)

Besides what to watch and see, **how and where to watch those body movements** is also important for learning. During the teacher’s demonstrations, I, and the rest of the students, stood very close to the teachers’ wheel. We were allowed to walk around the ‘show and watch’ area (the physical layout of this teaching and learning space will be described in the next chapter). I needed to observe carefully the body actions involved in each step of making. It was important that the teacher was physically close to the learners to enable us to watch these movements and try to feel how the clay was moving in the hands of this master. It was also important that my learner’s body was flexible physically in the space of the teaching and learning area. That way I could watch the teacher’s bodily movements from different sides and pay attention to the teacher’s finger movements from inside and outside the pot, the movements of their fingers on the left and right hands, etc. When participants watched similar demonstrations from different angles and sides, they could see different movements that could not be seen from standing or sitting statically, as participant N illustrated:

> When I got to watch a potter [showing the making process], I went to see a man called X. He sat like this and all the people that were watching stood there, but when you make a pot, make it here, you know on o'clock. It's three o'clock. All the work is going on. So, people sat all around, so I moved, and I came, I stood here. Then I could see and feel what he was doing by watching. So, you must be able to see from that point of view. Sitting there, you can't see anything. You can just listen to him talk. And it was wonderful to [listen to him] talk[ing] about his stories. But what I wanted to know is where his hands went...And so you had to stand here from this point [participant pointed the directions through his body gestures]. So, I walked around and stood in the doorway. You can see the fingers movement and you understand why they're doing it…… And I watched him doing it and it has this sort of spiral, sort of line. And all he did was he threw a pot, and then he just turned his [thumb] from his thumb down the other side. And three seconds, and that makes a complete difference, everything goes, spiral comes up when you're throwing but you go back down against the spiral it puts up. And it's just that, but if I was standing there [another direction], I wouldn't see it. So, you know, your eyes are very good learning process, watching and observing [from different sides].
>
> (Participant N)

Participant N illustrated that if a learner wants to gain certain knowledge from more experienced craftspeople, they need to focus on the master's hands movements. This means they cannot just sit in a fixed place and see the process without moving as they could miss important movements which make a difference to the clay.

In conclusion, my research showed that an effective way of teaching pottery is through show and tell. Experienced potters show their body and fingers movement throughout the whole process and how their body communicates with the clay and tools. The teacher explained and showed learners how to make certain pots through their body intra-actions with clay and tools. Learners needed to watch and observe these body actions with their eyes which are very good tools to learn and copy all these movements. Learners felt the intra-action process by integrating the teacher's body actions into their own bodily sensation. Through this whole process, learners aimed to understand pottery practice through the shared embodied feelings. The bodies of the teacher and learners were in a shared material sensibility. Experienced potters shared the sensation of their body while working with clay and tools with students, and learners tried to feel and imagine this sensation through watching this embodied practice with their eyes and bodies. These embodied feelings and imagination of touching materials and using tools varied according to the different level of embodied knowledge that learners had acquired. These feelings and material sensitivities were improved when leaners obtained more practical experience of making different pots. Participant N experienced the nature of the clay when he was watching another potter throw a pot, even though he was not the one who was touching the clay. He still felt the moves through the demonstrator's body. He positioned himself in the demonstrator's body and tried to feel what the demonstrator was feeling and sensing.

However, my research illustrated that the teacher's way of making pots was not the only way. The teacher could only explain what their body and hands felt like when working with clay, but they could not tell learners how they will feel when they work with clay. This required learners to touch the clay themselves and feel it through their own hands and bodies. What the learner learnt was produced in the specific intra-actions with their own body, the teacher's body, materials, tools, and other matters in a particular time and specific space. Different intra-actions produced different ways of bodies connecting to materials and tools. Though the basic rules and step sequence of making certain pots are quite similar, the actions of the body can be different.

When I was learning pottery and watching YouTube videos about making certain pots, I found that different potters showed different hands gestures when they are making. When opening the clay, some potters used both their thumbs to open it towards both directions (Image 29), but some potters used all their right hand fingers to open it towards one direction, with their left hand holding the clay body on the other side (see previous image 25 in this chapter).

Image 29: Opening the clay with thumbs towards different directions

How potters worked with clay and tools depended on the sensation of their body and the feeling of the process of making. Therefore, learners can copy the same gestures and body actions but they cannot just copy the body movement without understanding the meaning behind these movements. These movements become meaningful because of the combined material sensations. Participants tried to incorporate the material sensibilities from other bodies into their own corporeal schema to understand what their bodies needed to do to achieve these movements. Through long-term practice, they explored the way their own bodies worked with the clay and tools in a fuller sense. Participant N, a teacher, had already established his own voice in working with clay and tools. He discussed how learners needed to explore their own voices:

> When I'm teaching anyone, I say to them, ‘right this is how I do it. This isn't the only way to do it. This is the way I do it. Over the years I’ve figured it out. You try my way first and then find your own way. You have to start somewhere. So, try doing it my way (firstly). It's like centring, I centre like this. Some people centre (in other ways), but that's the way I do it. That's not the (only) right way, you have to find your own way. I've got my voice, you have to find those as a different voice’.
>
> (Participant N)

After observing teachers the research participants had a go at pottery to practise what teachers and masters had taught them. During this practice, participants had different kinds of problems which required guidance and advice from experienced potters. In the next section, I will discuss how experienced potters supervise and guide students in the process of their learning practice.

7.2.2 Supervision and guidance

When the research participants started to learn pottery, teachers taught them the basic techniques and let them have a go. The teachers’ role then became mostly supervisor, providing advice when necessary:

> The teachers teach you more, like, in the beginning, like how to make moulds and glaze making, kind of, they can teach you basics. And then you just get on with it. If you have problems they come and help you.
>
> (Participant D)

Usually, teachers and masters were physically near the participants when they were learning how to make certain things. It enabled them to check the progress of the participants, recognise any problems, and give feedback. Additionally, they identified participants problems from the resultant objects and provided suggestions for the future:

> And then also, so they would have either revised at the end of the day what I had to make, or like sit next to me and be like, [checking if I am] doing this wrong.
>
> (Participant A)

At the beginning of each session of my short pottery courses the teacher started by illustrating basic techniques. I then went to my own wheel to practise. While practising, the teacher walked around the whole room and watched everyone making certain pots. When I had some problems I just asked the teacher to check what the problem was and suggest ways to solve it. The teacher always provided advice about my body positions and movements. This advice was normally given by describing suitable body positions and actions. When I was centring the pot I could see that the clay on my wheel was quite ‘wobbling’. I asked the teacher how to prevent the clay moving around in every direction. The teacher asked me to show him how I centred the clay, and he stood around me to check my body position. He told me that my arms were not placed on my legs which meant my hands were not steady and the forces from my body were not even and stable. This meant that the forces of the clay were not even, and the clay could not remain centred through the whole process. He suggested a few solutions around how my hands and body should be positioned and moved. When I still could not work it out, the teacher said to me, ‘do you want me to show you?’ Then he showed me the movement of his fingers and asked me to copy his movements in my next practice:

> The interesting thing is when the teacher was watching me making, we all knew that something went wrong, but sometimes he could not explain what was wrong in spoken language, he just directly showed me how he worked with the clay or how his hands moved.
>
> (Field note, pottery short courses)

What bodies do is informed by what bodies know. What learners know about materials and tools is applied in the learners’ body and finger movement (Markula, 2019). When the teacher watched my making process, he was not just watching my body positions and actions or just watching the clay. Instead, he watched the relationship between my hands, materials, tools, and equipment. My teacher tried to understand how my body and hands communicated with the clay and tools through the actions of my body. He checked my basic body positions to make sure I was giving even, stable, and consistent forces to the clay or holding the tools in the right way. Sometimes, he could not understand the problems I was having because it was difficult for him to feel the material sensation of my body and hands. He showed me his own movements and tried to explain how his body and hands worked with clay and tools to enable me to sense and feel the right way of making and experience the process for myself in order to solve my problems.

Participants who were also teachers illustrated how teachers and masters had a more embodied and corporeal experience of working with clay and tools than learners. When they tried to help students develop their ideas, they were able to access more embodied imagination about potential pottery and give learners advice before they started to make pots. Participant N talked with his tutors about the glaze he intended to use on the lid of a pot and his tutor envisaged that there would probably be some problems in the making process:

> Each week we would have a tutorial where we would discuss my ideas. So, I would have an idea. I'd say I want to make vessels, but I want to make it with glaze on the inside only, but no glaze on the outside. [I] had to explain to the tutor what I liked and why I wanted to make it, why I chose that size. And then they would advise me and say, ‘okay, maybe you might have a problem with the lip, you might have a problem with that, to think that this (or that way)’. And they would critique the idea, then they would say that's okay. Then we would then go and make the work.
>
> (Participant N)

Even when the participants made some learning progress through practice, their teachers still imagined how the learners would intra-act with the clay and what problems they might meet. Participant N showed his teacher had conversations with his work and gave feedback and suggestions for the next steps:

> And then the following week, we would put it down and say this is from there. And then they say to you, 'how do you think you've succeeded? How did it work? What problems did you have? Maybe you could try this. Maybe you could try that'. Just in conversations like this……and it's just a conversation and they say, 'why isn't it doing that? Why is that one better than that one'? And you say, 'I don't know'. [The teacher explained], 'why is it? Because of this, because of that', and they say, 'maybe it's whatever if you just made the narrower one?' And you go 'okay', and when they come back, you'll see, it's slightly different. So, it's all done through a conversation. It can't be just me as a teacher giving information.
>
> (Participant N)

When participant N saw his students objects, he gave certain suggestions like 'maybe try to make it narrower'. He gave suggestions about the objects his students had made. This showed a way of thinking where teachers tried to understand how the learner translated their ideas into their bodily intra-action with materials and tools. Here, the matter was the actor who guided how teachers and students talked to each other. All these conversations conducted with the participants were negotiated and renegotiated through the intra-actions between bodies and materials. These conversations helped to develop ideas and constitute meaning inside the teaching and learning practice. This teaching practice was not the process of just transmitting the already-known knowledge from the teacher and master to learners. Clay, tools, equipment all played important roles in affecting this process. It was situated in the specific engagement with materials. Materials and tools were not just mechanic or mediated things to be used by teachers and students in the teaching and learning practice. There was a conversation going on between teacher-matter-learner to understand each other.

In the process of teaching, the teacher, as an affected body, was also affected by different intra-actions between themselves, their students, and other matter. For most of participants, who are already experienced potters, learning from the process of teaching was also an important way for them to gain new knowledge. While watching and guiding students to make specific things, teachers learnt something from the students:

> I have to solve all of their problems, so it's good for me, because it makes me think about [how to solve these problems]. Because it's some of the problems I think that I actually have to deal with myself. So, it actually forces me to think really quickly about them and to actually [solve them] in my process [of making].
>
> (Participant D)

Different ways of engaging with matter were shown by my research to be conceived differently in learners' different embodied intra-actions with materials and tools. There could be various problems happening in the process, which contained information about different relationships between bodies, materials, and tools. It was difficult for teachers to overcome every issue in their own practice of making. When they encountered problems they had not met before, the participant teachers tried to understand what had happened through observing what their students did and how they worked with clay and tools. This then helped them with their own problems. In the process of solving problems, participant teachers learnt something new about materials properties and how to communicate with them appropriately in different situations.

To summarise, this research showed that the knowledge emerged in the dialogue between the teacher, learner, materials, and other matter. These conversations were processed and co-constituted through the intra-action of the materialities between learners and teachers and with materials and tools. This knowledge was continually negotiated and re-negotiated in the intra-actions among all of them. The relationship between learning and teaching was not conceived as the transmission and acceptance of fixed knowledge that existed in books. This knowing was generated and evolved through the entanglements between different bodies with matter. Teaching and learning existed everywhere. Potters learnt from each other and taught each other at the same time. Learning was not restricted to formal relationships that happened in formal classroom or lecture halls (Springgay et al., 2008). Knowledge did not have to emanate from human teachers. All of the teaching and learning practice was in the shared embodied materiality and corporeal knowledge. Potters connected with other bodies through this shared material sensation and a social learning network was constructed. The social mutual communication was materialised in the intra-actions among different bodies and matter. As participant N said, the embodied teaching and learning practice continually constituted social communications between potters. The materialised sensitivity became the medium for potters to gradually construct and build up their informal pottery social networks to exchange their knowledge and information and share and learn this embodied and materialised sensitivity from each other.

> Even now, after all this time, I still can learn. I have trouble making jugs, don't know why, they don't seem to feel right. So, I'm going to go to a friend and he's gonna teach me how he throws his jugs. So, you know, there's always someone better than you. There's always someone with more knowledge than you've got. You gonna talk to them.
>
> (Participant N)

7.3 Summary of the chapter

This chapter mainly discussed how learners communicate with more knowledgeable people in their learning process. Because of the tacit property embedded in this pottery knowledge, its practical teaching and learning cannot be passed on purely through oral language. This knowledge can only be taught though a combination of demonstrations with some talking and oral explanation at the same time. The oral explanation is mostly about body positions, actions, how clay is shaped with the hands, and descriptions about the teacher's feelings in different times and spaces. Within this research, teachers and masters asked students to 'sit close to the wheel, always put one of your arms on your leg, use your index fingers to pull up the clay, and the clay will become taller, or use your hands to feel how thick the clay wall is'. The relationships between the clay, body, and tools cannot be adequately described verbally, it can only be embodied.

Second, in this chapter, I have also discussed the findings of my research in relation to how and what teachers demonstrate in order to teach pottery. Teachers showed their body's movements to the learners to enable them to copy this movement in their own practice. This bodily showing was not just to show the gestures and actions of the body. The focus was also on how teacher's bodies or hands were intra-acting with materials and tools. The research showed that learners did not need to pay attention to either the teacher or materials, but to their intra-actions. It was very important that these bodily intra-actions with matter were shown in front of learners' eyes.

Third, I discussed how the research findings highlighted the way teachers help students to solve problems and develop their ideas. Teachers witnessed the leaner potters' problems through observing their making process and guided them on how to correct their problems. Within this process teachers tried to understand how learners intra-acted with materials and tools through observing the movements of their body. The teachers and masters were shown to have a better corporeal imagination than their students about what problems could happen in the body of the clay and objects. They tried to help learners develop their ideas and gave useful suggestions based on the objects that students made.

The suggestions and guidance from teachers related to the intra-actions between different bodies and hands, materials, and tools. Teachers and learners shared the embodied materiality and tried to feel and sense how each other's body or hands communicated with materials and tools. In the process of helping learners to develop pottery knowledge, this research showed how pottery teachers learnt from their students. As different bodies have different relations with materials and tools, learners also encountered problems that the teacher had not met before. Teachers learnt from the process of helping learners to get along well with materials and tools. Through the corporeal intra-action with more knowledge people learning happened everywhere. The participant potters learnt from a variety of sources, including experienced human bodies and non-humans. Potters asked for help from each other to build up pottery knowledge and this social communication conceived meanings through the intra-actions between different bodies with materials and tools.

In last chapter I have also discussed how the intra-actions between human bodies, materials, tools, and equipment were different at different times. The physical structure of spaces was important for learning pottery knowledge. They shaped the way teachers, learners, materials, tools, and equipment intra-acted with each other. They influenced the teaching and learning process. The temporality and spatiality entailed in the process of learning pottery knowledge helped me to consider craft learning from the perspective of time and space, which I will discuss in next chapter.

Chapter 8: Time-space: learning craft knowledge in the space of studio

In the last two chapters, I discussed two relationships: intra-actions between potters, materials, tools, and equipment and intra-actions between learners and more experienced potters. In my thesis, there is one more topic I would want to discuss: that of time and space. Although my research participants developed pottery knowledge in a variety of settings, the most common space for learning was the pottery studio. Therefore, it was important to consider how the studio space shaped their learning and how they became experienced potters through practice within this studio space. I will take the studio where I learnt pottery as an example and combine it with participant interview data. In this way I will illustrate the dialogue between potters, teachers, non-human elements, time, and space.

In this thesis, space is not considered as a pre-existing physical container of practice. Therefore, the attention of this chapter is not only on what happens 'in' the studio space, but also what happens 'with' the space to discuss how the studio space and learning activities co-constitute each other. In the first section of this chapter, I will discuss the layout of the studio space and the teaching and learning activities that took place there. I will then talk about how the layout of the studio shaped and affected teaching and learning, how pottery learning emerged in this space, how the space was constituted in the intra-activities between teacher, learner, and other non-humans, and how teaching and learning activities produced meanings to the space.

Time in this thesis is considered as the lived experience in the studio space and the embodied perception of the studio here. In the second section of this chapter, I will talk about how potters became more proficient through practice. Time and practice became the theme to consider how potters' knowledge improved, how the feeling about materials was embodied gradually, and how regular habits were formed to deal with different circumstances. Although learning happened in the moment, it was entangled with the (distant) past and future and this will also be discussed.

8.1 The co-constitution of studio space and craft learning

The research participants spent a lot of time in their studios working and learning through repeated practice. The studio space played a very important role in their daily activities and in the process of teaching and learning. Therefore, it is important to consider the relations between the material arrangement in the studio space and the learning process. In this section, I will discuss the studio where I learnt pottery to highlight the role of the material environment. First, I will provide a brief introduction to the layout of the studio space and explain the multiple relationships between learning practice and the arrangement of space in different rooms.

The studio where I completed my pottery course was divided into three different rooms. There was a making room, a glazing room, and a firing room. There were around 10 potter's wheels next to each other in the middle of the room. Each potter's wheel had one chair, a small shelf for putting the finished pot on, and a few tools that were needed in the making process. Around the wall there were two long work desks for wedging the clay and preparing it for throwing. There were a few sinks that provided water for cleaning the wheel and throwing. Pictures of different pot styles and finished pots were displayed in the corners. At the end of the room the teacher's wheel faced toward the student's wheels so that the teacher could demonstrate techniques. The materials, tools, equipment, objects, pictures, and other things in this room were not just static objects separated from the teaching and learning practice. They communicated through the intra-actions with each other and with students and teachers and this activated the possibilities of pottery. Being situated in this space containing materials, tools, and more experienced potters was the first step in learning this tacit and embodied knowledge. The glazing room was full of different glazing buckets, work desks, and tools. There were various samples of finished pots demonstrating different possible combinations of glazes. Two electronic kilns were set up in the firing room. The firing room also contained some fired pieces that were ready to be picked up by their maker. In this section, I will explore how humans, non-humans and this space shaped teaching and learning practice.

8.1.1 Material assemblages in the studio

As outlined above, the studio was mainly composed of the rooms for making, glazing, and firing. In this section, I will discuss how the different rooms were arranged and organised, and how different material assemblages provided space for teaching and learning craft knowledge.

