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Tacit Learning in an Extended Interior Design Studio

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Abstract: Tacit knowledge, an important component of design is widely researched. However, its acquisition in design education still remains unclear. Its difficulty in transference and articulation suggests that it is constructed and thereafter internalized by the student. The social environment of the design studio scaffolds and further shapes the acquisition of tacit knowledge. But as the boundaries of the physical studio are extending to the virtual, how this extension facilitates the acquisition of tacit knowledge is the aim of this study. Constructivist theories are applied to study the above in the Environment and Interior Design programme at the School of Design, The Hong Kong Polytechnic University. Methods of data collection were focus group interviews and studio observations. Participants in the study include students and tutors in various years of the programme.

Keywords: *tacit learning; constructivism; blended studio environments; extended interior design studio*

1 Introduction

Studios in design education are sites for experimentation, application of knowledge as well as act as simulations for the real-world design practice. The active and dynamic nature of the studio also facilitates the acquisition of tacit knowledge, an important component of design (Schön, 1985). Aesthetics, intuition, spatial perception, problem-solving, and sensibilities that are considered examples of tacit knowledge in design are difficult to transfer compared to explicit forms of knowledge. Tacit knowledge is instead constructed by the student, facilitated by the tutors and the interactions in the studio, a characteristic of the studio learning pedagogy.

Adoption of online platforms to support tacit learning gains prominence as it affords access to knowledge beyond the studio, thereby impacting learning behaviour. Though a lot of e-learning subjects allow for the learning to extend, online learning such as a Learning Management system is seldom used in design schools because of the inefficiency of the platform (Ma and Chan, 2016). This paper documents the findings of an empirical research done in the interior design studio by using constructivist educational theories to study the acquisition of tacit learning. An objective is to study the potential of using blended learning for tacit knowledge construction. Blended learning in this study refers to combination of physical, digital and online environments as well as social media environments that also serve as



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learning environments. How blended learning helps in extending tacit knowledge construction from the physical to the virtual is the aim of this study.

2 Literature Review

2.1 Tacit Learning

2.1.1 Definitions and Theorizations

Wong and Radcliffe (2000) attempt to gather various definitions of tacit knowledge which may be summarized using the following words: implicit, non-verbal, inarticulate, uncoded, intuitive, embodied, unexplained, and knowledge that is difficult to transfer (p. 494).

Michael Polanyi's frequently cited definition that "we know more than we can tell" (1966, p. 4) suggests a difficulty in communicating certain types of knowledge termed as tacit. Though such knowledge can be demonstrated, it relies on the learner's ability to catch the meaning of the demonstration (p. 5). Polanyi mentions the concept of indwelling where the tacit is embodied and interiorized within the knower (p. 16). He further argues that the indeterminacy of problem-solving is based on the concept of indwelling, and not on positivist philosophies.

Drawing from Polanyi's concept, Donald Schön (1985) questions the application of technical rationality in teaching artistry in architectural education. Acquisition of artistry is difficult to describe because according to him:

Our knowing is ordinarily tacit, implicit in our patterns of action and in our feel for the stuff with which we are dealing. It seems right to say that our knowing is in our action (Schön, 1985, p. 21).

When design practitioners encounter surprises in the act of problem-solving, it triggers the process of 'reflection-in-action' (p. 23) which explicates their 'tacit-knowing-in-action' (p. 21).

Schön cites the unique setting of the architectural studio to formulate his theory, where the studio master and student engage in a "reflective conversation with the situation" (1985, p. 26) resulting in reframing of the problem. The studio master uses the design language to demonstrate the act of designing through a web of moves (p. 52).

2.1.1 Explicit Knowledge

Explicit knowledge is regarded as knowledge that is effable, articulable, communicable, transmittable, static, and a manifestation of tacit knowledge (Wong & Radcliffe, 2000; Koskinen et al., 2003; Schindler, 2015). Wong & Radcliffe (2000) argue that design knowledge has elements of the tacit and the explicit that are intertwined or can lie in varying degrees of a spectrum. They identify the need to access tacit knowledge in order to apply explicit knowledge.

