



What Got Us Here, Won't Get Us There

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Shaping the Future Paradigm in Design Studies: Introducing Inquiry-Based Teaching and Learning into Design Education

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Abstract: Design learning at different levels has been highly promoted in recent years. Its educational value is not only on creative thinking but also its enquiry-based nature. However, some learning problems have caused design education to be ineffective. Students cannot understand what they learn in their design courses. A method applied to other subjects, enquiry-based education, can be introduced for modifying the current design education methods. Several teaching and learning activities shape the main features of an enquiry including encouraging inquisitiveness, teaching strategies for motivating learning, manipulating materials to study particular phenomena, and prompting students with questions. Design educators should consider introducing enquiry-based teaching and learning into design education. This study explored an approach to guiding students in attaining a superior learning experience. The influence of emotion in enquiry-based education for design studies was investigated.

Keywords: Enquiry-based teaching and learning, Design studies, Future design education

1. Introduction

Design teaching and learning emphasise continuous investigation and production of new meaning through resource organisation (Kress, 2003). Several design education methods have been developed and adopted in design curricula, such as outcome-based and studio-based learning. Current research in design education recommends a holistic view based on the creative approach to problem-solving and innovative design outcomes; however, some learning problems were identified and were determined to cause design education to be ineffective (Siu, 2008). Design education poses unique challenges, and design educators have observed that some undergraduate students struggle to retain what they learn in design courses, despite the efforts of teachers to convey the material. While this issue is not universal, it is a recognised challenge in design education that motivates our interest in exploring new approaches to teaching and learning in this field. According to Winters (2011), design educators reported that undergraduate students had trouble recalling what they had

learned in design courses, despite instructors' efforts to impart the subject matter. A lack of engagement, comprehension, and motivation were identified as contributing factors to the ineffectiveness of design education in the research.

Sometimes, they understand what they learn through involvement in their learning process, but understanding is not guaranteed in this situation. In addition, design education curricula provide undergraduate design students with limited encouragement to undertake further study in a design topic. To improve experiences in design education, new methods for curriculum development must be investigated. To increase design students' ability in advanced topics, design learning methods must be modified. To strengthen the ability of design students to study advanced topics, design learning methods must be modified. A method applied to other subjects, inquiry-based teaching and learning, can be introduced for modifying the current design education methods. Enquiry-based education involves similar teaching and learning activities that entail emotional concerns, indicating that enquiry-based teaching and learning can be applied in design education. Design educators should consider introducing enquiry-based teaching and learning into design education. Enquiry-based education involves teaching and learning activities similar to those employed in emotional intelligence training. Therefore, inquiry-based teaching and learning be applied in current design education? Where should design educators' direct attention when introducing enquiry-based teaching and learning into design curricula? What do design educators intend students to achieve after lessons? How can design educators guide their students to achieve a superior learning outcome? How do the expression and management of feelings influence enquiry-based education applied to design studies? This study explored how design educators can guide their students to achieve a superior learning outcome. The influence of emotion in enquiry-based education applied to design studies was investigated.

2. Emotional Concerns in Future Design Education

In the initial investigation of the trends in design education, five main attitudes in the design learning process were identified. Reviewing studies conducted by psychologists revealed that emotion is related to the five attitudes. Specifically, emotion influences appraisal and judgement in decision-making. Stimuli from the external environment create emotional responses and guide the thinking process over time (Atkinson & Shiffrin, 1968). This thinking process involves motivation and appraisal for judgement and responses (Craig & Lockhart, 1972; Freud, 1937; Longueville, Le Cardinal, Bocquet, & Daneau, 2003). Scherer (1984) described emotion as a sequence of reactions towards external stimuli that shapes a person's perspective. After an event, a person's intrinsic pleasantness and goal relevance emanate appraisal. Subsequently, it affects the person's ability to control his or her responses. Author (2016) followed Scherer's study and observed that appraisal generated a result as the attribution of causation, which directed a person's responses including decision-making and actions.

Emotions can have a significant impact on a student's motivation, creativity, and decision-making abilities during the design learning process. Passionate or inspired students may be more likely to experiment with new design concepts and take chances with their work. Emotional management skills can be taught to students to help them detect and regulate their emotions, increasing the usefulness of design education. Students may learn to detect emotional cues and manage their emotional reactions, as well as nurture good emotions, which will help them be more creative and motivated. Emotional management skills may also benefit in the development of communication and teamwork abilities, making students more productive designers. Developing emotional management skills may help to create a more supportive and effective learning environment at design school and help students succeed in their future professions as designers. Furthermore, in studies on emotional

intelligence, self-awareness, social awareness, motivation, self-management, and responsible decision-making were identified as skills for enhancing emotional management. To explain the relationships between emotion and the five main attitudes in design education, the model illustrated in Figure 1 was proposed.