The making room

The room for making was mainly equipped with bags of clay, various tools, potter's wheels, unfinished and finished pots, desks, chairs, and a whiteboard. These materials constituted teaching and learning practice differently at different times.

The whiteboard was mainly used by the teacher at the beginning of the course to draw out the structure of different shapes of, for example, a bowl, plate, or a cup. This enabled me to visualise a pot from different perspectives especially the inside structure which is always invisible in the making process. In the later stages of the course the whiteboard seemed to fade away from the teaching and learning practice even though it was still physically there.

Across the corners of this room were a few long tables without chairs that were used for wedging the clay. There were a few potter's wheels set up one by one with chairs for throwing. The different set-ups structured and organised learning practice in different ways. There were no chairs provided alongside the wedging tables because potters needed to lean into the clay from a standing position to use their whole-body energy to wedge the clay. Seats and planks were arranged around potter's wheel for stability during the process of shaping. This enabled consistency through putting one arm onto a leg for support during throwing. These physical and material arrangements in the studio facilitated engagement in different modes of learning at different stages of making and reminded me to adjust my body gestures and actions throughout the learning process.

Within this room there was also a lot of clay, different shaped tools, water taps, and plastic bowls for taking water for throwing. These were always arranged in the same way which afforded a sense of intimacy with the materials and tools and attained a high level of availability allowing me to access any required materials and tools immediately. Different tools were categorised in different drawers according to different techniques, for example, turning tools. These drawers contained notes that guided me in the tools' different uses and functions, enabling a basic understanding of the tools' being used in different techniques.

On a shelf there was also some pottery pictures and some unfinished and finished pots. The display and physical presences of those pictures and pots afforded me more ideas about how those pots were made through other potters' hands and I could ask questions about their shaping, colour, glazes, temperature and so on. It played a very important role in my learning process by showing me the possible connections between materials, tools, equipment, other potters and so on. This meant that I, as a learner, could have a conversation with other potters through touching and looking at the pots they had made. This replicated research participants' experience of visiting museums and galleries where learners respond to the objects and the potter's relationship with materials behind it and try to replicate this in their own work. This provided the opportunity for leaners to expand their practical vision, imagination, possibilities, and inventiveness. Embodied and aesthetic knowledge was generated and produced through engaging with those pots imaginatively, thereby embodied and material sensitivities developed. This was mentioned by many participants during their interviews, for example:

> For the first project, we had to select an object from The Victoria and Albert Museum and respond to that. I just used the opportunity to learn as much as I could, get into the workshops and try as many different things as possible.
>
> (Participant I)

> I had seen an exhibition of her [Kate Malone, a UK leading ceramicist] work in Bristol on a school art trip called 'The Allotment', a touring exhibition supported by the Crafts Council, and was totally amazed at her sensual, brightly glazed fruity forms. My early work was certainly influenced by Kate's style. Her work is uplifting and showed me at an early age what is possible from working with clay.
>
> (Participant R)

The unfinished and finished pots were refreshed and renewed, some of them were collected by their makers, and some of them were sold. Then new pots were added to the shelf. These new pots held the potential to spark new ideas and possibilities and create new aesthetic knowledge.

The glazing room

In the glazing room there were lots of buckets of different glazes which were arranged into colours in different areas. There were numerous samples of glazed pots using different combinations of clays (stoneware, earthenware, and porcelain) and glazes showing the potential glazing outcomes. The glazed samples invited me to experiment and learn from the experience. There was a big table in the middle of the room to enable potters to stir glazes in buckets and glaze their pots. This big table was often shared by many learners and provided a space for me to talk to other learners. Here, I exchanged ideas and knowledge with each other learners and this was inspirational. Some more experienced learners, including the teaching assistants, shared their understanding of different glazes with me. I showed my finished pots to other learners and they showed theirs to me. I always asked questions about what glazes other potters had used to achieve their colours and how they combined different glazes. This space soon became a site for social communications as well as a space for learning from each other.

The firing room

The kilns were in a separate room from the glazing and making areas. There was no physical boundary to prevent us from accessing this room because the door was always open, and everyone was allowed to go inside and pick up their fired pots. However, I, as a learner on a short course, was not allowed to operate the electronic kiln. Normally, the teacher and teaching assistants fired pots outside of class hours. I was not able to watch and learn the techniques for firing pots.

The corridor

The corridor, which contained a few cupboards, was not supposed to be the place of teaching and learning craft knowledge. I always put my unfinished pots inside the cupboard to stop my pots drying too quickly. The teacher always put fired pots on top of this cupboard so that I could recognise my own pots and collect them up as I entered the class. When collecting my own pots I could also see other people's pots. This initiated conversations about how these pots were made. Gradually, the corridor became a space to exchange ideas and learn from each other. These pots provided information about what others were working on and these social conversations gave me a sense that the corridor was buzzing with creative ideas and knowledge. The meaning of the corridor had been changed and transformed from a mere physical space for walking to a social space for communications and learning.

8.1.2 The workspaces of the teacher and learners

In chapter 7, I discussed how more knowledgeable potters shared their knowledge with learners and how it was key to watch and copy their body movements to learn. Therefore, it is very important that the more knowledgeable potters are physically close to learners when they are practising. The learner can easily observe the teacher at work and better understand their patterns, and the master can easily spot learner's mistakes and guide them to fix the problems.

Within my pottery learning studio the teacher's showing space was physically close to students' practice space (see image 30). This meant I was able to watch and copy their body movements, and more experienced potters could see my bodily actions and give me guidance and feedback. The teacher's wheel faced the students' wheels, and I could observe and watch his body movements whenever he was working on a pot. The teacher could easily demonstrate techniques in response to a question.

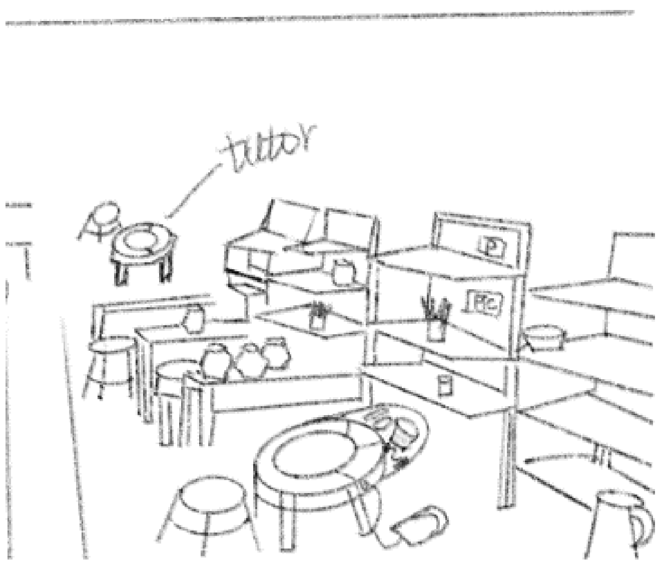


Image 30: Part of the workspaces of teacher and learners in the studio

As the studio was small it was possible to see different people doing different things, for example, throwing, decorating, turning. The making spaces were also physically close to each another and there were no boundaries between these working spaces. This enabled me to see what others were doing and how they were making their pots and 'steal' knowledge and skills from more experienced potters. This space allowed a high degree of relatively unconstrained movement. I could walk around freely, watch, and talk. When other learners walked through and saw my making process, they talked to me and sometimes gave me some suggestions about how to improve my pot. This small space also stimulated social conversations. The fluidity of this space afforded access to relationalities and diverse knowledge embodied in teachers and learners' bodies, materials, tools, and equipment.

8.1.3 The extension of the studio as a learning space

Once when I went to the studio and the teacher was watching YouTube videos about how to throw a teapot and invited students to watch together and learn from the video. This activity broke down the physical boundaries between me, as a learner in the studio, and the online potter. It extended the dimension of the studio through connecting the maker in the video, the teacher, and me, as a watcher.

Online tools, like YouTube, provide an online platform for communication and have become more important for potters to teach and learn. Some of participants, for example, participant N and K, set up the camera to show the making process, record their body movements, and upload the videos online. In this way, they did not need to be physically close to a learner to demonstrate their body movements. I, as a learner, could search these videos online and choose the one to watch to learn particular techniques. Additionally, pottery TV programmes, like 'The Great Pottery Throw Down', show the ideas and making process of many experienced potters providing a great learning opportunity. As participant T said, you could just watch pottery programmes to learn the techniques even without going back to study at university again:

> Then programmes like 'The Great Pottery Throw Down'. You can watch it and learn a different process or different skill. You don't tend to have to go back [to college], you can if you want to go back to college, but without [going back to college], a lot of the skills can be learned by just watching [online videos].
>
> (Participant T)

This technology has affected the space and time of pottery learning practice. Especially the explosion of COVID-19 has transformed the traditional physical space of learning craft. Some of research participants, for example, participant K, started to explore the alternative way of teaching and learning craft when people were not allowed to meet each other physically.

8.1.3.1 Learning pottery 'anywhere' 'anytime'

In the case of participant K's online class, the technology provided more opportunities for people who cannot physically be in the pottery class and still want to develop craft knowledge. Some people were very busy working or taking care of children or they lived far away from the studio or are disabled and was not convenient to go to the offline courses physically:

> So, my students, the feedback I'm getting is that they really love that [online course] because, you know, your children come and they need to be fed or taken to school. And you can just stop and then you can carry on later. So, that actually works very well for my students. And interestingly, some of the people who were my students, a couple of them, I would say not the majority, but some of them have said, they want to carry on online rather than working here [in the studio], because they're too busy to come to class, but they still want to do it. Some people won't come back to class after [COVID], they prefer working that way. I think it's more available to people with disabilities who can't physically go to class, or people in countryside who are too far away from the city to go to class, they can just sit in their studio at home. So, I think that's really an opportunity for people to reach.
>
> (Participant K)

The digital technology enabled learners to learn flexibly, as participant K said above. They could stop the video whenever they wanted to. Learners who found it difficult to remember the teacher's body gestures and movements initially, can rewind and watch the same video again and again. This enabled learners to watch the body gestures very carefully increasing their ability to remember the techniques being demonstrated:

> Right, I have a big YouTube thing and I learned more from watching YouTube videos, techniques are very good. I learned growing technique because you can watch it over and over again which I did. So, I learned more in three months watching YouTube about techniques than I did in three years in university.

(Participant N)

When learners encountered making problems and did not have anyone to discuss them with, there was a video online showing how others found a solution:

> Watch a lot of YouTube videos with Simon Leach you know, because sometimes I'm in here and I'm trying and I'm making and then it's not going right so you're able to go and watch a video, that always help me quite a lot. I am alone. I don't have anybody I can talk to about glazes fired or why the form isn't right or why there is a crack, there is nobody.
>
> (Participant M)

Additionally, the technology allowed learners to find and learn techniques from videos which show the making process of famous and expert potters. Learners did not need to go to their studios physically. This means potters could join as many workshops as they want from around the world:

> I've noticed many, many more people offering online workshops, and offering to share their knowledge and skills in a very generous way. You know, sometimes it's a free workshop. And this is just going online, going live on Instagram, live on Facebook, and they give a little free workshop. Otherwise, there are lots of these workshops that are much cheaper than if you have to travel across the world to go and visit someone and learn their skills. So, it's a very exciting time. I've been attending a lot of workshops that’s made by myself.
>
> (Participant K)

It is evident that online technology enabled the knowledge of experienced potters to be more visible to a greater number of people and offered more opportunities for communication with the whole world. This technology broadened participants’ possibilities and provided additional space for them to watch and learn. It reoriented pottery teaching and learning practice and showed that teaching and learning pottery could be realised through online platforms. It provided an effective way to navigate the sudden world change brought about by COVID which necessitated the closure of studios and college classrooms. Potters were not allowed to learn techniques in a physical space and the utilisation of online platforms enabled them to change their traditional ideas of learning pottery:

> I guess in this time, because of COVID and because of teaching studios, many teaching studios also closing down, I think that online teaching is becoming bigger and bigger. And I see everybody moving, scrambling into that space. And I think that landscape is changing massively just in terms of how we teach and how we learn.
>
> (Participant P)

However, will the technology replace the physical space for teaching and learning craft? Do embodiment and materiality disappear in this case? Next, I will discuss how embodiment and materiality are affected in the extended learning space.

8.1.3.2 The embodiment and materiality in extended learning space

As participant K described, through digital technology the body gestures and movements of more experienced potters could be recorded, and learners could see these very clearly if the camera is set up properly. It can support the visibility of demonstrations by more knowledgeable and experienced craftspeople. Compared to the physical class, where only a small group of people could be physically in the class to be able to see the teacher's body movements properly, the online space allowed more learners to watch these actions clearly.

> And obviously, you can only teach small numbers of people in a class or in a studio or a relatively small number, because people have to be able to see that gesture. And the advantage of digital teaching and what I find very interesting is, you know, people set up the cameras in ways that really can show the gestures very nicely and if you're in a class with five people or 10 people, maybe you can't see the gesture nicely. And you can really zoom in on the gesture and then repeat it and stop it and edit the video and make sure that people really understand very fine movements and very fine gestures. So, I think video and online teaching is really interesting and we tend to think of hand skills as something that one can't teach.
>
> (Participant K)

The technology cannot replace the embodied practice and the understandings of materials and tools through bodily touching them. Participant learners still needed to embed knowledge into their body. When their body felt a wrong connection with materials and tools, they remembered the mistakes bodily and through embodied practice their body could feel the difference and understand how to solve certain problems (I will discuss more in next section 8.2 about learning from mistakes). Therefore, it can be argued that if a teacher prevents learners from making mistakes then the student misses the opportunity to feel the difference between appropriate and inappropriate moves. When participant teachers could not give direct feedback, their students had to learn how to solve the problems themselves, which comparatively improved their skills.

> When they make mistakes, normally, I stop them to make mistakes, because I see them to make mistakes, and I stop it, and now they make mistakes, and they have to correct themselves, and I think they have to really look at what they are doing and fix themselves…For example, if you drive a car, somebody tell you to park to have a picnic, and you just checking to that person, and next time, you have to go to the park to have a picnic by yourself, you can't remember the way to get there. It's because you weren't pay attention. So, if you have to pay attention, you get this quicker than someone else taking you there, you know what I mean? I think it's deeper learning actually, because they are learning their own mistakes. So, some of them make something and it collapsed in the case to dry, and because they couldn't get more clay, they have to recycle the clay, and wait for it to dry, and rework it, and start right from the beginning. That whole process is also very important structurally and creatively, you know, to take something right from the beginning, and also to start again.
>
> (Participant K)

In chapter 7, I stated that the teacher's role is not just demonstrating techniques but includes watching how students work with materials and how they use tools. This helps teachers to identify problems and provide students with support to find solutions. However, online technology only allowed participant potters to watch body movements. It is very difficult for learners to have immediate communication with the teacher and the teacher could not watch and see learners making process. They could not give feedback, which constrained their learning process:

> But it actually is easier to teach them in a workshop where I can actually watch them. And I can get everything just right for the students, you know, to try and stop them making mistakes. You know, if you're in a workshop, you're right in, you're watching them do it. And that, you know, because you get feedback, you can get a lot of feedback when you're in a physical interaction with somebody, you know, you get instant feedback.
>
> (Participant K)

Direct communication between a teacher and a learner was possible through a one-to-one online video call. Teachers could then see their students making process and provide feedback. The student could ask questions directly and solve problems. However, participant teachers found it was difficult to pay attention to each student when there are many students on an online workshop:

> What I could do is do a Zoom. I've been planning to do that with some of my students, where I throw in my studio, they throw at their studio. I mean during zoom, I've been doing the zoom lesson with one of my students, making them a sculpted head, it is just a sculpted human head. She's sculpting in her studio and I'm sculpting here. So, twice a week, we meet for an hour and I'm teaching her the proportions of the head and helping her with it. That's actually working very well one on one, but I couldn't imagine teaching a whole class of people like that.
>
> (Participant K)

It can be seen from above that the technology can help to connect the teacher participant A and her student when they were not in the same physical space. The way of teaching and learning still relied much on the shared embodiment. Participant A and her student still worked on their own potter's wheel with the clay and tried to share the understandings of clay, tools, and equipment with each other. Through the online screen, the sense of embodiment and materiality could still be shared between potters.

However, some important moments in learning pottery could possibly be edited in online videos. Experienced potters were already familiar with clay's materiality and responded to clay very quickly. For them, making pots had become a very natural process and the individual steps involved had become one overall step. They had already formed certain habitual ways of communicating with clay and it was now very difficult to separate the whole process into each step. The teacher's body gestures and movements in the studio were very quick but they did not skip any necessary steps in the making process. However, online videos could be edited so that certain steps were missed if they were not deemed necessary. So, simple moves could be skipped to make the video shorter. My teacher had already practised techniques many times before he showed students. He had already incorporated each technique into his body. Some teachers found that it was difficult for their students to understand the meaning behind these disconnected body gestures because they had not yet developed enough knowledge of how materials move following different body gestures. They needed to see clearly each step of, for example, how clay is shaped differently by certain hands movements. As participant K said, she heard from her students' feedback that they wanted to see all her moves for certain techniques:

> When I do a full day workshop, I teach exactly what I teach in these videos, but I do it over a whole day. But the video is only half an hour. So, it's a lot of information in a half an hour video……When I make a video, when it's a very complex technique, I don't put enough information in. And I realise afterwards, because we have a zoom session afterwards where everyone comes with their problems and questions. And in that zoom session, I found that they said, oh, but you suddenly skipped to this or that. And then I think, oh, but I didn't put every step, because I thought you would be bored watching me do it, but I sometimes forget that they need every bit of information. Sometimes you know, me as a teacher, I didn't realise that I must go slow because I know the technique really well. So, after getting inside the head of the people that are watching the video and think I must explain that more, you know.
>
> (Participant K)

It can be seen that the technology is already part of knowledge teaching and learning practice. Experienced potters, learners, materials, tools, and the technology all worked together and co-constituted the knowledge sharing and learning. The properties of the online platforms turned a limited physical learning space into a broader space, where experienced potters did not have to be physically near learners. This technology connected different bodies in a much bigger learning space and offered more opportunities for the learners to see different body movements from potters around the world. Pottery knowledge could be negotiated and renegotiated between many potters at the same time. It enlarged the visibility of pottery teaching and the learning process and facilitated access to pottery knowledge. However, it also constrained this learning practice in some ways. Teachers needed to see learners' bodily connection with clay and tools to appreciate any problems and it hindered direct communication between teachers and learners. This technology has already influenced the traditional way of intra-active pottery teaching and learning practice.