The discourse on tacit knowledge has also gained prominence in organizational studies. Nonaka and Takeuchi's widely applied SECI model identifies the models of knowledge conversion from the tacit to the explicit as: 1. Socialization - tacit to tacit, 2. Externalization - tacit to explicit, 3. Combination - explicit to explicit, and 4. Internalization - explicit to tacit (Adloff, Gerund and Kaldewey, 2014, pp. 10-11). New knowledge is constantly created in this dynamic conversion process.

2.1.1 Cognitive and Social Dimensions

Central to the notion that tacit knowledge is individualistic and internalized is the role of the body, from which we come to experience a situation (Polanyi, 1966, p. 15). When the experience is embodied, the sensory systems, emotions and motivations produce conceptual and perceptual representations of the situation (Ignatow, 2007, pp. 120-121). Due to the subjectivity of the experience and its representations, the verbalization of sensuous knowledge is limited (Schindler, 2015, p. 17). From a cognitive perspective, new learning occurs when the mental representations are constantly changed due to environmental affects (Koskinen et al., 2003, p. 283).

Mareis (2012) observes that emphasis on tacit knowledge as an innate ability of designers overlooks its socio-cultural dimension. She refers to sociologist, Pierre Bourdieu's concept of habitus which refers to a structure of sensibilities, dispositions or tastes that are ingrained in an individual gained through collective experience and determined by existing social or cultural conditions. (p. 69). Loenhoff (2014) states that tacit knowledge is collective, differentiated and context-specific. It is "socially shared, because it is the result of agents' successfully coordinated and co-produced action" (p. 25).

Koskinen et. al (2003) have explored kinds of social engagements that provide tacit knowledge acquisition in a project work context. They conclude that trust, language, corporeality, face-to-face interaction, situation and context are factors that affect, facilitate or enhance acquisition and sharing of tacit knowledge.

2.1.2 Online Applications

Yi (2006) studied the externalization of tacit knowledge to online environments by analysing online course management data. Findings reveal that while knowledge in the physical environment is externalized through learning by doing, sharing of experiences is most effective in online environments. Sharing in the form of story-telling and metaphors generates new mental models and new knowledge (2006, p. 670). Another example is where Ma and Chan (2016) investigate the effectiveness of an eLearning platform in the blended learning approach of project-based subjects. The utilization of discussion boards in the projects allowed students to broaden their knowledge through sharing, exchange and debate of ideas. Self-reflective blogs that facilitated the reflection of students' learning process may have also aided in explicating tacit learning. Their research is based on Kolb's Cycle of Experiential Learning.

Building on social constructivist theories, Oztok (2013) explores the potential of online learning for leveraging the tacit knowledge of individuals in a community that could provide opportunities for situated learning. He reasons that by sharing knowledge, experiences, as well as values and beliefs, individuals develop an identity and a sense of belonging to the community. He proposes the utilization of tacit knowledge through the concept of social capital that contributes towards bridging, bonding, and making meaningful collaborations amongst the members (Oztok, 2013, p. 31).

2.2 Knowledge Construction

2.2.1 Definition and Perspectives

According to constructivist theory, knowledge and meanings are constructed from the interpretation of experiences, reality is constructed through the interactions of people and their world in a social context and that these constructions change with new experiences and in new situations (Mertens, 2010; Guba & Lincoln in Denzin & Lincoln, 2005).

From a cognitive perspective, construction of knowledge is an internal activity in the mind of the learner. In Jean Piaget's model, experiences that are interpreted are either adapted or altered to pre-existing schemas. Schemas, meanings and world-views are unique to an individual (Fosnot & Perry, 2005).