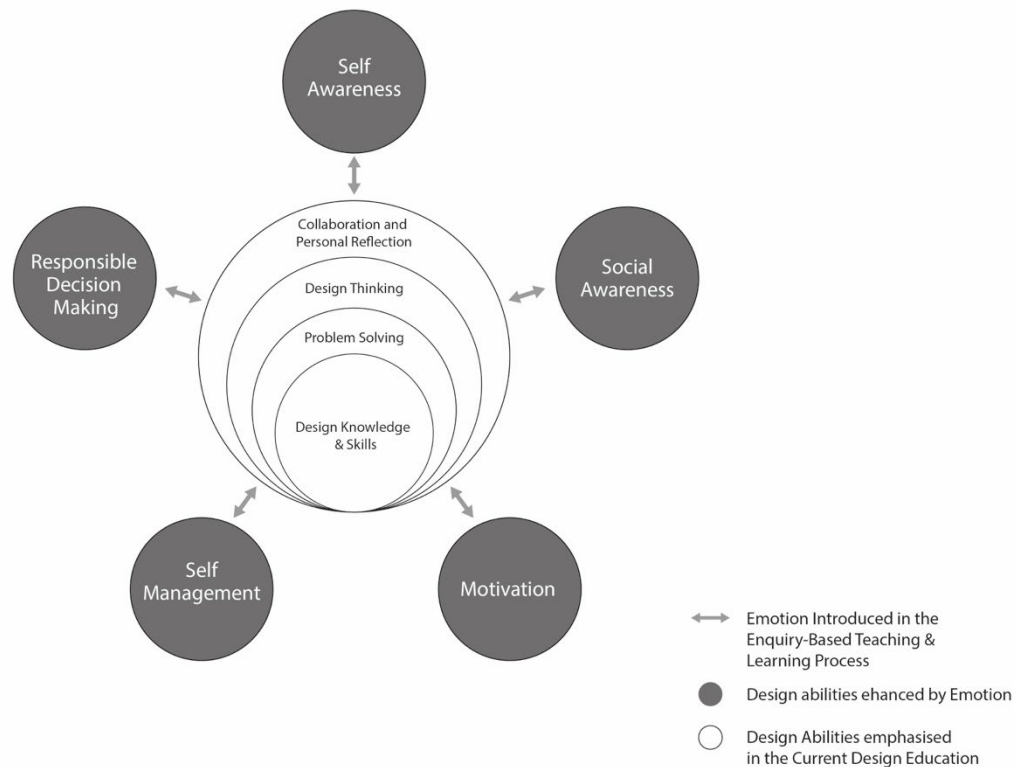


Figure 1. Model for Understanding the Relationships between Emotion and Five Main Attitudes in Design Education.

3. Enquiry-Based Theories in Education

After the role of emotion in enhancing design abilities were understood, an additional question on how emotion is introduced into design curricula step by step was raised. As mentioned, some unconventional teaching and learning methods have been adopted, but none of them involves emotion and can equip design students with five design abilities as expected. Among various teaching and learning methods, enquiry-based education seems applicable to design education. Enquiry-based teaching and learning are rooted in the concept of the science learning process proposed by Dewey (1910). He emphasised the importance of students' experience in education and proposed six steps of the science learning process: "...sensing perplexing situations, clarifying the problem, formulating a tentative hypothesis, testing the hypothesis, revising with rigorous tests, and acting on the solution...."

The National Research Council (1996) supported Dewey's concept; therefore, it questioned the quality of science teachers in the science curriculum based on the school. It emphasises that science should involve "...thinking like a scientist. The science process was developed as the guideline of learning included 'observing, classifying, inferring, controlling variables'...."

Inquiry-Based Teaching and learning is an educational strategy that has its origins in the early twentieth-century progressive education movement. It stresses the significance of experiential learning and student-centered teaching approaches, both of which are considered as a break from the conventional teacher-centered approach to education. The approach gained prominence as a

scientific education strategy in the 1960s. The role of inquiry, experimentation, and exploration in the learning process was highlighted in this approach. It was seen as a means of involving children in the process of scientific discovery while also developing critical thinking and problem-solving abilities. Inquiry-Based Teaching and Learning has been used in a variety of subjects throughout the years, including social studies, language arts, and mathematics. There has been an increasing interest in applying this technique to design education in recent decades. Several efforts throughout the globe focused on integrating Inquiry-Based Teaching and Learning into design education in the 1990s and early 2000s. In the design process, these efforts stressed the value of project-based learning, teamwork, and experimentation. They also underlined the necessity of design students learning critical thinking, problem-solving, and communication skills.