Finally, the effect of digital technology in the ceramics learning practice required consideration. Participant O considered technology as the one which should not hinder the learning of pottery, it should be in symbiosis with hand skills in the way that electric kilns replaced the original coal firing kilns in order to protect the environment. This is technological development that does not replace human hands in the making process:

> I mean the technology and the hand skills, the old skills and the new skills, do work well in certain things. Because lots of us do all sorts of ceramics like industrial ceramics, and we get parts made for us, tools and different, different models for the different materials. We work with them. With regards to the technology, that, it is good, because you can keep some stuff, like the oven and stuff like that, that helps.
>
> (Participant O)

Technology brings many possibilities for learning pottery, but traditional hand making knowledge should not be forgotten. There is a space where technology and traditional 'know how' can work with each other:

> As technology accelerates and brings forward many exciting possibilities, it's important not to forget about the knowledge of the hand, which has brought about the success of this region as a world-renowned centre of production. It is my vision to create a space where high-tech/digital collides with traditional 'know how' to open up a breadth of new opportunities for research and development in ceramics.
>
> (Participant L)

In conclusion, space is not just a physical thing to be occupied by human activities. It is assembled in relational, physical, materials, social, and imaginative phenomena. The studio spaces within this research were constituted by various physical and material artefacts, including tables, chairs, clay, shelves, finished pots, wheels, tools, pictures, glazes, teachers, learners, and the activities taking place within.

The arrangement and use of these physical and material artefacts afforded the teaching and learning of embodied knowledge where verbal instruction and bodily demonstrations were used effectively to teach and learn rather than formalised written language. For example, the use of the whiteboard within the short pottery course faded away after its initial use. Other artefacts, such as the potter's wheel, clay, desk, chair etc. all contributed to the embodied learning practice.

Space and human activities constitute each other. For example, the cupboards where pots were collected activated my action to recognise and collect my pots while viewing other people's pots and meeting other learners in the corridor. The conversations between me and other learners were generated in the process of choosing my pots and this became a regular routine and reproduced the meaning of this corridor space as a spot for learning from each other. Even though the physical arrangements in the studio seemed static they were being continually refreshed with different displayed pots. This brought changes to the space through imaginative practice. The minimal physical boundaries between the workspaces of the teacher and learners, and between materials, tools, equipment, and learners in the studio allowed potters to communicate with each other and work closely with materials and to watch the bodily movements of others. The unconstrained movements around the space also constituted a flexible space for teaching and learning pottery knowledge. It enabled and constituted the embodied intra-actions with others, including other human bodies and non-human actors. It also opened a dynamic for social communication between the teacher and the learner, and between learners themselves. The use of specific artefacts, the layout and arrangements of the studio (e.g., the physical closeness and reduced physical boundaries), and the flexible physical movements in the studio produced and reproduced the logic of teaching and learning craft knowledge effectively.

The technology also transformed the traditional space and time and craft knowledge was shared without the limits of physical spaces. This helped to build up a network of shared knowledge. While the physical space and time were extended through technology, the sense of embodiment and materiality still remains and is shared between potters in the extended space. In the next section, I will discuss how craft knowledge is learnt in the studio through the perspective of time.

8.2 Becoming a professional potter: developing a learning rhythm in everyday practice

When I asked participants when they thought they had become pottery experts, they told me it came with time:

> So, you get a basic understanding of, you know, how things can work but yeah, it's only through that admiration, through long periods of time that you grasp, you know, the finesse. The kind of, how you fine tune those craft skills only comes with that time and everyone's still learning, you know, even the people who had been there 20 years were still learning.
>
> (Participant L)

In this research, this quantitative time was not the focus as although learning can be structured and constrained in institutionalised time, the development of expertise cannot be characterised by this alone. The growth of expertise depends on practice and experience, and refers to the lived experience of learners through everyday practice in a particular space.

8.2.1 Learning through repeated everyday practice

To get to the mastery level, potters need to repeat the same bodily gestures hundreds of times. Participant A said that she felt she really learnt a lot when she was just making the same things over and over again, sometimes 100 pieces a day. It was just ‘repetition, repetition, and repetition’. After repeatedly making the same piece every day, she could imagine each step in the process of making without actually making something:

> I don't know, maybe in terms of the making, they are making, because it is a technique. And that's why I always tell everybody, whatever you do, it is a technique. If you practise, everybody can be good. Because it's a matter of practising, you know, as I cannot be (professional) without much practice. So, I think that maybe when it comes to making, everything can be taught……It was kind of like at the beginning, it was I remember the first day is like I had to make this thing or like this big. It was 100 (pieces) a day. When I go to bed, I would close my eyes and I would see that it was in (front of) my face. So, it was a bit like, yeah, repetition, repetition,

> repetition, repetition, and then everyone will go a little bit bigger in terms of size and amount of clay.
>
> (Participant A)

It may seem that participant A was just repeating the same gestures and movements over time. However, for her, it was not just a process of reproducing the same thing. Such a skill cannot be considered as a mere 'imprint' or a 'trace' somewhere in the brain. It was actually a process which combined multiple rhythms within the space which were attuned in the learner's body.

My learning experience in the studio demonstrated that various rhythms existed in the space. When I went to the studio, the teacher initially taught me to wedge the stoneware clay and to start to throw on the wheel, use basic tools to work with clay, trim the pot, and glaze the bisque fired pots. Those procedures became my daily routine and tasks for gaining pottery knowledge. These learning sequences and procedures are common for learning pottery and became collective enactments and norms applied to every class. My body also had its own bodily rhythmic actions and movements, for example, I am right-handed but not all potters are. Sometimes, if I was not in a good place emotionally or physically, I could not feel intimate with the clay. My teacher also told me that sometimes he did not feel right and so he just stopped working with clay. Materials also had their own temporal dimensions. They moved, changed, and transformed through time. For example, clay dries, changes, and moves, as discussed in chapter 6. My potter's wheel also had its own rhythms. It had different spinning speeds and turned in different directions. Therefore, the studio space was full of multiple temporalities, which needed to be attuned to in order to develop knowledge and skills.

When participant A imitated, practised, and overcame problems she was situated in different conditions and was engaged with multiple temporalities of non-humans in that space. Materials, tools, and conditions in the wider environment could not be replicated from one instance to another. This meant that when I repeated behaviours, I did not repeat the same thing as other learners, because they were experiencing different embodied adaptation of various rhythms in the environment. Skilful craftspeople, like my teacher, have much experience and know the minor variations and differences between different relationships of the body, materials, tools, and equipment. However, for me as a beginner, when I saw someone making a pot, I just saw quite similar body movements and gestures every time.

Those body movements and actions were not just simple gestures that their bodies demonstrated, it was about the intra-action between multiple rhythms behind it. The intra-action between the potter's body and materials was consistently changing and in a dynamic status. The learning was happening in the present moment to accommodate different temporalities. I was watching a potter who had a feeling for what they are doing in the moment, which results in many variations. The process of dealing with these variations was a process of responding to ongoing monitoring and correction to each phenomenon as it unfolds. The repetition was not the pure repetition, it conceived the differences within it. Hence, each time I repeated the same practice, my feeling about material's movement improves a little bit.

Each time participant potters intra-acted with materials and tools, the entanglements collaboratively produced some questions and problems. Through the whole process of making, they were trying to feel what was going wrong and how to make it right in the process of making the same piece many times:

> But for ceramics, I do think you have to make the same piece many times in order to be able to make it. Because you overcome problems through making something many times, it would be able to work out how it needs to be made for not collapsing.
>
> (Participant R)

Therefore, these potters learnt a lot from making mistakes, which enabled them to reflect on problems and adjust their gestures and actions to be fluent to other rhythms. For potters to learn this knowledge space was needed for mistakes, as such mistakes underlie the improvement in their body necessary for the various and changing situations. The accumulation of making experience through making many different mistakes made the participants flexible enough to have an immediate response to how the material was acting. It enabled them to gain the ability to imagine the workings of the clay in a dynamic way in each moment.

When I was learning how to throw for the first time, I only saw my teacher's right hand body movements and connections with clay, tools, and potter's wheel. I had not experienced different situations where mistakes happen, and had not developed bodily memories and material sensitivities based on touching materials. Therefore, I did not have enough ability to respond to the immediate changes and different responses from the materials in the moment. I could not imagine the possible movements for different situations and their ultimate result. This meant that I was still unable to deal with the different problems occurring in the making process. If I was afraid of making mistakes then my progress would be stopped because I would lose many opportunities to explore more about working with clay. Participant N felt his students had similar experiences:

> What that did is it taught me that you mustn't be precious. It wasn't precious about work. It's only clay, I said to my students, it's only clay. It's just clay, it's okay. He mustn't worry about, when you cut them all off, you go, oh my god, but then it's only clay, you put the ball, and then you make it again. So, it's okay. So that gives you a freedom to make mistakes, important in learning, you learn from mistakes, you can't learn from doing things perfectly. If we only ever made things perfectly, we would never progress. Because we just stay as that perfect thing. And you would just make that and that, but by making a mistake. You go, 'Oh, maybe I can develop that'. So, I encourage my students to make mistakes. I say it doesn't matter.
>
> (Participant N)

However, if the participants continued to make the same mistakes over and over again they were not finding a solution. They were communicating with materials in the same way wrongly and not learning anything new:

> You learn it by mistakes. If you make mistake, you will improve it, learn from it and do it again, don't make the same mistake, when you keep making the (same) mistakes, you're not learning from it.
>
> (Participant B)

When touching clay, the participants felt the clay would tell them directly when something was going wrong. The clay would tell them directly that their hands were working in the wrong way and needed adjustment. For example, participant A said that if the clay was not centred, they could feel that it is 'wobbling around' in their hands, which would tell them the work was going wrong:

> Because you know it's not centered in the first place, then everything is going very badly or you make something very thin. So, it's very easy to know what's going wrong, depending on what it is……Because you don't realise one thing with clay, sometimes you don't know, you do things and then afterwards, it tells you 'you did it wrong' and you didn't compress enough. You only see it once you fire the thing and then in a sec, it breaks. You didn't compress or you didn't mix the glazes properly and then you fire it. So yeah, it's learning.
>
> (Participant A)

Having completed a pot, that pot shows any mistakes in the making process and communicates which part went wrong. This made the participant potters reflect on their embodied feeling. For example, each time I had thrown a pot, the teacher would tell me that the best way to know if I was making a good pot or not was to cut it in half to check. That way I could learn from the objects and my mistakes. As image 31 shows, I threw one pot, cut it and found that the base and clay wall were too thick for a cup, which would make the cup too heavy to hold. There was more clay on the bottom than on the top, which meant that I was not able to lift up the clay from the bottom. I learnt from this 'failed' cup that I needed to pay more attention to the cup base and lift up more clay when I made my next cup.

Image 31: Learning from mistakes through cutting the object

All of these mistakes conceived different ways of intra-action between the body and materials. It was a situation where things were related to each other and related to potter's hands and body. The process of solving problems was the gradual adaptation of potter's body to respond correctly to the materials movement and flow. It took a lot of trial and error to build up to this correct connection of body and materials. It was a very slow process for potters to get into their body and understand the rhythm of the materials and tools' they are working with, as participant C said:

> Disasters are a great way of learning, because you then need to figure out what went wrong and why. The questions that each problem raises inevitably leads to a lot of testing, and you often learn even more from this than you originally intended. The downside is that this is a very slow process! You eventually get to a point where you know the materials that you are working with, and their capabilities and limitations, and problems become a rarity.
>
> (Participant C)

Learning from mistakes was a process of bodily and sensory adjustments to different material situations and circumstances. Some potters reflected on their mistakes, thought about what they were doing wrong and tried to guide their future actions through, for example, making notes. However, this was not a process a purely cognitive pre-reflection process. Such reflection could not fully encapsulate the process and outcomes before encountering matter, it unfolded in the process of making and resided in the immediate bodily responses to situations. As participant C said above, she learnt more in the process than she originally intended. Craft practice required immediate reflection and the potters always learnt by entangling with matter in the moment. Masters had already built up the corporeal connections between their body and other matter in different situations. Therefore, they were able to draw on past experience to solve present problems and had a clearer idea about the outcome when their hands worked with clay, tools, and equipment in different ways.

8.2.2 Habits as stabilised patterns

When I was learning how to use tools for the first time, I kept reminding myself about how I should hold my tools, how my hands should move, that I needed to keep stable by putting an elbow on my leg, to keep checking with my eyes that my body was in the right position, and that the tools I was holding were at the right angle. My focus was on some part of the whole. My mind, body, tools, and clay were separate parts and I tried to combine them together, but they were not attuned to my body yet. After I got better, the tools, my hands, and the clay became more attuned and my hands moved 'automatically' in certain ways.

After many hours of practice, the potters built a strong connection with materials and tools and understood how materials moved under different conditions. Certain ways of intra-action with materials are retained in the potters' bodies enabling them to cope with and respond to certain problematic situations. The more appropriate movements had become part of the bodily memory. The forming of habit was not a random operation, it involved the production of certain body movements in a dynamic relation of materials-body and an embodying relation with materials, tools, equipment, and contexts. Because more experienced potters had encountered more situations where the body and materials worked with each other, they had a rapid response to different situations. Their body could 'automatically' find a way to feel clay and follow the movements of clay when they are making. Their repeated practice had produced and reproduced a rhythmic pattern, and this pattern had stabilised and was embedded within multiple spatio-temporalities.

The more experienced participant potters were able to make pieces quicker and quicker and to the same good standard. They did not need to think about it, their body's movements were natural, as participant B mentioned:

> It's just time. I would say it's just time, because you learn how to create and it becomes quicker to do. What you're going to bear in mind that you want to make the best prestige product you can. So, you know, it's difficult. You always want to improve, you always want to keep that standard high, but the sort of things around you, the speed becomes quicker, because you get more experience, you know. It's hard to improve, it's hard to keep it the way it is. You just keep it, the standard you know it is, and then the speed obviously creates you know, it used to take me two weeks to do a teapot and now it takes me about two days. So that's speed. And I'll still do the same standards as if I did it in two weeks or two days. Always be the same standard, but that comes through experience. Yeah, more practice, you just need practice, practice, practice.
>
> (Participant B)

Learning this practical knowledge involved the incorporation of new sensibilities into the body schema, which formed the habit and transformed perception and generated actions. After developing greater proficiency in a certain area, previous habits reduced. Practice established a new pottery habit that generated new body actions.

For example, when I was initially learning how to wedge the clay, I was used to the way of working with flour with water. So, I used this way with the clay. However, I always encountered problems and needed to remind myself every moment not to do it this way. My body had, for a long time, already adapted to one way of doing things. It had already adjusted to certain ways of working with other materials. Therefore, it was very difficult to restructure my body's intra-actions with other materials. I needed to practise more to embody the new practice and sensitivity. As participant E said, it was very hard to teach someone who already had learnt how to paint in other materials. They had already formed habits in moving their hands in certain ways to paint, that style was already in their body. It was difficult for them to adapt to the new ways. They needed to reflect and undergo many embodied practices to enable their body to adapt to working with new materials such as clay:

> I have difficulties with people who do have painting (experience), because they have got their own style in how they pick up the colour and then it takes them actually a longer time to adjust and do it on the porcelain painting way, because ultimately, they go back to their own brushstrokes. And you have to use it differently on the porcelain because you have to use a different way of painting on porcelain. But because they have already got their own style, just really difficult to change it in this two and a half hours you know. That's a really difficult part. You need to remind them again and again how to use porcelain with the brush. So, you pick up the colour with the tea brush, but you don't do this kind of (movement). When you paint on canvas, you pick up the colour like this. So, you have got the colour in here on your brush. And you painted on, because you do bigger surface. So, for porcelain, you have to have a colour on the brush and in this little area. So, you have to wiggle colour in and just get it on the top of your brush. And then once you kind of pull a straight line, you're going to release your colour evenly. If you pick up the colour in here, you have zero control of it where you put it, totally differently ways to even pick up the colour.
>
> (Participant E)

After having formed habitual rhythm in making pots over time, it does not mean that it was fixed. If one part in the rhythmic practice had changed and shifted, it broke the accustomed rhythmic performances which then needed to be re-attuned with the new environment. For example, participant N had more than 20 years' experience in pottery. He worked very well with stoneware clay and made good and consistent pots, even bigger sizes (See image 32). However, when he tried to make pots with porcelain, he could not keep the consistency and quality of his pots (see image 33). When he talked about working with porcelain, he said, 'if you ask me what I hate about porcelain, I will answer you everything!' It meant he, as an experienced potter, still needed to adjust his bodily rhythm to cope with the rhythmic movements of porcelain clay.

Image 32: Pots in stoneware clay

Image 33: Pots in porcelain clay

8.2.3 Imagination with practice over time

When I attended the pottery class, the teacher showed me how to make a cup. Before having a go on the wheel by myself, I remembered his body movements and sequences. I was expecting that the shape of the cup would come together in the end in my hands. However, when I was at the wheel and touching the clay, everything went differently from what I expected. I encountered lots of problems. The clay's force against my hands was significant. I could not even centre the clay! After the first trial, the shape came out as shown in image 34. It was not what I was imaging before throwing. It was actually far away from my original imagination: one side of the wall of the cup was taller, another side was shorter; one side was thinner, another side was thicker; and one of them collapsed.

There were many reasons why the shape in my imagination was not realised in the practice of making. My arm was not put on my legs for stability, so my force on the clay was not even and consistent and the clay was not centred. While the clay was still wobbling around on the wheel, I continued to open and lift it up. This meant that through the whole process of making the cup the force from my hands was unstable and uneven, so the shape of the cup come out unevenly. In this section, I will discuss the relationship between our imagination and practice over time.

Image 34: First try of throwing a cup

In my case, I remembered the different body gestures and movements of my teacher's hands when centring the clay, but that was only a memory processed in my mind. My body, clay, tools, and potter's wheel were not involved in that process. I consciously knew that the clay could be made into a cup, but that was just the imagination of my mind. I had not developed the embodied sensitivity about how clay behaved and moved with my hands moment by moment during the making. Although I understood the affordance of working with clay, I was not able to actualise my imagination. My body was not in tune with the clay, tools, and potter's wheel. Therefore, to know materials and how to make a cup, for example, I had to learn through practice and connect my body's sensations with the materials. The feeling of the materials had to be in my body. It was impossible to learn this knowledge from just thinking about it. Even though I understood the basic principles and rules, this still could not lead to me make a pot. I had to imagine with and through my body with the feelings of materials.