Seymour Papert's theory of constructionism focuses on the contextuality and the dynamics of change in constructing knowledge structures (1980). Considered to be a pioneer in Artificial Intelligence, Papert regards computational environments as new ways of thinking, learning and interacting.

Well-known socio-cultural perspectives of constructivism such as Vygotsky's Zone of Proximal Development and Bruner's Scaffolding theory highlight the effect of social interactions on learning (Fosnot & Perry, 2005). Knowledge that is co-constructed in a social process is contextually situated in the learning environment (Kurt, 2011).

The following are the conditions of constructivism outlined by Driscoll (2005, pp. 393-402):

- Embed learning in complex, realistic and relevant environments – dealing with ill-structured problems and in multiple contexts
- Provide for social negotiation as an integral part of learning – communication and collaborating in learning using computer technologies
- Support multiple perspectives and multiple modes of representation – using hypermedia to provide a flexible knowledge base through multiple sensory modes
- Encourage ownership in learning - students are active producers of their knowledge, teachers act as facilitators and guides
- Nurture self-awareness in the knowledge construction process – reflexivity as an attitude helps students to be critically aware and defend their beliefs that helps them understand multiple perspectives

2.2.2 Online and Digital Applications

Driscoll (2005) is convinced that the use of online and software systems can empower a constructivist learning environment (p. 404). Similarly, Kurt (2011) promotes the intense use of digital technologies such as databases, virtual

realities and the internet to foster a student-oriented approach in an architectural studio. She further proposes a hybridization of “traditional and constructivist attitudes in studio environment” (p. 3983).

The relationship between the constructivist educational theory and tacit acquisition was studied by Andjomshoaa, Islami and Mokhtabad-Amrei (2011). They empirically tested constructivist applications in an architectural studio project by utilizing computer-aided design. The incorporation of computer-aided design in all stages of the design process aided the construction of more meaningful learning and deeper understanding (p. 221). In turn this led to the retention of knowledge for a longer time resulting in the generation of tacit knowledge (Andjomshoaa et al. 2011).

To summarize the literature review, the embodiment and internalization of tacit knowledge is effectuated by social interactions and collective sharing of experiences. The social aspect of tacit learning also has a bearing on stimulating its cognitive aspects. Since tacit knowledge cannot be taught it is constructed through the act of doing, which also explicates the tacit. But it must be emphasized that tacit knowledge is co-constructed in a social process which is then internalized by the student. It therefore includes both the act of doing as well as sharing of experiences. Online platforms and social media can broaden the sharing of experiences beyond the physical boundaries of the studio.

2.3 Conceptual Framework

A conceptual framework was developed based on the literature review which also serves as criteria for the facilitation of tacit knowledge construction in a studio:

- Learning by doing – knowing how to design through the act of design
- Explicating the learning – demonstration of knowledge through representing in different media
- Cognitive development – generation of new mental models through multiple sensory modes and exposure to multiple perspectives and representations
- Sharing experiences – collaborating and critically reflecting other experiences to generate new understanding and sensibilities
- Situated learning – learning in a context and co-constructed in communities of practice

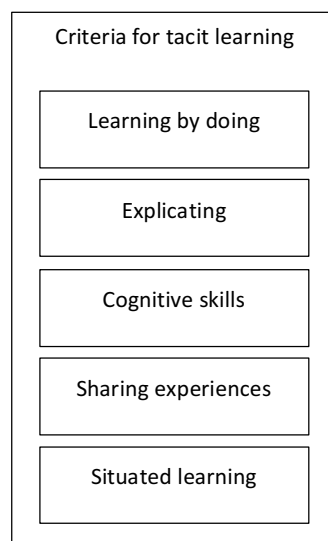


Figure 1. Conceptual framework

2.4 Research Question

Therefore, the research question developed through the literature review which the study attempts to answer is:

How can a physical interior design studio that facilitates tacit knowledge construction be extended to online and social learning platforms?