Inquiry-Based Teaching and Learning is now extensively utilised in design education, with many modern design colleges and institutions including some type of Inquiry-Based teaching into their curriculum. The use of technology and digital tools into the learning process has aided the process, and the incorporation of Inquiry-Based Teaching and Learning within the wider framework of Design Thinking has advanced the approach. In the design process, Design Thinking stresses empathy, iteration, and experimentation. It is a highly collaborative and user-centered technique that has been used to solve a variety of design problems. It is viewed as natural complements to Design Thinking since they stress many of the same concepts and ideals. Both methods value experimentation, cooperation, and user input, and both emphasise critical thinking and problem-solving abilities.

Overall, there has also been an increase in interest in the use of Inquiry-Based Teaching and Learning to research design. In this setting, Inquiry-Based Teaching and Learning is seen as a means of engaging students in the research process and developing their data gathering, analysis, and interpretation abilities. It is also considered as a means of encouraging students to explore new ideas and ways in the research process, which promotes innovation and creativity. In response to shifting demands and settings in design education, inquiry-based teaching and learning has continued to change and develop. Its focus on experiential learning, collaboration, and critical thinking has made it a popular educational method, and its incorporation within the larger framework of Design Thinking and design research is expected to lead to more innovation and advancement in the area.

Barman (2002) interpreted enquiry as a teaching strategy and a set of student skills (i.e., individual process skills). The Education Bureau (2002) defined enquiry-based learning as "...a student-centred approach which helps students to integrate generic skills, knowledge and values in the learning of General Studies..." (p. 2). Students actively assume a role as constructors of knowledge while teachers assume a role as the learning facilitator in the enquiry-based learning process (Chapman & Heater, 2010). Instead of depending on the correct answers provided by teachers, students raise questions (Donham, Bishop, Kuhlthau, and Ober, 2001; Harada & Yoshina, 2004), investigate their own answers, and explore related information (Piaget, 1973; Vygotsky, 1987; Minstrell, 2000; Alberta Learning, 2004; Kuhlthau, Maniotes, & Caspari, 2007).

Maher, Powell, and Uptegrove (2009) examined the influence of enquiry-based teaching and learning experiences on graduate students. Their findings suggested that students tend to show increased improvement in scientific reasoning and writing skills (Sleeswijk Visser, Stappers, van der Lugt, & Sanders, 2005). In addition, teachers or instructors involved in research tend to be more effective in engaging students by using inquiry-based instruction. Moreover, the connection between research and teaching is strengthened when graduate students teach in areas directly related to their research field. Kamler and Thomson examined the learning process of doctoral training in different subjects. They demonstrated the importance of research in doctoral training, revealing that doctoral training entails preparation for the scholarship, in which the developing scholar both conducts and reports the research (Kamler & Thomson, 2006). Med (2012) proposed an enquiry-based learning process

from the mathematics and science education perspective. He identified the following skills and processes that must be developed: knowing and understanding; estimating, computing, and solving; visualising and modelling, representing and communicating; conjecturing, reasoning, proving, and decision-making; and applying and connecting.

4. Emotional Concerns in Enquiry-Based Teaching and Learning

Some educators have noticed emotional aspects during the teaching and learning process of enquiry-based education. Kremenitzer (2005) examined the effectiveness of the enquiry-based teaching and learning process. He found that some teaching and learning activities such as self-reflective journaling can enhance learners' management of their emotions and contribute to successful teaching practices. Perez (2011) examined Kremenitzer's concepts at the undergraduate level. She investigated how graduate student's understanding of their emotional reactions may influence their ability in their learning and teaching process and observed that the enquiry-based teaching and learning process is effective in creating a suitable learning context. Emotion can help students learn the value of self-reflection and engage in thoughtful enquiry into their professional practices. Accordingly, Perez reported that enquiry-based teaching, learning and self-reflection enhanced the ability of graduate students to recognise and, consequently, regulate their emotions" or omit it.