Once this material sensitivity was in the body, participant N, who had more than 20 years pottery experience, could even feel how the clay flowed through the demonstrator's body without him touching the clay. That meant that participant N had already built up these muscular sensitivities shared with materials. He could imagine the natural flow between another potter's body and clay. People without any pottery experience could not sense and feel this. If great designers do not know anything about the clay and have never touched clay, their designs and ideas are meaningless in ceramics field. As participant J said, ceramics is much more process led. Material imagination only comes from practice, and an idea would become pointless if it could not be realised and made:

> Much of ceramics is process led and an idea is no good if you cannot make it and what do you do when there are no longer the skilled makers to fall back on.
>
> (Participant J)

The ability to imagine is not a retrieval of a static memory applied to the now and envisioned as a certain future. It requires the immediate response to the present situations. Individuals reconstruct past experience to create more actionable visions of the future. As a complete new learner, I had not developed the ability to envision dynamic and changing images immediately. What I imagined was how to make a cup, bowl, vase and so on. I was trying to repeat each production step that the teacher showed me, but I ignored how to understand what the results of the position of each tool. That was one of the reasons why I could not deal with problems consistently present in the making process. As a new learner, I needed to learn through the clay and the process.

With practice, my ability to imagine past experiences and envision the future developed. In general, if the clay was centred in the beginning of throwing, then it can be opened up. Once when I was throwing a pot I centred it in the beginning and opened it up and tried to make a shape from it. However, it became slightly uncentred because I accidently used too much force on the clay. I could then feel the clay wobbling slightly on the wheel. This was the first time I had encountered this situation. My only solution was to give up, throw the clay away, and grab a new clay ball to centre again. However, after much practice of centring the clay, I was able to imagine the ongoing process through the clay. I knew how my hands would relate to the moving clay on the wheel. I could re-imagine my past experience of centring the clay and knew how to position my hands to slightly 'calm down' the wobbling clay and centre it again, even when I had already opened it up. The benefit of imagination was not in predicting all of future results, but in constantly imagining the next step and how to move to this step.

The ability to imagine also entails more possibilities for making pots. In the beginning, I was even struggling to make a cylinder, which is considered as a basic shape in pottery. After I practised for a while, I could imagine more possibilities with this clay than just making a cylinder, like a mug. I could actually make the neck narrower, or wider (see image 35).

Image 35: Different shapes of pots

As discussed in chapter 7, master potters have developed embodied knowledge about the properties and possibilities of materials through experience. This provides them with more immediate intra-action possibilities and provides a base for future imaginings about how materials will react and be shaped in different ways. That is why masters can always imagine corporeally more future possibilities than less experienced potters. Pottery beginners have not built up this pottery material sensitivity and so cannot imagine, through past pottery experience, new possibilities. They are not able to reconstruct the past and apply it into the present entanglement with materials. They are not able to imagine the possibilities of future pot making. For example, when the tutors tried to give advice to participant N for future possible actions:

> (I) had to explain to the tutor what I like and why I wanted to make it, why I chose that size. And then they would advise me and say, ‘okay, maybe you might have a problem with the lip, you might have a problem with that, to think like this (or that way)’. And they would critique the idea, then they would say that's okay…And then they say to you, ‘how do you think you've succeeded? How did it work? What problems did you have? Maybe

> you could try this. Maybe you could try that. That maybe came out'. Just in conversations like this……and it's just a conversation and they say, 'why isn't it doing that? Why is that one better than that one'? And you say, 'I don't know'. (The teacher explained), 'why is it? Because of this, because of that', and they say, 'maybe it's whatever if you just made the narrower one?' And you go okay, and when they come back, you'll see, it's slightly different.
>
> (Participant N)

In summary, learning pottery knowledge was to incorporate multiple rhythms of materials, tools, equipment, and the environment into the body of potters. It could not be learnt purely from abstract rules and principles, it required practice. This knowledge was developed through the continued embodied efforts.

Embodied practice involved the bodily sensation experienced when working with materials. With this material sensitivity, potters transformed their imagination into real things. This was to think corporeally with materials or think through the body. The imagination was built up from the past embodied experience and constructed through the present practice. As the knowledge is developed, potters were able to imagine more possibilities. The future oriented imagination was also transformed and became open to more possibilities to engage with materials. This made the experience of the space undetermined and unpredictable.

When learners were in the process of learning, they encountered problems. Materials and objects communicated that some problems were happening or had happened. Learners needed to find the solutions to these problems when working with the materials through adjusting their body gestures and movements. In this reciprocal process of problem finding and solving, learners found the appropriate feeling when working with materials. That was how potters learnt from their mistakes. Each mistake was a circumstance where a potter communicated with materials inappropriately. More experienced makers generated appropriate body actions to cope with different situations and find the solutions to problems in the moment.

New pottery learners needed to do lots of time-consuming experiments and tests before they were proficient in working with clay. The process involved using body senses and feeling to incorporate individual making actions into a whole process, and incorporating the movements into the body. Practice was the dynamic process that forms perceptions and action. When potters adjusted their body in the same rhythm as the movements of the materials, they could respond to the material’s movement rapidly and produce pottery of the same quality more quickly. Pottery practice helped to solicit pot making habits. However, after one habit was formed in a certain way, it was hard to restructure and adapt to new circumstances. Potters needed to reflect and remind themselves how to do the right movements. This reflection cannot stay in the mind, it needed practice to ensure it became embedded into the body. Practising something for a long time generated new habits and new ideas and knowledge emerged through dealing with new circumstances required to work with materials differently.

8.3 Summary of the chapter: space-time-mattering

This thesis does not focus on the individual’s practice or consider time and space as separated from human activities, instead it focusses on relational assemblages. Learning occurred and developed in the rhythmic and arrhythmic relations between the body and materials at a particular time and space. Learning arose through the human lived experience of engaging in the material environment, which includes human and non-human elements. The learning body was enmeshed within the assemblages of the wheel, clay, pictures, environment, and taken-for-granted chairs and tables. Learning did not just take place in this space, rather it emerged through the encounters between the body, materials, tools, equipment, and other non-human elements. Different material assemblages and the material arrangement in the studio constructed the stories and relationships and it supported the ongoing process of learning. The knowledge was embedded in these intra-active relations and developed through repeated acts, where different human bodies and matter shared sensory memories. These memories did not reside in the folds of individual brains as a record of a fixed past. Instead they were continually reconstituted through the practice of bringing the past into the present with the matter together in the studio. This became an inextricable element in the ways of learning pottery. Through time the relationship between potters and non-humans changed and gradually formed a specific habitual mode through which potters performed effectively in response to certain material circumstances. These regular patterns were gradually routinised into daily life and contained meaning and use in a particular space.

This chapter offered an alternative way of considering space as material as much as social. The specific, organised, and arranged material assemblages in the studio space engaged potters to different materialities, and offered a host of imaginative, embodied, material opportunities for movements, actions, and performances. This view of the capabilities of material artefacts and material space added to traditional discourse, language, and social-based analysis. Through this chapter, it can be seen that materials also ‘possess’ temporalities, perishability, changes, and transformations through time. They also have the capacity to affect the imagination to enable the engagement with possible futures. The consideration of multiple temporalities (including humans and non-humans) made the assumption that space is always weaved in the process of being and becoming, in the exchanges of stabilities and changes. This attention to the capabilities of materials challenges the normative habits and rhythms that are taken for granted in the reproduction of space and invite the unexpected, uncertainty, and indeterminacy in particular time-space.

Chapter 9: Discussion and conclusion

This thesis has responded to the research question of how craftspeople craft knowledge is learnt. In Chapter 6, I answered the first research sub-question: what are the relationships (including craftspeople, materials, tools, and equipment) in learning craft? In Chapter 7, I answered to the second research sub-question: how do learners learn from more experienced and knowledgeable potters? In Chapter 8, I addressed the third sub-question: where is craft learnt and how craft learning occurs and developed in the studio space? In this chapter I will review previous literatures and this thesis's findings and discuss what this thesis has added to this field. Then the implications and contributions to theories, methodology, education practice, and policy will be outlined and discussed.

9.1 How and where craft knowledge is learnt

Due to the tacit nature of craft knowledge (e.g., Gamble, 2001; Nasseri & Wilson, 2017; Temeltaş, 2017), previous research has examined its development through embodiment (Gherardi & Perrotta, 2013; Strati, 2007) and suggested the master-apprentice relationship for effectively teaching and developing craft knowledge (Cattani, Dunbar, & Shapira, 2017; Coy, 1989; Wallaert-Pêtre, 2001; Wolek, 1999). This research contributes to the understanding of how to learn craft knowledge in terms of embodiment within the master-apprentice relationship through introducing the active role of non-humans and the process of materialisation.

9.1.1 Embodiment and materialisation in craft learning

Previous research has argued that knowledge is not learnt purely through the mind of the potter. Instead, it is embodied (Ryle, 2000; Schlauch, 2020). The body is not just for carrying or mediating knowledge in the mind or a "vehicle for the expression of extra-sensory, cultural values" (Ingold, 2000, p.285). Craft knowledge is not removed from the body but emerges through the body and is embedded in practice. The body becomes the source of producing knowledge and meaning (Gherardi & Perrotta, 2013; Strati, 2007) and craft is learnt through body senses, for example, touching, tasting, smelling, and looking (Brown, Greig, & Ferraro, 2016). The findings in this thesis follow this embodied approach to knowledge and recognise that craft is learnt through indwelling the body into socio-material practice (Polanyi, 2009). For example, the data showed that participants had to understand materials via their bodily actions, such as, touching, through which the knowledge was learnt.

Previous research has recognised the importance of materials, tools, equipment in learning craft in addition to embodied learning (Nasseri & Wilson, 2017) (Chapter 3). Knowing and learning craft relies heavily on embodied connectedness with materials, tools, and equipment (Bell & Vachhani, 2020; Ingold, 2001). However, the power of material attributes, like materiality, temporality, and plasticity, and the part the agency of non-humans plays in producing, generating, and developing craft knowledge is still paid less attention compared to the power of humans (Bennett, 2015). In this thesis, data showed the agential power of non-humans to produce and develop knowledge.

9.1.1.1 Materiality and its power to affect craft learning

Craft knowledge "at the potter's fingers that the form and shape of the vessel is perceived as it gradually emerges in the interactive tension between the centrifugal force and the texture of the wet clay" (Malafouris, 2008, p.34). In this way, non-humans are not in the background or passive things being used by humans, they have their own properties which are not "necessarily predisposed to fall into the shapes required of them" (Ingold & Hallam, 2007, p.3).

O'Connor (2009) discussed how glass behaved and moved in the process of glassblowing. I agree with this movement of materials and the data also showed the agential power of non-humans and how materials affect the process of learning. I have highlighted how the process of learning was affected by the physicality and materiality of materials, which affected what potters felt with their hands (Chapter 6). The plasticity of clay allowed potters to use their hands to create forms and shapes. The softness of the clay integrated with potters in the fluid space where the clay pushed back against their hands. They could sense the clay's movement and changes through touch. This materiality in the clay directed potters to move accordingly, guiding the next move and affecting the process of learning. Each clay embodied different materialities which affected how potters responded. In chapter 6, I discussed the different materialities in Kaolin, which is usually used for porcelain, is not as plastic as other clays, and is full of inertia. The action of engaging with porcelain takes place "within boundaries set by the clay's limited elasticity and excessive friability. [Working with porcelain] is a tense negotiation" (March, 2019, p.137). It is different from working with other clays like stoneware or earthenware. The participants kept mentioning how difficult they found throwing porcelain. They felt the clay was not stretchable and was 'lazy' in their hands. Even the participant with more than 20 years' experience in working with stoneware could not make consistent pots with porcelain (Chapter 8). Therefore, the potters had to be true to the materials and respect their materialities.

9.1.1.2 The materialisation in craft learning

The relationships between humans and non-humans are not fixed and decided before the intra-actions but unfold in their movements and process. Through this process, rather than non-human elements being entrenched in human thinking and personality, it is human potters who materialise and reformulate themselves into being thing-like (e.g., clay-like) characters (Bennett, 2015). Humans are asked to think from materials, rather than think about them (Farnell, 2000). The process of materialisation as Bennett (2015) discussed was shown in the process of craft learning, where humans materialise to become the material, tool, and equipment in order to feel the movement of the clay. For example, when one participant was beginning to learn pottery, she was told by the teacher to become the clay, think about what the clay was thinking and doing to learn how to centre the clay on the potter's wheel. She had to materialise herself to become clay and feel its movement in order to know how to respond to these movements.

9.1.1.3 Developing knowledge: 'becoming one'

Developing craft knowledge required potters to be in tune with the materialities and movements of non-humans and find the balance between themselves, clay, the wheel, and tools. The participants mentioned that they felt 'natural' and 'comfortable' when they became more skilled in craft. Through this process of materialisation, the participants and materials, tools, equipment gradually became one in the development of expertise. This aligned with the learning process using tools outlined by Merleau-Ponty (2002). He discussed the relationship between tools and the body:

> The blind man's stick has ceased to be an object for him, and is no longer perceived for itself; its point has become an area of sensitivity, extending the scope and active radius of touch, and providing a parallel to sight. In the exploration of things, the length of the stick does not enter expressly

> as a middle term: the blind man is rather aware of it through the position of objects than of the position of objects through it. . . To get used to a hat, a car or a stick is to be transplanted into them, or conversely, to incorporate them into the bulk of our own body. Habit expresses our power of dilating our being-in-the-world, or changing our existence by appropriating fresh instruments.(Merleau-Ponty, 2002, p.165-166)

What Merleau-Ponty (2002) mentioned above was shown in the process of learning how to use tools. Tools were not instruments and objects outside their body. They became one, and tools acted as an extension to their hands to feel and sense the movements of materials. The learning of how to work with tools involved incorporating them gradually into the body. When the participants were first learning how to use tools, the tools felt like a hindrance to the direct feeling of materials because the tools, materials, and their bodies felt separated and not in the same area of sensitivity. Using different tools appropriately in different ways required the participants to adjust body positions and angles of the tools. Then the relationships become attuned. This showed that tools were not just a means for transforming the material into an object, they were involved in an entanglement.

In the process of becoming one, the materials included in this thesis move to the foreground and the potter as an expert became minimalised. This reflected the work of Holt and Yamaychi (2018):

> The food itself carries an inscrutable depth and suggestiveness that is denuded by decoration and excessive colour. The sushi is there because it allows itself to be there. The presence of the expert is minimal, and this is his expertise. (p.31)

When the participants became more proficient their bodies were attuned to the movements of non-humans. Thus, they started to minimalise their presence, power, and control over materials. This allowed the materials to show their ‘personalities’ and take the lead in the process of encounters.

9.1.1.4 Intra-actions between non-humans

In the process of learning craft, I have shown that learning is embodied and materialised in the relationalities between the learning body, materials, equipment, and tools. These relationships were not only happening when humans were fully engaged, but were also in the ongoing process when humans cannot fully control the ongoing practice. This research also showed the relations between non-humans and other non-humans, where materials have their own stories, historicity, and historical trajectory of becoming (Ingold, 2011; Ransom, 2019). The research findings support Barad's (2007) view that:

> [...] matter itself entails entanglements—that is its very nature...Intrinsic to these concerns is the question of the boundaries of nonhumans as well as humans and how these differential boundaries are co-constituted, including situations where there are no "humans" around. (p.160)

The intra-actions between non-humans themselves became more obvious in the process of firing pots. In this process, the participants communicated how they cannot feel the clay's reaction through direct body sense, for example, touching, looking, or listening. They were always worried about opening the kiln after firing pots because the outcomes were always in the flux of becoming and cannot be decided by potters themselves. Some of participants were also excited by this uncertainty and uncontrollability. They strived for more indeterminacy and uncertainty so that they could develop greater knowledge from materials. The participants tried to learn from materials through experimentation and tests to improve the ability of the imagination of how clay, glaze, kiln, and other elements move and react to each other. After much experimentation, potter's imagination can get close to accurately predicting outcomes. This experiment approach as an important way of learning craft has been discussed in previous research (e.g., Kroezen et al., 2021; Adamson, 2018). I agree with this approach and further explained the inner mechanism and the materiality within the experiment to learn craft.

9.1.2 Shared materiality in master-apprentice relationship

Tacit understanding has been considered as embedded in bodies and expressed through human actions and behaviours (Polanyi, 2009). When potters communicate with other potters, they use body language. Information is conceived and passed on through bodies, and learning can take place through copying another person's body movements:

> It is precisely my body which perceives the body of another, and discovers in that body a miraculous prolongation of my own intentions, a familiar way of dealing with the world. (Merleau-Ponty, 2002, p.412)

Previous research has concluded that this learning from others comes through shared embodiment, with the assistance of verbalised communication and linguistic articulation (Gamble, 2001; 2004a; Høgseth, 2013). Physical showing and observation have been considered as the most important ways of the master and teacher communicating with apprentices and learners, where the master and teacher teach and apprentices and learners learn craft knowledge (Chan, 2015; Wallaert-Pêtre, 2001; Wolek, 1999).

I have discussed in this thesis that craft knowledge is produced and generated in the intra-actions between human bodies and non-humans, where non-humans are actively engaged in the process of learning. This involves more than physical showing and observing and includes the sharing of the materiality in the process. The participants' experience of sharing knowledge through bodily movements involved sharing material sensitivity and understanding, and experiencing how others were feeling and sensing materials in the moments of practice. When the participants were learning, they were told to copy and imitate the master's bodily movements and action. However, the imitation of different gestures was not the purpose of this imitation. It was just a way to get to become familiar with the materials and the understanding of others through feeling the intra-actions in practice. Learners could feel the differences every time they practised in the studio. Other more experienced potters already understood the sensation of materials, so had more of an insight into what is behind and beyond the bodily actions of others. They could even feel the movement of materials through other bodies when they were watching them. It was through continued shared materialisation that knowledge was developed, understood, shared, and passed on to future generations. While following previous research on sharing knowledge through making sense of the meanings of body languages within a community (Hindmarsh & Pilnick, 2007; Strati, 2007), the meaning of materialised sensitivity in understanding body languages to share knowledge to others has been further emphasised in this thesis.

9.1.3 Where craft learning occurs

In chapter 2 and 3, I reviewed previous research about where to learn craft. In this thesis I discussed the relationships between craft learning and the craft studio. Previous research examined the role of social communities in teaching and learning craft knowledge (Gamble, 2016, Høgseth, 2013; Lave & Wenger, 1991). These communities provide a shared understanding of craft knowledge, techniques, shared culture, meaning, craft attitudes, and the socio-cultural space for learning from others (Gamble, 2016; Wendrich, 2013). Craft knowledge is developed and shared, and craft identities are negotiated and reproduced through socialisation within these communities (Gherardi, 2001; Hadjimichael & Tsoukas, 2019; Lave & Wenger, 1991). Here, teaching and learning craft knowledge is organised in daily tasks, activities, and routines in particular craft organisations and communities (Fuller, 1996; Stout, 2005). While this social learning space has been examined in previous research, the material space still required more attention. Previous research has shown that craft learning is organised in social spaces in the form of social communities (Gamble, 2016, Høgseth, 2013; Lave & Wenger, 1991). It stressed the social communications between members (Lave & Wenger, 1991). However, the extra layer of the material space has been added in this thesis to explore the intra-active activities of spatial arrangements and layouts in the material space of studio and craft learning.