3 Research Design

The qualitative study was conducted using six focus groups in the Environment and Interior Design programme of the School of Design, The Hong Kong Polytechnic University. A focus group comprised of 2-3 students. Year 2 students and Year 4 students and their respective tutors were observed and interviewed in two design projects as part of the studio

subjects. The Year 2 project required students to research and submit a proposal for an existing site in Hong Kong. The Year 4 project was a Capstone research project. Observations were also conducted by being members of social media groups organized by the tutors. Audio and visual recording was used after obtaining the consent of the participants. The transcribed data was initially analysed using the conceptual framework. Names of participants have been altered to maintain privacy.

4 Findings and Discussion

4.1 Students Actively Construct Tacit Knowledge Through an Experiential Learning Process

Intrinsically, the tacit and explicit components are interwoven in the act of design. Whether these acts require the physicality of the studio is a point of discussion. Studio observations reveal that issues of designing brought up during desk reviews are often resolved through the physical acts of sketching and modelling (Figure 2, Left). Students expressed this preferred way of discussing their design with the tutor, concurrent with Schön's explanation on design moves. Tutor Paul finds a "physical confrontation" more exciting. A case in point was when he made Year 2 students participate in a studio workshop to finalize their design proposal (Figure 2, Right). Both students and the tutor found this method successful after having failed through verbal and textual feedback in the desk review. The act of designing then requires the physical setting to provoke a spatial design conversation mediated by design representations.

Tutor Cory opines that, "teaching tacit knowledge digitally and the level of physical specificity required for critique is unlikely to translate well digitally". But he adds that digital reviews are possible if students have the cognitive maturity to visualize the design by having a foundation of physical design. It implies that when students can visualize and conceptualize their design, they can also participate in online design conversations.

More than the act of doing, it is the engagement in an experiential learning process in either the physical and online setting that constructs tacit knowledge.



Figure 2. Left: Photograph from the physical studio, Left: Photograph from the physical studio

4.2 Cognitive and Sensory Experience May Not Be Easily Replicated in an Online Studio

Though the use on online platforms for desk reviews is not new, tutor Lloyd expresses his frustration over the limitations of the screen to demonstrate spatial understanding through drawings. In his words:

If a student sits in front of you and draws a line and I draw over it and by looking at the same drawing we come to a different realization that can have another application then in the end no online platform will be actually able to explicate that.

The connection between the hand and cognitive development has been well-researched on. Suwa, Gero & Purcell (2000) add that sketching can lead to new conceptual discoveries. Encountering with the visuo-spatiality of illustrations can trigger the tacit knowledge of an architect (Suwa et al. 2000, p. 562). The pedagogical implications are that the studio environment has to allow for such encounters to happen. The tutor's knowledge and expertise are articulated in the encounters.

Likewise, tutors in design projects emphasize to students the need to explore new learning possibilities through the medium of modelling. Models are not only translators of students' spatial ideas but also provide the haptic engagement with material and form, emphasizing the aspect of learning by doing. Seen as a craft, it is a source of experiential and emotional knowledge that develops material sensibilities, haptic perceptions and human values (Niedderer and Townsend, 2014).

Conversely, Andjomshoaa et al. (2011) argue that computer-aided modelling tools and simulations encourage students to develop spatial abilities as well as evaluate their spatial designs through multiple viewpoints (p. 221). It promotes critical discourses of their work resulting in efficacy of learning (Andjomshoaa et al. 2011). Nevertheless, the use of simulations in early stages of design is questionable as it privileges simulation over abstraction (Ambrose, 2012), having cognitive consequences.

According to tutor Yao, the virtual environment cannot replace the spatial and material experience and understanding provided by the physical studio. However, tutor Jackie envisages that the future of spatial designers would lie in their unique ability to blend hand crafting skills with powerful computer visualizations. An overlap of the physical and digital can lead to newer ways of understanding and constructing tacit knowledge.