9.1.3.1 The materiality of space and its power to affect craft learning

This research has suggested that the physical building and surroundings, chairs, tables, equipment, tools, and materials all affected teaching and learning practice respectively (Aktinson, 2013). What makes the space more effective for learning this knowledge was embedded in the negotiation and reciprocal forces flowing from potters and materials (Massumi, 2009). The availability and visibility of all of the non-human elements play important roles in the craft learning.

In the findings I have shown the materiality of space and its power for constituting craft knowledge. The data highlighted that the development of craft knowledge was deeply inscribed in the material arrangements of the space, which in the case of this research was the studio. It was shown in Chapter 8 that the physical bodies of teachers and students, the table, chair, clay, potter's wheel, tools, kiln, and others were all assembled in this space. The studio was not an objective thing independent from learning activities, processes, and practice. It participated in and constituted the production and generation of craft knowledge in my learning experience. The physical arrangements of different material entities affected relationships with teachers, other learners, the material, tools, equipment. All of which affected the teaching and learning craft.

For me as a new pottery learner, the visibility of the body gestures and actions of experienced potters were very important. The arrangement of the pottery space in that studio affected what and how my teachers taught, and their students learnt. The setting in the studio I attended enabled the body positions and gestures of the experienced potter to be visible for me and other students. This also allowed me, as a learner, to move around and watch the teacher's hands working with materials and tools from different angles. In this studio, multiple relationships which included interpersonal relationships between teachers and me as a learner, between learners and me, and intra-actions between me, the teacher, and other non-humans, were generated and produced. This enabled me to learn craft in that space. This physical arrangement and layout of the studio engaged me within these multiple relationships and contributed to my development of craft knowledge and the gaining of craft learning experience. This materiality of space aligned with the previous research in discussing the creativity and production of new knowledge in the studio (Leclair, 2020).

9.1.3.2 The co-constitution of material space and craft learning

Traditional research on space habitually considered physical space as separated from social activities (Hubbard & Kitchin, 2010; Pile & Thrift, 1995). That perspective of space followed the paradigm of dualism and separated the social from the material. This ignored the multiple relationalities in the space.

This research reduced this dualism and showed the co-constitutions between the studio space and learning and its (re)production of other spaces, for example, the social, the imaginative, and the embodied within the co-constitutions. It aligns with Hickey-Moody and Malins's paper (2007) in showing that learning "does not simply take place in space, but rather is produced with space; as an interactive, connected field" (Hickey-Moody & Malins, 2007, p.10). For example, in the studio, the arrangement of material entities in the space of corridor allowed me, teachers, and other leaners to talk and communicate with each other, which created a social space for all of us to learn from each other. This social relationship between all of us had been constructed and reproduced with the material arrangements in corridor, further contributing to the learning of craft. Additionally, the emergence of online platforms for watching the craft videos in that studio also allowed the links between various physical work studios. This went beyond the physical boundaries of learning craft and transformed the relationships between teachers and learners. In the process of learning craft, the material space of studio and the learning practice co-constituted each other. The material, social, imaginative space were (re)produced through the (re)production of learning practices, and conversely, those spaces were reproduced through the learning activities.

9.1.3.3 Multiple temporalities in craft learning in the space

The traditional perspective of space tends to consider space as a fixed container which is separated from time (Taylor & Spicer, 2007). Therefore, the analysis of space lacks temporality and ignores the movement of the space (Vásquez & Cooren, 2013). Although a physical structure of a space may seem fixed for a certain period of time, the learning space is not static. Instead it is generative and agential. Knowledge is produced and flows in the assemblages of student-matter-teacher-space-time.

This thesis discussed the intra-actions between various temporalities of humans and non-humans. These relationalities recognise the temporalities of non-humans in the practice of learning in a studio. The data suggested that developing knowledge also depended on the incorporation of the temporalities of non-humans. These multiple temporalities were attuned in the present moments of practice within the space of the studio. For example, in my own learning process, I learnt that clay dries, changes, and moves in its own temporalities. When my hands were touching clay, my own bodily temporality was involved in the moments of intra-acting with the clay. The development of my knowledge of working with clay required me to attune to these rhythms and develop a pattern of communication. This pattern was then reproduced through repeated practice. This highlighted how different patterns of learning can emerge in different learning spaces depending on the multiple intra-actions with other humans and non-humans.

This reproduction of various intra-actions does not mean that it entails no changes within this space. According to research findings, the previous patterns formed through engagement with other humans and non-humans, could not decide or predict the result and due to the multiple intra-actions happening in each moment of practice. For example, the outcome of fired pots could not be predicted in advance even though the recipe was same because of the varieties in the intra-actions between fire, clay, glaze, and oxygen. These various intra-actions created repeated patterns, but also created the space for more possibilities.

The materiality of the studio space was able to create the heterogeneous atmosphere for developing craft knowledge and creating the new knowledge.

The data showed it was open to many opportunities and possibilities in the relational encounters between human bodies and non-human actors towards the reciprocity of (in)determinacy, (un)certainty, stability/changes, or (de-) transformations, which supports the work of O'Donnell (2013). This thesis also showed the materiality of the studio through discussing imagination in the studio space which is not "in the realm of ideas alone" (Dawney, 2011, p.538) that exist in the human mind. Rather it is the process of materialisation. It is not an individual memory that floats over practice, rather it is embedded and constituted in a particular time-space and entails the relationships between different bodies and materialities.

Through the discussions around the research questions, I have concluded and constructed a conceptual model for learning craft based on the previous literature of craft learning and the research findings in this thesis. In this model, I suggest that the pedagogy of craft or the teaching and learning of craft knowledge is not only happening and constructed in the master-apprentice relationship and embedded in social communities. It is also embodied in the relationalities of learning bodies, materials, tools, and other non-human actors and affects and is affected by particular space and time. In next section, I explain this conceptual model for learning craft.

9.1.4 Conclusion: A conceptual 'model' of the pedagogical relationships in learning craft

In response to the question of where and how craft knowledge is learnt, in this thesis I have constructed a conceptual 'model' for learning craft knowledge. As Figure 1 shows, the acquisition of craft knowledge was situated in multiple relationships, including social and material ones. Developing craft knowledge was embedded in these various relationships and intra-actions. The social relationships include the micro relationships between master and apprentices and macro relationships happening in the social spaces of craft communities. The two material relationships involved in the process of developing craft knowledge are the inner relationships between body, materials, tools, and equipment and the outer relationships that happen in the material and physical space.

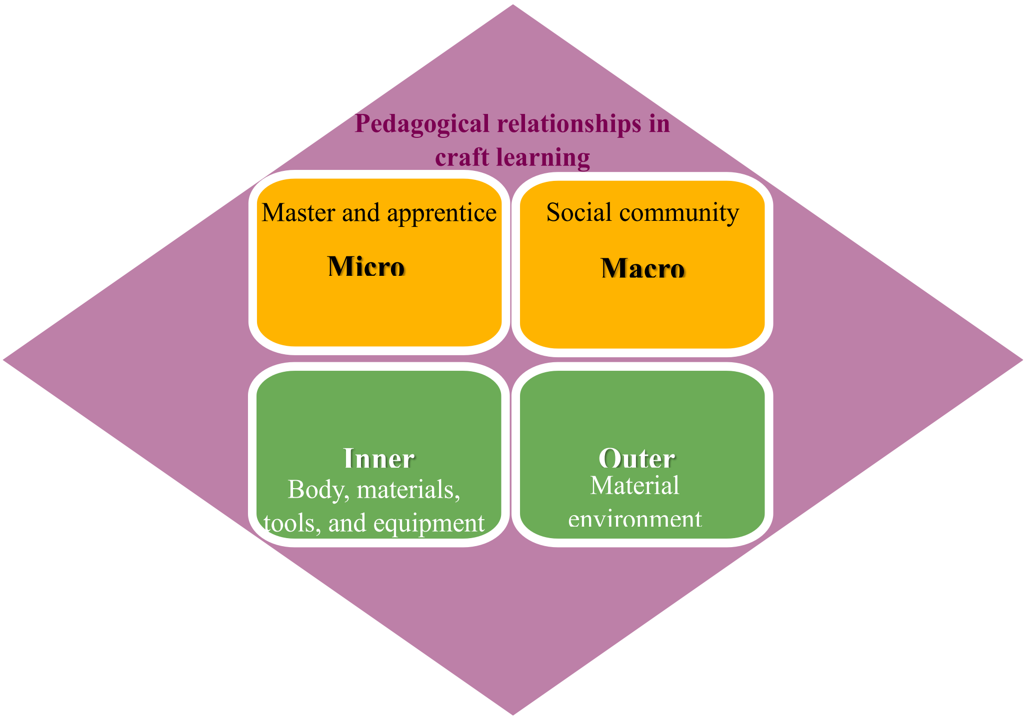


Figure 1: Conceptual model for learning craft

In regard to the research question of how to learn craft, previous literature has mostly focussed on the master-apprentice relationship (Cattani, Dunbar, & Shapira, 2017; Coy, 1989; Wallaert-Pêtre, 2001; Wolek, 1999). Here, such learning was discussed through embodiment, for example, bodily demonstration and observation (Gamble, 2001; 2004a; Portisch, 2010) and socialised communication. Such communication was shown in, for example, the hierarchical relationships in traditional apprenticeships, where the master held more power than apprentices and apprentices only learnt what the master required for their business (Wallaert, 2012). The above discussions showed that in this thesis I have added the materialised perspective to the practice of learning craft. The materialisation was shown to happen in the embodied practice of learning, where non-humans held agential power that affected the process of learning and materialised sensitivities were shared among leaners and the master. These multiple intra-actions between humans and non-humans were one of the most important aspects in craft learning.

In response to the question of where to learn craft, this research suggests that the master-apprentice relationship and the practices of teaching and learning craft are always embedded in social communities and organisations and organised in the social and organisational structures. Previous research has discussed the organised working and learning tasks and activities within particular communities and organisations (Fuller, 1996; Stout, 2005); the learnt social rules and regulations which regulated training and learning behaviours (Wallaert, 2012); and the formation and reproduction of communal identities constructed through social negotiations (Lave & Wenger, 1991). This research data highlighted the multiple and various relationalities within the studio space, the materiality of space for constituting craft knowledge, and the reproduction of, and varieties within, learning practice and the studio space. This showed the material space where craft learning took place and craft knowledge was generated and produced.

It can be seen from this thesis that craft learning occurs and develops in these multiple relationships, which have to be combined together to construct craft knowledge. Previous research has mostly explored the social relationships in craft teaching and learning practice. However, the material relationships require more attention. Therefore, this thesis contributes to the understanding of where and how to develop craft knowledge through the lens of materialisation and the exploration of the material space. This thesis contributes to previous knowledge regarding craft learning practice through recognising the capacity of non-humans to engage humans in learning and by exploring the relationships between non-humans, where humans play a subservient role.

This conceptual model was constructed to show the whole picture of craft teaching and learning, where various relationships occur and emerge in their intra-actions with each other. This points to previous literature and this research's contribution to the field and illustrates the materiality within the process. While it has shown the important elements and relationships in the process of learning craft, it lacks the ability to draw the liveliness of matter, the multiple intra-actions, the complexity, and the temporality within the process by using the lines, arrows, and words for description. When looking at what is happening in the potter's studio (see image 36), we can see the observation and showing in teacher-learner relationships; the relationships between the learners; the relationships between the body and materials, tools, and equipment; and the relationship between non-humans. Through the image, you can also sense the materiality, the embodiment, the liveliness, the movements, and the changes. This links to the methodological approach within new materialism, which advocates an alternative approach where language and words alone cannot explain the process. In this thesis, I suggest reconsidering the use of the traditional model, with lines, arrows, and words, which may risk simplifying the phenomena, and provide an alternative way of thinking about the relationships which are materialised and embodied.

Image 36: The multiple relationships in craft teaching and learning

The development of the conceptual model (figure 1 and image 36) for learning craft entailed theoretical considerations of tacit knowledge, learning theories, and space theories. Therefore, in next section, I will discuss the theoretical contributions on tacit knowledge, learning, and space made by this research.

9.2 Theoretical discussions and contributions

Drawing on the findings, this thesis contributes to challenging binary thinking in knowledge production, learning, and space. This thesis is situated in the approach of relationality and intra-activity. According to the findings, non-humans, which includes clay, tools, equipment, the studio, table, chairs, and so on, showed their agential power to engage in the process of producing knowledge, learning, and space. Humans and non-humans were integrated into each other in the process of learning, where the boundaries between them gradually decreased and even disappeared. The process of humans constructing craft knowledge and the movement of non-humans were transforming and transformed through engagement with each other. This has suggested the need to reconsider the dualistic approach, which separates humans from non-humans and the social from the material. This approach of thinking through relationality and intra-activity also brought the possibility of new changes, differences, and innovations. Knowledge is not considered as only reproduced in a fixed mode, but also as emerging in the various intra-activities among humans and non-humans, where traditional knowledge is challenged and new knowledge has the chance to be created. Based on this intra-active approach, this research has contributed to the tacit knowledge and craft learning theories.

9.2.1 Why knowledge is tacit?

Previous research recognised the tacit nature of craft knowledge (Gamble, 2001; Nasseri & Wilson, 2017; Temeltaş, 2017). However, few research has explored the question of 'why' craft knowledge is tacit (except Gamble, 2001; 2004a; Høgseth, 2013). Gamble (2001; 2004a) used Polanyi's (2009) and Bernstein's (2006) theoretical understandings of knowledge to explain the tacit nature of knowledge. Such tacit knowledge involves the integration of different parts into the whole and includes the integration of the focal and subsidiary awareness embodied in humans. Humans cannot consciously recognise how they integrate different sections of knowledge to perform a task once their skills have developed. This knowledge has become tacitly embedded in their bodies. This tacit knowing also includes the incorporation of social rules and regulations into human bodies through engaging into social practices (Hadjimichael & Tsoukas, 2019; Tsoukas; 2005). Therefore, what proficient craftspeople know is mostly shown in their daily bodily actions and movements. Gamble (2001; 2004a) has explained tacit knowledge through exploring the structure of craft knowledge. This research increases the understanding of the tacit nature of craft knowledge through recognising the agential capacities of materials in producing and generating knowledge.

I have discussed materiality in the process of learning craft, where I have claimed that knowledge was not produced by humans alone. Instead, it was possessed and generated in the intra-action between animate and inanimate things. Objects, tools, and artefacts all embody knowledge. They anchor practice in their materiality. "Focus shifts from the subject and/or the object to their entanglement; the event, the action between…is what matters" (Hickey-Moody

& Page, 2015, p.4). As outlined in the previous chapters of findings (Chapter 6, 7, and 8), I suggest that craft knowledge entails tacit knowledge because craft knowledge is produced in the various intra-actions between humans and non-humans.

This relationship includes the relationalities between non-humans themselves, for example, during the firing process, humans can only interfere but cannot fully control the movements of non-humans. The variety, dynamics, and movement within the intra-actions with non-humans resulted in the difficulties of humans fully verbalising craft knowledge and formalising it into fixed modes of texts. Therefore, craft knowledge had to be embodied, sensed, and materialised to be tacitly known. Craft knowledge was not a fixed outcome to be learnt, it was always in the process, in the intra-actions. It has been argued that craft knowledge can be converted into explicit knowledge, recorded, and saved in, for example, recipes and instructional manuals (Nonaka & Takeuchi, 1995). However, craft knowledge could only be partly articulated (Tsoukas, 2005). What recipes and manuals show are the standardised and mechanised versions of certain body movements in certain moments of practice. It required the user to have tacit understanding of materials, for example, food (Ribeiro & Collins, 2007). This thesis showed that craft knowledge involved much more than recipes and manuals can record and communicate. By recognising the active role of materials in producing craft knowledge, this research contributes to the understanding of the tacit nature of craft knowledge through its materialised structure.

9.2.2 Contribution to craft learning theories

Previous research has applied social learning theories, including situated learning theory (Lave & Wenger, 1991), to describe the process of a new learner participating in the social activities within a community and gradually developing a more central identity within that community. However, previous research is still mostly human and social communities centred. There has been little research that pays attention to the relational encounters between humans and non-human actors, and material space. Some craft knowledge research considers non-humans elements as important elements entangled in craft practice (Ingold, 2001; Nasseri & Wilson, 2017; Risatti, 2009; Warnier, 2001). However, little research focuses on the agential capabilities of non-human actors in the process of learning craft. Though embodied learning theories already considered the active role of non-human actors in affecting human embodied practice, it needs to go further to consider the relationships not only between the human body and non-human actors, but also between non-human actors themselves.

This thesis contributes to the further development of social and embodied learning theories in considering non-human's agency ontologically as part of practice. Considering the active role of materials in learning, competence, skills, and knowledge shifts the focus from something that can be acquired to entangled becoming between forces without a pre-existing beginning or fixed end (Johansson, 2016; Juelskjær, 2017). These aids the understanding of learning viewed through a materialised lens. This thesis also showed the power relationships between humans and non-humans, where I suggest the reconsideration of the human-centred approach to discuss learning practice and empowerment of non-humans in constructing knowledge and constituting learning.

9.2.3 Research on the learning space

Previous research has highlighted the social aspect of space, resisting the traditional geographical sense of space as a physical container for human activities (Law, 2002; McGregor, 2003). This recognition of the social aspect of space has been used to examine learning practice in educational research (Mulcahy, Cleveland, & Aberton, 2015). Researchers have paid more attention to the (re)production of social space, for example, how craft learning happens and is supported in different communities, and how knowledge and identity are generated and negotiated through socialisation (Cattani, Dunbar, & Shapira, 2013, 2017; Coy, 1989; Lave & Wenger, 1991). However, the agential power of the material learning space is still ignored (except Leclair, 2022). Although there is an increasing interest in the material space in educational research, it is comparatively under-developed and under-theorised (Gulson & Symes, 2007b; Harrison & Hutton, 2013). Different material arrangements may conceive a critical shift of focus in the perspective of who teaches whom, what, and how (Juelskjær, 2020). The exploration of learning in the studio space in this thesis has shown that the materiality of space has the power to engage learners in certain ways and influence the intra-actions.

This thesis contributes to spatial studies through discussing the physicality and materiality of space in craft learning. In this thesis I build on the current knowledge outlined in spatial studies through explaining space in terms of temporality. In this sense, physical space is not fixed, time is not understood in the general sense, and the non-human experience is considered. It includes the temporalities of materials, tools, equipment, and the space. This thesis adds more materialised understandings on temporality and spatiality.