Cognitive and sensory stimuli activated through the physical environment in the studio play an important part in tacit acquisition of design knowledge. While the digital media may be easily adopted into online studios, the physical interactive experiences may not be replicated on an online studio.

4.3 Misconceptions and Reluctance in Using Online and Social Media Platforms

4.4.1 Online Platforms

Student Rachel realized that discussions in the physical studio opened new opportunities for discussions about her thought process. This was not afforded by online platforms like Skype as she had to structure her discussions to suit a certain purpose of design review. Some students found Skype discussions distracted them from having clear and focused arguments as they tend to open multiple tabs while discussing.

The use of websites such as YouTube and Google are frequently used by students and tutors as referencing tools. Tutors however do not consider them as learning platforms. Tutor Cory is considering the use of web-streaming to let students observe his research work. This could expand students' understanding of real-world practices.

Tutor Lloyd asserts that critical thinking that is developed from hearing, comparing and understanding discussions of analysis, and that synthesis cannot be learnt in an online system. On the other hand, tutors do not use platforms such as the existing Blackboard Learning Management System because students seldom access them, preferring the faster interface of Whatsapp.

4.4.2 Social Media

Motivation that leads to an active construction of knowledge (Ma & Chan, 2016) is in turn mediated by the participatory learning environment of the studio. Social media groups formed by tutors and students already find their presence in the milieu of the studio. Instagram and Facebook are often used for disseminating or promoting students' works whereas WhatsApp groups are for scheduling meeting. It was also observed that social media was used for casual and not critical discussions.

Most students and tutors commented that texting often resulted in misinterpretation and misunderstanding of thoughts, ideas and feedback. Delay in replying also affected the quality of discussions. As mentioned in chapter 4.1, students prefer a face to face discussion of drawing and modelling-related issues as the tutor is able to quickly demonstrate the fixing of these issues. Students are thus able to observe the tutors' reflection-in-action. Likewise, student Ben finds that the use of social media is restricted to solving simple problems and not suitable for conceptual problems.

Students in an Y2 focus group mentioned their reluctance in arguing among peers in larger groups organized by the tutors. This is indicative of a cultural influence especially relevant in Asia. Y4 students revealed that sometimes they value their classmates' opinions more through critical discussions that take place beyond studio hours in either the physical studio or social media groups. These informal settings organized by students themselves were not accessible for observation.

Unfamiliarity or lack of technological resources could be some of the reasons for misconceptions and reluctance to use the above platforms. For example, collaborative online drawing software used along with instant messaging or with video conferencing can extend critical and participatory discussions to an online studio.

5 Conclusion

Construction of tacit knowledge though an internalized process is facilitated by dynamic interactions in the studio. Evidence shows that the physicality of the studio offers engagement in spatial design conversations through the tangible and tactile act of engaging in sensory and embodied experiences, and development of cognitive skills. On the other hand, digital interfaces provide new dimensions to learning by doing by providing a different interactive experience through digital artefacts. Blending of the physical and digital offers multiplicity of experiences required for tacit knowledge construction. Conversations can be extended to online platforms depending upon the cognitive maturity of students.

Though evidence reveals that not all of the physical experiences can be replicated in an online studio, it offers readily available platforms for critical discussions and networked collaborations even across various design communities. The social media facilitated by tutors or initiated by students provides easier access and alternative platforms for prolonging these discussions beyond the physical studio. Currently these resources are not being used for critical discussions owing to their perception as sites for casual conversations.

Collaborations at a multiple level not only add to the repertoire of students' knowledge but also broaden their knowledge base (Ma & Chan, 2016). In particular, they strengthen critical reflective skills which are crucial in the tacit learning process. Sharing of knowledge that is explicated online and through social media may be converted into knowledge artefacts that are time-stamped, easily accessible, retrievable and available at all times.