9.2.4 The new materialism theoretical approach

In this thesis, I have shown that new materialism provides a good theoretical perspective for the study of the relationships between different bodies in knowing, developing, and teaching craft knowledge. This unique connection between craft learning research and new materialism is the contribution this thesis has made to the development of new materialism theories. Craft learning relied heavily on handwork with materials, tools, and equipment (Nasseri & Wilson, 2017). Craftspeople were driven by what these materials could do (Ingold, 2013). The process of production and making did not involve directly imposing ideas onto the end objects. It was affected by materials, whose materiality constrains in the realisation of ideas (Gherardi & Perrotta, 2013). Materials, tools, and objects were so fundamental to craft learning that it was difficult to ignore their existence and active involvement as non-human actors in the process. Craft learning also provided an opportunity to reduce the dualism between mind and hand, between subject and object, and between social and material. New materialism provided a relevant perspective for this research, conversely craft also provided a phenomenon through which to consider new materialism, its concepts and extend its theory and methodology.

Materiality also had a critical impact on the process of conducting this research. I demonstrated how my research methodology was affected by materiality in Chapter 5. This research process had implications for the traditional way of doing research. In the next section I will discuss how this research contributes to the understanding of conventional research methods, rigour, and ethics.

9.3 Implications for research methodology

9.3.1 Traditional research methods

Craft, as an embodied practice, emphasises the bodily intra-actions with materials, tools, and equipment. Learning craft relies heavily on bodily communication with other bodies and the sensation from working with other non-human actors. The traditional way of conducting research, which is centred on humans and language, makes it difficult to explore these relationships as it ignores an important aspect of data generation.

This study invites researchers to rethink the conventional quantitative and qualitative research methodologies, and reconsider who and what (including human and other non-human elements) are present in the research scene, what roles they are playing, and how they can be studied (Sheridan et al, 2020). Instead of focusing solely on human language, researchers can pay more attention to how materials and participants act in the research process, for example, in the interview, which is conventionally centred around human (researchers and interviewees) spoken conversations and emotions. Researchers need to learn to value other non-human things and orientate attention towards them and immerse themselves in the atmosphere to feel and sense what materials want to communicate. This will allow researchers to join the conversation between human and non-human actors (Clever & Ruberg, 2014; Hejnol, 2017; Hetherington & Wegerif; 2018). This thesis challenges traditional methodology, which it views as problematic. The new materialism methodology, developed through this research, is posited as good practice for research involving non-human actors.

Additionally, researchers need to reconsider the data analysis process. When theories are considered unproblematic in their framing of research practice#se, there is a danger of going back to foundationalism, where "true 'knowledge' is securely established on one clearly definable foundation" (Markula, 2019, p.7). The involvement of materials in the research process ruptures the traditional way of imposing the researcher's point of view on the data to make sense of it through the so called scientific, logical, and reasonable inquiry (Coleman & Ringrose, 2013; Fox & Alldred, 2013; Masny, 2013). Instead, in this thesis, I did not only focus on or hear one voice as the essence (Rousell, 2019). The voice is no longer an "innate attribute of an individual human being" (Mazzei, 2013, p. 734). I encourage researchers to challenge traditional scientific methodologies, decentre themselves and other humans in the process, and be open to more opportunities and possibilities by thinking about the entanglements between researcher, participants, research tools, images, videos, and other research apparatus in the research scene. When using particular research methods, their benefits and limitation should be considered.

9.3.2 The rigour of research

This methodological shift from traditional qualitative research to post-qualitative research requires a rethink, not only about research methods, but also about the conventionally rational and scientific way of viewing validity and confidentiality. Research based on Cartesian dualism strives for research neutrality and objectivity, which assumes that "there is an unproblematic relationship between us and the world, including social scientific practices and its products, which results in a valid and reliable representation of the world" (May & Perry, 2017, p.4). This scientific view excludes the messiness, variability, contingency, and indeterminacy of research. This focuses on "stability, representation and order that might be leftovers from a positivist approach that still has tentacles into a (traditional humanist) qualitative research paradigm" (Østern et al., 2021, p. 12).

However, this thesis is in the entanglement of matter-researcher-other humans. It is in the process of being and becoming. The active involvement of matter destabilises this process and humans alone, including researchers, cannot pre-determine the research development and outcome. Using stabilised and organised scientific methods to measure the rigour and trustworthiness of this research cannot represent the complexity within the research. It narrows the explanation of certain phenomenon. In this thesis, I suggest that it is "the fluidity, complexity and performativity [of research that makes it] rigorous, solid and trustworthy" (Østern et al., 2021, p.12).

9.3.3 Research ethics

Traditional research ethical practice is based on anthropocentrism, which draws the distinction between human and other non-humans (Introna, 2009). In this way, ethical practice refers to a set of "rules, virtues or formulas [or protocols] that is used to ensure or judge righteousness" in conducting research (Rhodes & Carlsen, 2018, p.1297). These rules and ethical codes are developed by humans to define research practice and outcomes and consider the consequences for humans and other animate beings. Matter or objects are regarded as passive elements to be controlled by humans (Dale & Latham, 2015). Instead of mechanically applying ethical standards to practice (Guillemin & Gillam, 2004), in this thesis I recommend the consideration of the dynamic relations between humans and non-humans which are entangled in ethical practice. Different entanglements can be produced in different situations, which creates the dynamics, uncertainty, and unpredictability of the research process. This creates un-predefined ethical responses to in-the-moment encounters. Humans cannot pre-decide these ethical relations or control the process. Matter has the ability to affect research ethics. As Barad (2003) stated:

> […] ethics is not simply about the subsequent consequences of our ways of interacting with the world, as if effect followed cause in a linear chain of events. Ethics is about mattering, about taking account of the entangled materializations of which we are a part, including new configurations, new subjectivities, new possibilities. (p. 384)

This research considers the intra-actions between potter's bodies, materials, tools, equipment, and the material arrangement of space as important aspects for the development of pottery knowledge and skills. Loss of these intra-action elements is a key reason why craft knowledge is declining in modern factories and contemporary art schools, colleges, and universities.

The findings of this research could influence future craft curriculum, policy, and technological direction regarding the teaching of craft knowledge to the next. In the next section I will discuss the curriculum, policy, and technological implications of this research.

9.4 Practical implications

9.4.1 Implication for craft curriculum

The embodied approach to learn craft has a long tradition (Atkinson, 2013). However, the approach of sharing and teaching craft has been transformed in different times and spaces. Through mass industrialisation, craft work went through a critical shift after the "imposition of capitalist rationalization [and] automation" (Wallace & Kalleberg, 1982, p.309–310). The pedagogy of sharing and learning craft was informally organised in the daily work tasks and routines in the factory. These tasks were arranged according to the logic of management and production rather than that of craft work. They were divided into different specific and separate areas and the worker were split up into technicians, operators, designers, and others. The workers did not have direct connections with materials and traditional craft tools due to the reliance on big machines. Workers' control over the work, knowledge, and process was replaced. Craft knowledge was not embodied and materialised in that space and the tacit nature of this knowledge was not generated.

Craft colleges and universities, who once shared and taught craft knowledge, are mostly now closed in the UK and craft is currently taught and learnt in colleges and universities who have a lack of materials, tools, equipment, and studio space (Iswahyudi, 2021). The outline of craft curriculum design and structure in universities and colleges was analysed in Chapter 2, and it was found that it relied on the theoretical knowledge of design, art, and history.

In this thesis, I have shown that craft knowledge can be shared and learnt in the space of small craft studios because they were equipped with materials, tools, and equipment and organised in particular material arrangements and layouts. This material arrangement of the studio enabled craftspeople to touch materials, use tools and equipment, and practise and tacit knowledge was generated. I suggest in this thesis that the curriculum design and structure relating to learning craft should be re-considered to engage learners in multiple practices. The learning tasks and assessments should be designed towards greater incorporation of theoretical knowledge into the practical knowledge.

Additionally, it is suggested that the curriculum be designed to include all-round craft knowledge and multiple techniques and students should be tested to show this all-rounded craft knowledge. This curriculum redesign is not only the responsibility of higher educational organisations, but also requires financial and policy support from the government.

9.4.2 Implication for policy

In Chapter 2, I discussed how traditional apprenticeship were supported by the local craft guilds and the central government (Kieser, 1989; Lyon, 1920). However, the economic and political support from the craft guilds and government decreased through the disappeared craft guilds and the appearance of new technology and new modes of production (Epstein, 1998; Kieser, 1989). Contemporary craft colleges were closed because of the lack of funding to support the cost of equipment, space, and electricity (Crafts Council, 2014). As this thesis shows, alienation from materials and the material space reduces the possibility of traditional ceramic skills learning and teaching. When craft learning is shifted into the informal space, there is a risk that it becomes a middle-class pursuit as only wealthier people can afford the equipment and materials that are needed to learn. Therefore, from a policy perspective, it is suggested that the Government provides more financial and policy support to support and increase informal networks among small individual potters. Additionally, support for informal apprenticeship rebuilding in society and help for universities and colleges to rebuild their physical craft space and equipment for students to practise and learn would be beneficial.

9.5 Limitations and future research

Although all the research questions have been addressed, it is important to consider the limitations of this thesis. Through the discussion of the research limitations I will make suggestions for future research.

In this thesis I explored the intra-actions between potter's bodies and clay, tools, and equipment, between more and less experienced potters, and discussed how the physical and material arrangement in a space affects how learners develop skills. These intra-actions support the teaching and learning of this craft. However, in this thesis, the agential power of non-humans in learning other craft has not been explored and discussed here. Therefore, future research is suggested to explore other craft areas and consider the embedded learning of different crafts from the perspective of materials.

9.5.1 Future research on craft identity and meaning

The participants mentioned that 'the pots they made were pieces of themselves' during interviews. Their craft identities have been materialised into the materials and pots. The boundaries between potters and materials became blurred. One participant told me that the materials, such as clay, engaged her in specific traditions, cultures, and communities. The clay carried past memories and histories and re-engaged present potters in the reconstruction of identities connected to other traditions and cultures. However, this aspect of craft identity and how materials and physical space are involved in the construction of craft identities is not deeply explored in this thesis. Therefore, future research is suggested here to explore how engagement with matter, manual skills, and bodily experiences influences identity dynamics in and around craft practice and how identity, skill, materiality, place, culture, and tradition shape and are shaped by each other.

The data in this thesis shows that potters enjoyed the process of working with clay and loved the (un)certainty the clay brought to the process. Some participants gave up their previous permanent jobs to build up their own studios and make craft for a living. Some participants found themselves in the process of making craft. Some participants were using craft as therapy to cure metal illness. They all committed their lives to pottery because they found meaning within craft work. Their passion and love for craft cannot be explained through traditional understandings of humans as rational creatures who look for the best outcomes. However, this passion was not explored in this research. Future research can build on the findings in this thesis to consider the human emotions of love and passion to explore how meaningfulness is constructed or experienced through practising craft and the role of emotions in craft work. The future researchers could also consider pottery therapy as a way of helping humans find the meaning, happiness, and a sense of love and dedication to a skill.

9.5.2 Future research on technology and craft

In Chapter 2, the advance of technology was discussed as another key reason why craft skills had decreased (Wallace & Kalleberg, 1982). Machines took over control of the work from worker's hands and craft skills were degraded (Form, 1987). All processes were standardised and automated. It seems that the development of technology disrupted the nature of craft and craft teaching and learning. However, contemporary craft practice has already been influenced by the development of technology (Kroezen et al., 2021). Some craftspeople apply simple technology to help them improve work efficiency or assist in craft innovation (Banks, 2010). For example, in the studio where I was learning, the potter’s wheels were all electronic. The kilns were electronic as well. Additionally, digital technology has significantly increased the visibility of craft practice and is fostering a new space for the development of certain craft knowledge (Bratich, 2010; Fox Miller, 2017; Luckman, 2015; Minahan & Cox, 2007). It affords people greater opportunities to clearly see demonstrations from experienced potters anywhere, anytime. Leaners are able to develop knowledge and skills without the physical presence of teachers and masters. It broadens the learning space as communications between the teacher and learner are not in the same physical space or time. However, there is a tension between craft and the use of technology.

This research has shown that developing tacit understanding of craft involves being embodied in and engaged with materials, tools, and equipment. Therefore, even though the online videos and platforms have provided a space to teach and learn from others who are not physically close with each other, it still requires the learner to touch the material and use the tools in the physical studios, where the embodied sensitivity arises. The technology has shifted the dimension of traditional craft learning space and time, brought more opportunities for connections between craftspeople who are not physically close and for teaching and learning craft. This could help the future discussions about the potential of the persistence and survival of craft while the traditional craft apprenticeship disappeared.

This embodied practice and material sensitivity should not be replaced by technology for learning real craft. However, recently artificial intelligence (AI) is being explored in order to replicate the sensitivity of human movement. This may challenge the necessity of touching materials directly with the human hand when learning craft. Embodied sensitivity might be developed through wearing 3D glasses, for example. Robots may be developed to replicate human embodied actions and movements and think through the intra-activities. This highlights another tension about the development of craft knowledge. Should the robots' actions be considered as craft knowledge and has craft knowledge is passed down through them? I suggest further research to explore the tension between technology, craft knowledge, craft learning practices and the embracement of "the promise of artificial intelligence" (Kroezen et al., 2021, p.525). Another interesting and important field for future research is the exploration of the ways craft has declined and the how it has persisted, and the role of technology in sustaining certain crafts.

Chapter 10: Reflection on research and craft: Becoming a researcher and potter

Craft and research are regarded as related to each other: doing craft is congruent with the process of doing research, especially qualitative research (Atkinson, 2013; Bell & Willmott; 2020; Bernard, 2006; Brown, 2021; O'Connor, 2017). Learning pottery and conducting research in the field of pottery provided me the opportunity to rethink research with the creative practice of craft. The process of learning craft was not only a transformational one for the research itself, it was also a transindividual process for me as a researcher. This individual process involved becoming a critical qualitative researcher enacted in a specific relational phenomenon. The researcher and the researched were co-transforming each other all the time in the flux of the whole process of entangling with participants, the space, materials, and other non-human entities. It was a process of construction and deconstruction between the traditional and new and the researcher and the researched were all assembled in the relations that co-produced the data and constructed what has been and what will become. At the end of this thesis, I want to discuss how the understanding of doing craft helped me to reflect on conducting qualitative research, and how myself, as a qualitative researcher, was affected and transformed. This section will include the following aspects: pottery and research as embodied practice and becoming a potter and critical qualitative researcher.

10.1 ‘Messiness’ in making craft and conducting research-The tacit nature of knowledge in craft and research

In chapter 3, I have emphasised the tacit nature embedded in craft which leaves the teaching and learning of craft unformalised (Bell & Vachhani, 2020; Gamble, 2001). Though some argue (Nonaka & Takeuchi, 1995) this tacit knowledge is difficult to be fully explicated in, for example, recipes, manuals, or even machine, it can only be partially articulated (Hadjimichael & Tsoukas, 2019; Tsoukas, 2011). When I was learning from the experienced potter’s body demonstrations, YouTube videos, and pottery technical books, there were details of steps which told me the actions and procedures to learn certain techniques. These proficient body movements and actions have already been integrated into the experienced bodies, and slide into their unconsciousness (Polanyi, 2009). The ‘messiness’ and the tacitness has been ‘ignored’ from what has been recorded in the books, videos, and the experienced body movements.

I, as a new learner, needed to have the tacit understandings of the body movements first to be able to know how, for example, to throw a pot fully (Ribeiro & Collins, 2007). This required me to experience the ‘messiness’ myself to understand and feel what has been tacitly embodied in experienced potters. Thus, I could often see the fluent body movements of my teacher as an experienced potter when he was throwing a pot; however, when I practised myself, I had experienced lots of ‘messiness’. For example, when I was learning how to throw a pot, I was not in tune with the clay on the wheel. I added too much water to the clay, and the clay became too wet to stay in a shape, and then it collapsed. The potter’s wheel was full of the clay slips and was messy because

I had added too much water. The process of working with clay was messy when I was a beginner.

The process of data generation and analysis was also a messy process (Law, 2004). When I was reading published papers and articles, the data was neatly organised by the authors to present a clear structure to the readers. The 'messiness' and complexity in the process of doing research had already been 'cleaned up'. However, when I was in the research process, I felt this 'messiness' through the whole process of generating and analysing data.

When I was analysing my data, I struggled to find themes. I was confused by the participants' various craft learning backgrounds. Some participants learnt from watching videos and practising, some participants learnt from skilled potters through informal apprenticeships, and some learnt their craft skills at college. It seemed that so much data was spreading to every corner without any connections. I could not find any patterns in the data. This messiness was shown in image 37, where it can be seen that I was trying to build up relationships through analysing the different learning journeys from each participant. I listed all of the elements shown in the different stories and tried to connect them using lines and arrows in different colours (pink, green, blue, black). It looked really messy on the paper.

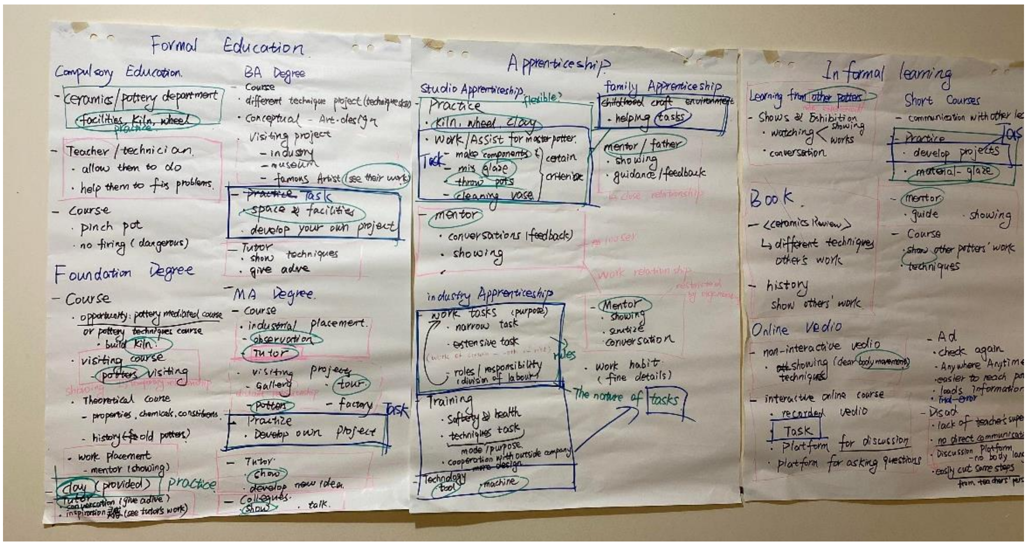


Image 37: The messiness in analysing data

It is very hard to articulate and formalise how to deal with this ‘messiness’ in books and papers. The process of learning how to do research entails the tacitness. The all-round knowledge of conducting research had to be learnt through my body to engage into the research field so that I could feel the messiness, the unarticulated, and the varieties in the process of doing research. To learn how to do research not only involves the techniques and methods outlined in the literature, but also involves the unarticulated part which can only be tacitly known through engaging the body within the socio-material practice. There were no full ready recipes for coping with the messy and problematic nature of research (Lynch, 2000).

Kroezen et al. (2021) has explored the nature of craft knowledge from two aspects: craft knowledge and craft attitude. Craft knowledge includes embodied practice, all-roundedness, and mastery of craft. Craft attitudes include commitement to craft, commuality, and experiment. I will reflect on learning craft and learning research through these perspectives in the next two sections.

10.2 Learning craft and research skills

10.2.1 Craft and research as embodied practice

When I went to pottery class, the teacher always suggested us to wear 'old' clothes to practise in the pottery studio. When my hands were working with clay, water, and the potter's wheel, the clay split to my clothes, the floor, the wall, as shown in image 38 and 39.

What I suggest here is that you have to 'get your hands dirty', to learn through touching the clay. Craft work was historically transformed into economic and management modes in modern craft factories, where human touch and engagement with materials and craft tools was replaced by big machines (Kroezen et al., 2020) (Chapter 2). Craft work was re-organised into rigid small units and knowledge was structured and converted into manuals on how to operate machinery. In this way, craft knowledge was considered to be eroded and lost (Form, 1987; Wallace & Kalleberg; 1982).

I also criticised the fact that UK higher education closed down workspaces with materials, tools, and equipment because of the high expense and low profit involved (Crafts Council, 2013). Students in these formal education institutions were not able to practise and learn (Iswahyudi, 2021). It meant that students did not get the chance to 'get their hands dirty' when learning craft. In this way, the tacit knowledge embedded in the 'messiness' through engagement of hands with materials was not indwelled into the learners. Therefore, learning craft relies on the embodied practice through situating the learner's body into socio-material situations (Gamble, 2001).

Image 38: Get your hands dirty

Image 39: The ‘dirtiness’ in the potter’s studio

Learning research also requires practitioners to ‘get the hands dirty’ (Schaenen et al., 2012). ‘Getting your hands dirty’ in research does not refer to the real dirtiness on your clothes, body, or the classroom, it means to learn through the research field. Learning to do research does not purely reside in researcher’s mind, it’s embedded in socio-material contexts which need to be embodied to understand the process. Reading the theories and research methodologies and imagining the research process through cognition cannot ensure that researchers know how these different ontologies and epistemologies shape research practice or how to conduct the research in practice (Markula, 2019). “[W]e may be in danger of losing the imaginative insights and understandings that came from a more embodied, hands-on approach to the crafting of knowledge [in research through only focusing on the techniques, even though] training might provide us with a technically competent generation of new researchers” (Smart, Hockey, & James, 2014, p.7)

The embodied practice in craft relies much on the sensible engagements with the matter, including clay, tools, equipment, and the physical studio space (Bell & Vachhani, 2020; Gibson, 2016). This also happened in my research practice. Thus, in the next section, I will talk about learning craft and research through body engagement with matter.

10.2.1.1 Learning craft and research with matter

My journey of learning pottery was a process of mutual communications with my teachers, and non-human entities, such as materials, tools, and equipment. I could not keep a distance from the materials and tools and understand what they were. I engaged myself into the flow of materials and felt the reciprocal forces. In the beginning, I felt the clay resisting the force of my hands because I did not understand what materials do and how materials move. Therefore, I was not in balanced communication with the materials. I needed to listen to the materials and attune my body movements and responses all the time to become comfortable with working with them. Through this embodied experience, I was able to know what materials and tools do and this fostered tacit knowing and feeling through the relations between myself and other important non-human entities.

Conducting my research also required the same body sensibility. When I started my research, I was already entangled with the research and connected to, and affected by, all of the research assemblages. I became part of the data generation and worked with and thought about the data all the time. I did not think and write from "a distant, disembodied position [instead I became] a present, sensing and relating researcher" (Østern et al., 2021, p.13). My body, as a researcher, became the site of knowing through receiving the response of the researched.

For example, when I tried to apply the CHAT theoretical framework to my data analysis, I felt the resistance of the data. I was struggling with 'finding the right theories for my data'. My supervisors suggested that I go back to the data and look for the answer from the data itself, rather than trying to read more theories that explained the data. My supervisors asked me to list all the data on a flipchart and look for the connections and commonalities between them. Then I started to have a conversation with my data and to feel what it was communicating. After I built up a relationship with my data, the patterns started to show up in the relational encounters between me and the data. I stared to feel the flow of the process of data analysis and attune my view with its rhythmic pattern (Marston, 2020). And the space that I did the interview with participants also has influenced the process of data generations. Interviewing in participants' studio helped me to generate a sense of craft work, practice, and learning, which enriched my knowledge about craft on the one hand and supported me to make closer relationships with participants on the other hand. The research assemblages, including humans, for example, participants and my supervisors, and non-humans, for example, the space for interview, the pots and pictures in that space, all shaped the data generation and analysis, and my understandings of making craft and doing research.

10.2.2 All-roundedness in learning craft and research

In Kroezen et al. (2021)'s paper, all-roundedness was identified as "a mastery of multiple interdependent techniques of making and a holistic understand of how particular aspects of making interrelate." (p. 508). To master all of the aspects in craft is important to learn craft knowledge. In chapter 2, I discussed the transformation of craft work and craft knowledge during industrialisation. Craft workers in that time and space cannot engage into the whole procedures of making and producing pots (Lewis, 1984; Wallace & Kalleberg, 1982). When I went to factory tour in one pottery factory in the UK previously, I saw the same phenomenon: workers worked in specific tasks and sat or only moved around designated spaces, the designers and makers in production line were different and separated. In that case, it was difficult for workers to learn and master the all-rounded craft knowledge. It was different situation when I went to participants' studio. They did and knew how to do all aspects of craft work: making, designing, glazing, and firing. In this way, they have learnt how every aspect connected to each other and shape their ideas and practice of making.

Doing research in my perspective also requires this all-roundedness. For example, when I was learning research methods before my PhD study, the research methodology and research methods were often separately taught in the University. I've learnt a lot of research techniques for doing interviews, observations, using data analysis software, such as SPSS and NVIVO, however, I felt I still could not clearly know the connections between research methodology and these research techniques. In that case, I still did not learn how to do research and understand the interrelationships between different parts of research. Later, I started to do my own research project, especially my PhD project, which included all aspects of doing research: research question, literature review, research methodology and methods, findings, and discussions. Some questions and problems arose in the process of doing the whole piece of research, which helped me to construct the interconnections between each aspect and how they shape and reconstruct each other in a non-linear process.

10.2.3 Mastery of craft and research knowledge

It took many years' dedicated practice to learn and master craft knowledge for participants. It was also shown in many craft literature (e.g., Cattani et al., 2013; Raffaelli, 2019). The expertise was built up through continued repetitions. I have discussed in chapter 8, the repetitions were not just 'copy' and 'paste', it involved subtle differences between each repeated practice because the learning practice was deeply embedded in the material circumstances, for example, the clay moves differently. The next practice was also built upon the previous ones to shape the practice in the moment. The potter became more proficient after repeated practices. For research participants as experienced potters, they have formed the body sensitivity, thus to tell the subtle movements and changes of clay when other potters were working with clay. As what participant N said, he could notice the maker's hand movement and how clay changed accordingly in two second on the process of watching.

However, I, as a new pottery learner, could not 'see' the subtle change on that process. In chapter 8, I discussed that that expertise was developed under different circumstances, where materials, tools, equipment behave differently with potter's hands. Experienced potters have integrated all the different circumstances into their body. When they got certain levels of expertise, specific ways and pattens of doing pottery would be formed through repeated practice. To open up new opportunities, one of research participants tried to uncontrol the materials and the process, allow the personalities of materials arise in the process of making.

It also takes many years' practice for a beginning researcher to master the research knowledge. It also requires continued repetitions. For example, I always read the same paper many times. I did not get the same meanings and knowledge through repeatedly reading same papers. What I have learnt from previous reading practice helped me to build up my reading skills and construct new knowledge and understandings.

When I was doing interviews on the same project with research participants many times, the contexts and circumstances I faced were different. My previous experience on interviews and the new circumstances I met with each participant have shaped the data generated. That was the process of myself developing the sense of research through repetitions and repetitions. For experienced researchers, they have developed the sense of understanding different words under different contexts and integrated these into their bodies. When I was talking to my supervisors and other experienced researchers, they could quickly notice and pick up the word that I used (un)appropriately in certain contexts through discussion. For example, when I talked about knowledge, learning, or knowing, I did not relate their meanings under different circumstances in the beginning.

Later, after reading literature and discussions with my supervisor, I have gradually developed a sense to be careful to use these words because there were different paradigms behind to understand and explain the meanings of words even though I am still a new researcher. After researchers got more experienced, they also formed specific ways and paradigms to think and do research. I met one experienced researcher on a seminar, he started to unlearn what he has learnt about research in the past to open up more possibilities.

10.3 Forming craft and research attitudes

10.3.1 Commitment to quality of craft and research work (authenticity)

When I was talking to research participants, they came from different backgrounds and faced different life situations, but the commonality among them is the love and passion for doing pottery. They committed themselves into the process of making pottery itself. The participants mentioned that they indulged themselves (knowledge and identity) into the process and the pots they made. Therefore, they strived for being 'true' and 'honest' to the materials, the pot, and the craft itself. The quality of craft was in the process of making craft itself and how potters communicated with materials, tools, and equipment, it was not about perfection and accuracy. Even when a pot was not perfect, it has its value and meanings in itself. This contrasts with the one of doing craft in mass craft manufacturer, where chases for the perfection and accuracy. Therefore, the pots broken are considered 'failed' pots to be thrown away because they cannot fit into the 'good' standards.

This 'honesty' and authenticity embedded in craft helped me to reflect on the quality criteria on research. I've often got questions from my colleagues who kept questioning the quality of their research if they could not get the results they planned and wanted through the interventions on class. They would see the research as failed ones because it was not perfect, they did not get ‘perfect’ data. This made me think the following questions: what should be the standards for a good data and research? How we define if a research or data is good or not? Should we consider ‘perfection’ as a criteria for deciding if a research or data is the good or failed? Should we look for the perfect result and outcomes or should we indulge ourselves into the process of doing research, listening to participants voice, keeping ‘true’ and ‘authentic’ to our research itself?

10.3.2 Communality in craft and research

Craft learning was always formed and shaped by the communities. In traditional apprenticeship, apprentices lived with the master within specific guilds where shared the communal values, meanings, and understandings of craft knowledge. Nowadays, some craftspeople built up informal networks to share craft knowledge and teachiniques for example, craft clubs and maker spaces (Kroezen & Heugens, 2019). The knowledge craftspeople learnt was (re)constructed through socialisation and negotiations with others and the rules within the community (Gherardi, 2001).

My way of doing research has also been shaped by my communities during PhD study. I am within the wider community of School of Education, University of Nottingham. I am also within the PGR community where my colleagues come from different cultures and traditions. Then I am also within smaller group with my supervisors. My thought on research has always been shaped by these different communities, and even the development of my thesis is being shaped by these communities continually. The knowledge has been shared through engaging with research activities and conversations with different people. This communality has kept shaping who I am as a researcher and what I want to become in the future.

10.3.3 Working with (un) certainty (exploration) in pottery and research

Making craft is not to actualise an original plan. It is never a process of printing directly onto the pot. The making process is different from the mode of mass industrial factories, where the outcome is always stable, predictable, and standardised (Adamson, 2018). When I was learning how to make pots, I had a rough plan of what I wanted to make. However, how the pots came out in the end depended on the momentary communication between me, as a maker, the clay, tools, wheel, the atmosphere of studio, and so on. Through the process of making pots, there were lots of possibilities and uncertainties that happened in the moment that were outside of my imagination and plan. Dealing with these uncertainties required the "minute, subtle reactions and decisions" to each circumstance (Hardy, 2004, p.181).

For example, when a centred pot became uncentred again, I needed to adjust the minor imbalance in the moment. The relation and processes were "not between matter and form, but between materials and forces" (Deleuze & Guattari, 2004, p.377). I needed to think through the process and reflect on different possibilities and adapt the methods of making pottery to the situation. Even participants, who are experienced potters, could not fully control what happened in the process or predict all of the variabilities. Sometimes, new knowledge was created in the process of encountering these unexpected, indeterminate, and uncertain situations.

In my research, the material, tools, technologies, researcher, participants, data, and other research elements, even the virus, were all assembled in relations and intra-actions. They co-produced the emergent phenomenon and embraced the power to affect the practice of conducting research. For example, the unexpected COVID-19 significantly influenced the research methods. Face-to-face interviews and observation were not allowed, which forced me to change my original research plan to online conversations.

These varieties required me, as a researcher, to challenge the traditional way of predetermining fixed structure of data generation methods and open my thinking towards different directions. This way I looked for the indeterminacy between determinacy, the uncertainty between the certainty, and the unpredictability between predictability. “Living with the ambiguity, uncertainty and the partiality of knowledge can be incredibly productive for thinking beyond the conventional approaches that have defined individual and social problems in often one-dimensional ways” (Fullagar, 2017, p.2). I had to embrace these uncertainties and indeterminacy, learn how to work with it, consider researching that includes diversity and multiplicity, rather than linearity and singularity, and leave space for producing something new and creative.

Becoming a potter or qualitative researcher included the process of incorporating different situations into the body. It requires many years repeated embodied practice to become an expert, a status I did not achieve. As a learner, I needed to reflect on the problems that happened in the process of working with materials. This reflection was not the process of thinking with my mind, rather it was in using my body. I needed to reflect in the moment of making, rather than believing in pre-ordained results. An expert is more capable than a beginner to respond immediately to different and unexpected situations and deal with its messiness. Just as a potter needs to undertake repeated practice to improve their skills, so a researcher needs to conduct repeated research practice to gain a better material sensitivity to the researched.

Becoming a potter or qualitative researcher was not only about mastering the techniques, but also about the shaping of my potter and researcher identity. The relationships between me, supervisors, materials, tools, the environment, the craft academic community in the process of learning pottery/research shaped what I, as a potter and researcher, became. This was represented in how I conducted my research and what pots and research pieces I made and produced. This process of making pots or conducting research was a trans-individual process for me. Potters and researchers are always in the entanglements, affected by human and non-human actors all the time and changed and transformed through the process (Østern, 2017). Learning how to do pottery or research was a process and journey of deep exploration. The pots or pieces of works produced through this process told me who I was as a person and as a researcher in the community.

At the end of this thesis, I suggest that learning how to conduct research is akin to learning craft skills. Traditionally, research has been widely recognised as an intellectual activity where learning how to do research resides in the researchers' mind (Bell & Willmott, 2020; Smart, Hockey, & James, 2014). Doing research about craft necessitated the removal of the Cartesian dualism between mind and body in academic field (Bell et al., 2019).

Conducting my research did not just include intellectual reflectivity, it involved the various unpredictable conditions of where the research takes place. It included other human and non-human participants which required me to cope with the multiple relationships in the process. This research knowledge could not exclusively be acquired and developed through learning the methods in classrooms outside the research field, it had to be embodied and socialised in the situations (Ulmer, 2015). This does not deny the importance of teaching and learning research methods through disciplined modules, including reading articles and books, but advocates for another approach towards a more embodied methodology for teaching and learning about research. My experience of conducting embodied research meant learning how to involve the body's sensitivities, as well as cognitive reflections. "If the concept of reflexivity provides rigour for the sociologist in the process of interpretation and analysis [then sensitivity] provides an appropriately sensitive frame of mind for dealing with the lives of research participants" and the research environment (Smart, 2014, p.136). Sometimes, my embodied feelings about the researched and data, whether comfortable or uncomfortable, happy or sad, natural or unnatural, told me if my analysis was in alignment with the data or whether it had been over interpreted.

Additionally, under the influence of traditional positivism, rigour, validity, bias and subjectivity was taken into consideration when conducting research (Smart, Hockey, & James, 2014). This craft research suggests that consideration be given to the relationality between researcher and the researched when assessing the rigour of research. My research affected and was affected by other humans, including humans (including participants and supervisors), and non-humans (including the space, research tools and so on) (Lenz Taguchi, 2013). We researchers are "not ghosts in these machines" outside the research field (Woodward, 2014, p.152). Just as potters engage themselves within the socio-material practice, so researchers are also entangled and embedded in the research within the field. We cannot alienate ourselves from the researched because what we become in the present influences and shapes how we engage with the research. Our gender, class, culture, community all contribute to the way we conduct research.

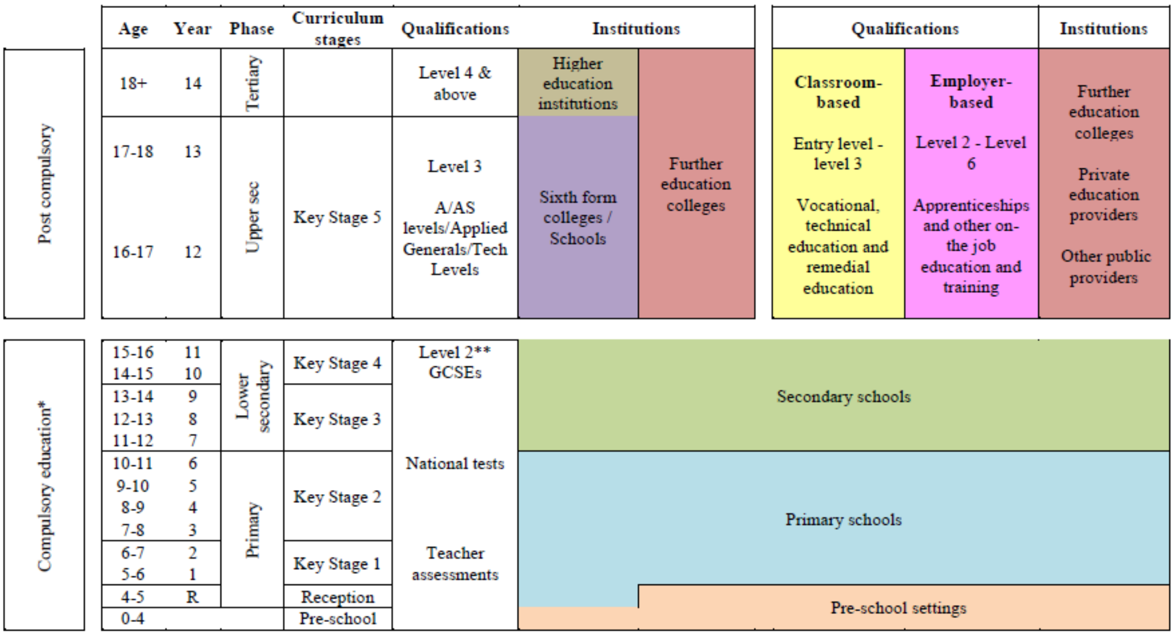
I want to finish by mentioning that learning craft and research do not have the end point. Even participants with more than 20 years' experience of doing pottery still told me that they needed to continue learning how to do pottery. One participant made a piece of work around 10 years ago, she was still working on the same piece and keeping reflections in the present (Image 40). Doing research is also same that researchers need to keep reflecting on the work they do.