This study is limited in that it covered only two projects and a limited number of participants conducted mainly in a physical studio environment and a few social media groups. But it offers insights into how tacit learning may be extended from the physical to online platforms by using a blended approach. The blending of both the environments in the experiential cycle of learning enhances tacit knowledge construction. As an attempt to answer the research question, Figure 3 proposes a framework that can help extend learning from the physical to the online environment.

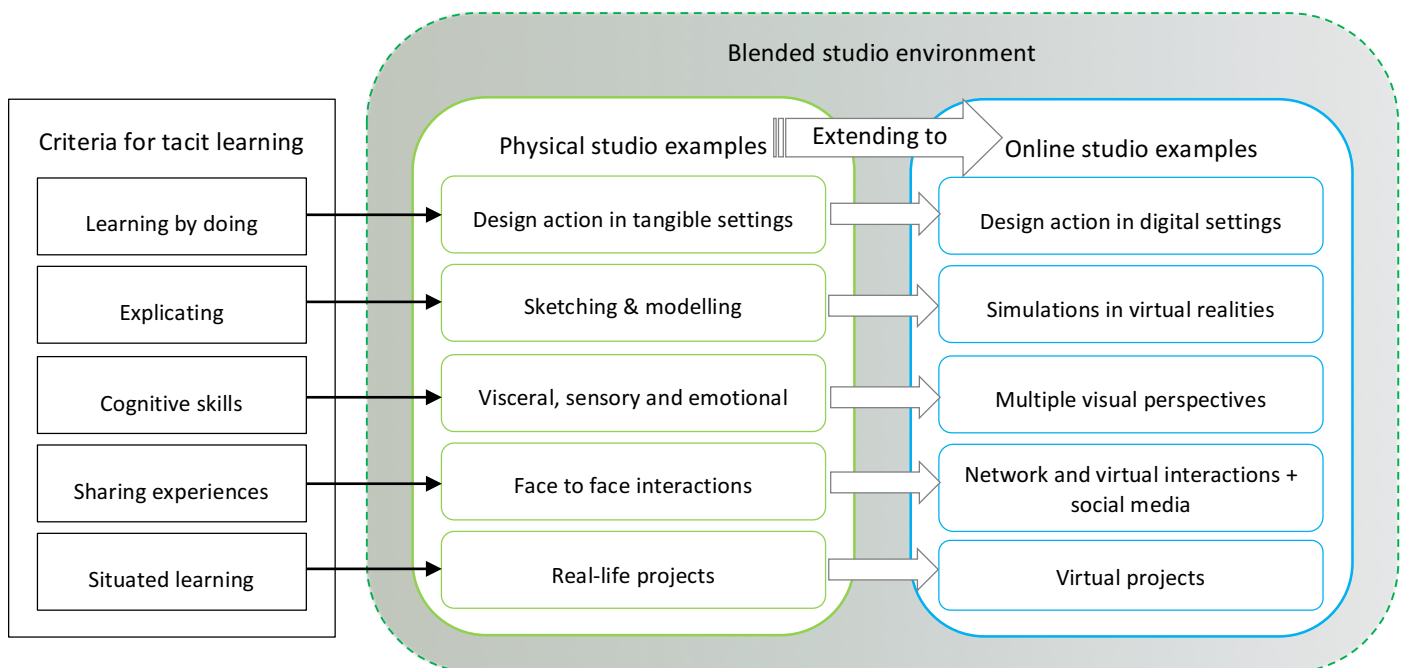


Figure 3. Framework for Tacit Learning in an Extended Interior Design Studio

Technologies such as augmented and virtual realities that have been not been mentioned in this study are already creating new frontiers in the learning and designing of interior environments. Secondly, interior spaces and activities are increasingly taking place in the virtual. Thus the implications of these frontiers bring into question the redefinition of interior space.

In the future, the capitalization of such technologies and newly developed haptic interfaces can develop new kinds of cognitive skills for spatial understanding. Along with the potential of the online to extend the social dimension of the studio, it serves to enhance the acquisition of tacit learning in the design studio through newer forms of understandings and discussions.

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