Image 40: Pottery piece with no ends

Appendix

Appendix 1: The UK education system

Within the formal education system, there are 5 Key Stages before Tertiary education. In Key Stage 1 and 2, students in year 1-year 6 study in primary schools. The main examination in this phase is National tests. After this, most students enter secondary school, which lasts for five years. Most students take part in GCSE examinations. Education is compulsory during this time. After GCSEs, students who are academic choose AS/A Levels and stay in their original secondary school or go to an FE or sixth form college to finish a two year course and get a level 3 qualification. Some students choose BTEC or other courses which are more vocational and practice-based in colleges and others will go to work. If students do not pass some GCSEs, they can go to college to retake them. If they obtain level 3 qualifications, there is a chance for them to get higher qualifications, like foundation degrees, Bachelor degrees, Master degrees or Doctor degrees. Below is the figure for education system in the UK.



Notes: * The leaving age in England where individuals must engage in some form of education or training became 17 in 2013 and 18 in 2015.
** Level 2 in GCSEs is achieved with grades A*-C

Figure 2: Education system in the UK (Hupkau, 2017)

Note: There are different education systems in England, Wales, Scotland, and North Ireland. This figure uses the education system in England, below is the same.

Appendix 2: The education qualification system in the UK

In October 2015, Ofqual replaced the **Qualifications and Credit Framework** (QCF) in England and Northern Ireland and implemented the **Regulated Qualifications Framework** (RQF). Below I have listed some usual academic and vocational qualifications and integrated them into the RQF, showing how each qualification level is equivalent to the RQF qualification levels. For example, Bachelor degree with Honours is a level 6 qualification. If students finish their study in the first year, then they can get a Certificate for Higher education, if they finish the second year, they can get the Diploma for Higher education, and if they finish the whole three or four year study, then they can get the Bachelor Degree with Honours. Additionally, there are some more vocational based qualifications which are equivalent to level 4 or level 5, such as, HNC is equivalent to the first year of a Bachelor degree, which is level 4, and HND is equal to the second year of Bachelor degree, which is level 5. A Foundation degree is equal to the second year of a Bachelor degree, which is a level 5 qualification. BTEC Higher National and Higher Apprenticeships are equivalent to level 4 or level 5 qualifications (see Table 1).

Table 2: The Education Qualification System in the UK

Levels	Academic-based		Work related or vocational-based				Other Various Professional Diplomas and certificates
			BTEC	Apprenticeship	NVQs	other	
Level 8	Ph.D						
Level 7	Masters			Degree Apprenticeship			

	MA, MSc, Mphi							
Level 6	Degree with							
Level 5	Honours BA (Hons)	Dip HE	BTEC Higher	Higher Apprenticeship	NVQs level 5	HND	Foundation Degree	
Level 4	BSc(Hons) BEd(Hons)	Cert HE	Nationals		NVQs Level 4	HNC		
Level 3	A-Level	IB	Level 3 BTEC Nationals	Advanced Apprenticeship	NVQs Level 3	Access to HE Diploma		
Level 2	GCSE Grades A*-C (9-4)		BTEC first Level 2	Intermediate Apprenticeship	NVQs Level 2			
Level 1	GCSE Grades D-G (3-1)		BTEC first Level 1		NVQs Level 1			

Note: * GCSE = General Certificate of Secondary Education;

A-Level = GCE Advanced Level;

BA = Bachelor of Arts;

BSc = Bachelor of Science;

BEd = Bachelor of Education;

MA = Master of Arts;

MSc = Master of Science;

MPhi = Master of Philosophy;

IB = International Baccalaureate;

BTEC = Business and Technology Education Council;

HNC = Higher National Certificate;

HND = Higher National Diploma;

NVQs = National Vocational Qualifications.

* The Entry level is not under the consideration.

Appendix 3: Participants Information Sheet

Research Topic: The Teaching and Learning of Ceramics in the UK

Researcher: Miss Mixue Li

Supervisors: Professor Volker Wedekind and Dr. Jeannie Holstein

Dear Participants,

You are being invited to take part in this research study. Please read carefully this information sheet in order to understand why the research is being conducted and what your participation will involve.

Introduction:

In recent years, craft and craft practices have apparently experienced a renaissance within the UK public imagination. However, according to the HCA (the Heritage Crafts Association) Red List of Endangered Crafts, industrial pottery has been listed in the category of "critically endangered", which means that it is at serious risk of no longer being practised in the UK. Hence, this research wants to closely examine how ceramics is learned and taught, and explore how the next generation can acquire the craft knowledge and skills.

In other words, the aim of this study is to describe the system of teaching and learning ceramics in the UK and explore how and why experienced craftspeople formed their particular ways of practising their craft.

What I will do?

Firstly, I will observe ceramicists how they make pots in their studios in order to understand how workers do in each stage of work. Then I will follow this with individual or small group interviews about what I have seen and ask a few questions about how they learned in school, college and the work place and what influence them to form particular practice way. Participants involved in the study will be interviewed (audio/ audio-visual recording) for a period of up to forty five minutes (45min). The recordings will be transcribed, anonymised and stored. Photographs and videos recordings will be used in support of data collection in the process. This data collecting process is planned to go from November, 2019 to September, 2020.

Confidentiality:

During the presentation of results obtained from data collection, your own words may be used in the text; nevertheless, your identity remains anonymous. In addition, All gathered data will be secured in a password protected and encrypted space. This procedure will comply with the Code of Research Conduct and Research Ethics of the University of Nottingham (Version 6.2016)[5].

Dissemination:

The Code of Research Conduct and Research Ethics of the University of Nottingham Version 6 highlights that researchers are encouraged to disseminate their research and findings in appropriate forms: Papers in referee journals and other sorts of publications. Once the data collection phase is over, the findings will be summarized and presented at academic journals and educational events

[5] For more details regarding data confidentiality and sharing, please read page 7 of the following:
https://www.nottingham.ac.uk/educationstudentintranet/resources/research/code-of-research-conduct-and-research-ethics-version-6-2016.pdf

inside and outside the university. Also, a summary of the results could be presented in papers and journals for academic conferences. I understand that data will be stored safely for a period of seven years after finishing the study.

Participant's rights:

- You are free to decide whether you will take part or not in this study.
- You are free not to answer any question.
- Your identity is kept anonymous during data collection and presentation.
- You can withdraw from the study at any point.
- You can ask more details related to the conduction of this research to me, my supervisors and you can write to research Ethics officers, to complain about your involvement in this research in the contacts list provided at the end of this page.

Contacts List:

Researcher: Mixue.Li@nottingham.ac.uk / +44 (0) 7521706576

Supervisors: Volker.Wedekind@nottingham.ac.uk / +44 (0) 115 951 6529.

Jeannie.Holstein@nottingham.ac.uk / +44 (0) 115 846 6408.

School of Education Research Ethics Coordinator:educationresearchethics@nottingham.ac.uk

Appendix 4: Consent form for participants

<u>Participants Consent Form (original):</u>

Research Topic: The Teaching and Learning of Ceramics Industry in the UK

Researcher: Miss Mixue Li

Supervisors: Dr. Volker Wedekind and Dr. Jeannie Holstein

- I have read the Participant Information Sheet and the purpose of the research project and what my involvement will imply has been explained to me. I understand and agree to take part in this study.
- I understand that I may withdraw from the research project at any stage and that this will not affect my status now or in the future.
- I understand that while information gained during the study may be published, I will not be identified and my personal results will remain confidential.
- I understand that I will be audio recorded during the interview.
- I understand that data will be stored safely for up to 25 years by the university and for a period of no less than 7 years after the research project finishes. Also, as a security measure, only specified people will have access to electronic and hard copies of the data.
- I understand that I may contact the researcher or supervisor if I require further information about the research, and that I may contact the Research Ethics Coordinator of the School of Education, University of Nottingham, if I wish to make a complaint relating to my involvement in the research.

Signed ………………………………………………………………… (Research participant)

Print name ………………………………………………

Date………………………………

Contacts List:

Researcher: Mixue.Li@nottingham.ac.uk / +44 (0) 7521706576

Supervisors: Volker.Wedekind@nottingham.ac.uk / +44 (0) 115 951 6529.

Jeannie.Holstein@nottingham.ac.uk / +44 (0) 115 846 6408.

School of Education Research Ethics Coordinator:educationresearchethics@nottingham.ac.uk

Participants Consent Form (revision due to Covid-19):

Research Topic: The Teaching and Learning of Ceramics Industry in the UK

Researcher: Miss Mixue Li

Supervisors: Professor Volker Wedekind and Dr. Jeannie Holstein

- I have read the Participant Information Sheet and the purpose of the research project and what my involvement will imply has been explained to me. I understand and agree to take part in this study.

- I understand that I may withdraw from the research project at any stage and that this will not affect my status now or in the future.
- I understand that I will be audio recorded during the interview.
- I understand that the research related information got through electronic correspondence (including University emails, Microsoft Teams, Skype for business) will be used as data in this research and all information will be encrypted.
- I understand that while information gained during the study may be published, I will not be identified and my personal results will remain confidential.
- I understand that data will be stored safely for a period of seven years after finishing the study. Also, as a security measure, only specified people will have access to electronic and hard copies of the data.
- I understand that I may contact the researcher or supervisor if I require further information about the research, and that I may contact the Research Ethics Coordinator of the School of Education, University of Nottingham, if I wish to make a complaint relating to my involvement in the research.

Signed ……………………………………………………………… (Research participant)

Print name ………………………………………………

Date………………………………

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Researcher: Mixue.Li@nottingham.ac.uk / +44 (0) 7521706576

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Jeannie.Holstein@nottingham.ac.uk / +44 (0) 115 846 6408.

School of Education Research Ethics Coordinator:educationresearchethics@nottingham.ac.uk

Appendix 5: Interview questions

<u>Interview questions (original):</u>

Dear Participants:

Thank you for your participation into my research! I am Mixue Li, a second year PhD in the University of Nottingham. My research wants to explore how ceramists learn their craft skills and knowledge. And I will go through the process of you making pots and ask something about how you learnt ceramic knowledge and why you form a particular style. The whole process will take around 45 minutes and the conversation will be recorded. If there is anything you don’t feel comfortable, you have the right to stop and I am looking forward to your suggestions about this interview profile. Here are the questions:

i Basic information:

Could you please tell me a little bit about yourself?

How long have you been making pots?

Could you describe the styles of your works as a particular way that you have developed?

ii Educational profile:

Could you tell me something about your educational background?

What are the courses related to ceramics you learnt in educational institutions?

Did these institutions provide opportunities of practising in the factory or studios to students? Did you arrange any practical experience for yourself?

How do you think the influence that the education experience had in forming or shaping your ceramics skills and knowledge?

Did you have any experience to further training your skills in the later stage?

iii Learning in everyday practice:

Could you remember what it was like when you first made a pot? Was it successful? How did you feel when you made it?

When you see the clay, how you get these ideas to design it? Could you give an example about the process when you make a pot?

Could you remember and describe some significant moments that have had important influence in your choice to be a ceramicist and learning the skills?

Besides educational training background, what else influenced your works? For example, family, wider social, political cultural issues, financial things and so on.

Thanks for your participation and if there is any questions or suggestions, please contact:

Researcher: Mixue.Li@nottingham.ac.uk / +44 (0) 7521706576

Supervisors: Volker.Wedekind@nottingham.ac.uk / +44 (0) 115 951 6529.

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Interview questions (adjusted example):

Dear participant,

Thank you for accepting my invitation of interview! I am Mixue Li, a second year PhD in the University of Nottingham. My research mainly wants to explore how ceramists have learnt their craft skills and knowledge. After reading your basic introduction about yourself, I am deeply attracted by your industry apprentice experience at the xxx (one of the leading ceramic factory in the UK), your learning experience in higher education institutions and your rich teaching experience in many different organisations. And I am very interested in your research about the manufacturing histories of North Staffordshire's ceramics industry. I am grateful that we can have a conversation and I can listen to your learning and teaching experience and your unique ideas about your work, contemporary apprenticeship in the UK, ceramics industry history and contemporary situations and so on.

Here are the basic questions that I want to ask you. If you have any questions and problems, please feel free to tell me and my supervisors, if you feel uncomfortable, you have the right to stop the conversation.

i. Basic Information:

Could you please introduce yourself and what influences you going into ceramics field?

ii. Learning Background:

- **Learning as an apprentice**:

Could you please tell me more about your experience being an apprentice at the xxx?

What did you usually do in the factory?

How the factory instructed you to learn the skills? How do you appraise the experience in this stage?

How do you think of the apprenticeship system in the contemporary UK?

How do you feel the situation and development about the ceramics factory in contemporary UK?

- **Learning in the higher education**:

What made you decide to enter into higher education and continue your study?

What the main differences do you think that you learned in between factory and higher education institutions?

How do you think the influence that apprentice and higher education experience had in forming or shaping your ceramics skills and knowledge?

How do you think the relations among theory, contexts, and practice?

iii. Work practice:

After many years of making practice, which part do you think has become a ritual that you don't need to think too much of it? Which part do you think still needs you to think when you do the work?

When you see the clay, how you get these ideas to design it? Could you give an example about the process when you make a pot?

How do you think about the relationship between yourself, clay, tools and your pottery (such as, how you feel the clay? Do you make your own tools? How tools act on the clay? Is there any changes happening in the process of making? What is the most important thing do you think in the process of making?)

Could you remember and describe some significant moments that have had important influence in your choice to be a ceramicist and learning the skills?

Besides educational training background, what else influenced your works? For example, family, wider social, political cultural issues, financial things and so on.

IV. Teaching Experience:

Could you please describe some basic information about the courses you teach?

What teaching methods/pedagogical techniques you use? Why?

what is the sequencing of skills and knowledge in the course? Why?

What do you think is the most difficult thing to teach?

What factors do you think that influenced your teaching?

Thank you very much and if there is any questions or suggestions, please contact:

Researcher: Mixue.Li@nottingham.ac.uk / +44 (0) 7521706576

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Appendix 6: Observation profile

<u>Observation profile (with participants)</u>

Date:

Where:

Participants (who):

Observational tasks and activities (what):

Observational lists:

i Observation mainly focuses on how practitioners do their work in the practice and the observation items are listed in the following:

How they complete their work tasks or achieve the work aims? What specific techniques do they use when doing the work task? How they communicate with their peers and how they cooperate with other workers to complete a task? How they interact with materials, the tools, and machine during the work process?

ii. During and after the observation, I plan to do some informal and formal semi-structured interviews. Interview will mainly centre on how workers learn to do these kinds of things and the purpose is to understand the learning process. This research will ask:

Why they operate the work tasks in a particular way? What factors that they take into account when doing the task? How they apply their knowledge learning from school and workplace into practice? How they learn to operate with materials, tools, machines and interact with their peers, more experienced workers?

Observing items:

Materials dealing;

Tools and machine using;

Communication: with partners, experienced workers; verbal and body (tacit);

Corporation behaviours;

Design part

Notes and reflections (for researchers)

Observation profile (for my pottery learning)

Date:

Where:

Duration:

Course design and objectives:

Learning tasks and activities:

Observational lists:

i. Studio space:

The elements equipped in the studio (including materials, tools, equipment, artefacts, desks, chairs and others);

The layout of different rooms in studio (including distance and boundaries between different entities, and the changes in the space)

ii. Teaching:

What teacher teaches for each class?

How teacher teaches for each techniques? (Ways of teaching: demonstration/verbal instruction/others);

Tools and equipment teacher uses for teaching certain techniques;

The communication behaviours and actions for teacher to teach and guide students;

The body behaviours and movements of teachers and the changes of materials accordingly;

iii. Learning

What I have learnt in each class;

Ways of learning different techniques and skills;

Tools I use for each task;

The communication behaviours between me and the teacher;

The communication behaviours between me, materials, and equipment;

The difficulties and achievements I will meet in the process.

Notes and reflections (for researchers)

Appendix 7: Details of participants learning and teaching background

Table 3: Details of participants learning and teaching background

Participants	Learning experience	Teaching experience
Participant A	Short courses; friends	Yes, short courses
Participant B	Factory apprenticeship; family apprenticeship; formal education; friends	No
Participant C	Formal education, friends	No
Participant D	Formal education; friends	Yes, short courses
Participant E	Factory apprenticeship; studio apprenticeship; friends	No
Participant F	Factory apprenticeship; formal education; friends	No
Participant G	Studio apprenticeship; friends	Yes, short courses
Participant H	Factory apprenticeship; friends	No
Participant I	Formal education; friends	Yes, part-time BA courses
Participant J	Studio apprenticeship; friends	Yes, short courses
Participant K	Studio apprenticeship; friends	Yes, short courses
Participant L	Factory apprenticeship; formal education; friends	Yes, full-time BA course
Participant M	Short courses; friends	Yes, school art courses

Participant N	Formal education; friends	Yes, studio apprenticeship
Participant O	Family apprenticeship; factory apprenticeship; formal education; friends	Yes, family apprenticeship
Participant P	Formal education; friends	No
Participant Q	Formal Education; friends	No
Participant R	Formal education; friends	Yes, short courses
Participant S	Formal education; friends	Yes, short courses
Participant T	Formal education; friends	Yes, short courses

Appendix 8: Details of my pottery learning courses

Table 4: Details of my pottery learning courses

Short courses	Where	Duration	Teaching and learning	
			What	How
First	Potter's studio	6 weeks (3 hours per week)	Wedging clay + throwing + turning (use tools) + glazing (different glazes)	Verbal instruction + body demonstration + embodied practice
Second	Potter's studio	10 weeks (3 hours per week)	Wedging clay + throwing + turning (use tools) + glazing (different glazes)	Verbal instruction + body demonstration + embodied practice
Third	Potter's studio	10 weeks (3 hours per week)	Wedging clay + throwing + turning (use tools) + glazing (different glazes)	Verbal instruction + body demonstration + embodied practice

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