5. Proposed Model for Enquiry-Based Learning in Design Education

The preceding investigations provide information on the reconstruction process of enquiry-based learning. They elicit further exploration of the process of introducing inquiry-based teaching and learning with emotion into design education. Acharya, et al. (2021) emphasises problem-solving in the real world and engages students in producing or acting on a study topic. Exposing students to real-world issues associated with sustainable development engineering, such as climate change and global warming, may be a starting point for the implementation of inquiry-based teaching and learning in design education. Teachers may then assist students in formulating queries and hypotheses based on these challenges. Then, students can engage in research activities, collecting data and information to answer their questions and test their ideas using cutting-edge technologies and resources. Teachers may also promote student collaboration and transdisciplinary work by organising students into teams centred on particular topics and projects. This method aids students in the development of essential skills, such as decision-making, advanced communication, ethics, leadership, and creativity, which are necessary for addressing challenging problems in sustainable development engineering. In addition, instructors can support inquiry-based teaching and learning through a variety of teaching strategies and techniques, including case studies, group discussions, project-based learning, and hands-on activities. These strategies may aid students in the development of critical thinking skills and the application of their knowledge to the solution of meaningful problems. To ensure the success of inquiry-based teaching and learning in design education, instructors must be willing to study and implement the most recent tools and resources, as well as be receptive to new concepts and procedures. In addition, institutions must provide instructors with the necessary support and resources for inquiry-based teaching and learning to be implemented effectively. Inquiry-based teaching and learning can be effectively incorporated into design education by employing problem- challenging as a pedagogical strategy. Problem- challenging emphasises problem-solving in the real world, collaborative and interdisciplinary work, and the development of essential skills such as decision-making, advanced communication, ethics, and

leadership. Inquiry-based teaching and learning can help students improve their ability to tackle new problems and transmit information from one context to another, which is crucial for sustainable development engineering success.

Furthermore, based on the case studies conducted in the South East Asia project, managed by Aalto University (Membrillo-Hernández, 2018) inquiry-based teaching and learning can be effectively implemented in design education. By combining problem-solving and design thinking approaches, students pursue self-learning in a topic or subject area motivated by real-world challenges. This technique teaches both the hard and emotional skills necessary for industrial readiness. However, current South Asian undergraduate programmes are instructional and content-heavy, necessitating a reconsideration to incorporate a problem-based learning approach. To initiate the incorporation of inquiry-based teaching and learning into design education, professors should present students with real-world situations requiring innovative design solutions. Teachers can contribute by facilitating the redesign process and creating a course proposal using Design Thinking, a creative approach to problem identification and resolution. During the five-day workshop, faculty course designers will be able to identify multiple problems from multiple perspectives, generate a vast number of solutions, combine them into workable solutions, and select the most promising one for further development.

Design thinking employs a human-centered approach that emphasises empathy, creativity, and collaboration. It teaches students to examine a problem from multiple vantage points, to comprehend the needs of end users and stakeholders, and to generate multiple solutions. This technique facilitates the development of critical thinking skills and the application of knowledge to meaningful problem solving. To ensure the efficacy of inquiry-based teaching and learning in design education, instructors must be provided with the proper support and resources for integrating problem-solving and design thinking. This includes access to cutting-edge technologies and resources, as well as training and mentoring to help instructors develop the necessary skills and knowledge to implement inquiry-based teaching and learning in the classroom. inquiry-based teaching and learning can be effectively implemented in design education by integrating the problem-solving and design thinking approaches. Problem-solving concentrates on solving real-world problems, whereas design thinking encourages innovation, collaboration, and empathy. Using these techniques, students can develop critical thinking skills and apply their knowledge to solve problems in a meaningful manner, which is essential for design success.

Different abilities are expected to be developed in the stages of questioning, investigation, construction, execution, and reflection. Under the influence of emotion, particular design abilities are enhanced in specific stages (Figure 2).

1. Learning activities involving emotion in the question stage: The connection of the learning content to the current situation, background knowledge, and the external environment enhances social awareness.
2. Learning activities in the investigation stage: Information for answering questions is obtained and evaluated. Hypotheses are tested. Information eliciting new questions and hypotheses are analysed.
3. Learning activities in the construction stage: New understandings and previous knowledge are collected and constructed. Conclusions regarding questions and hypotheses are drawn.
4. Learning activities in the execution stage: Some new contextual information is understood. New ideas are expressed and shared with others after careful consideration (i.e., decision-making).
5. Learning activities in the reflection stage: Students reflect on their own learning, and this reflection prompts them to ask new questions.

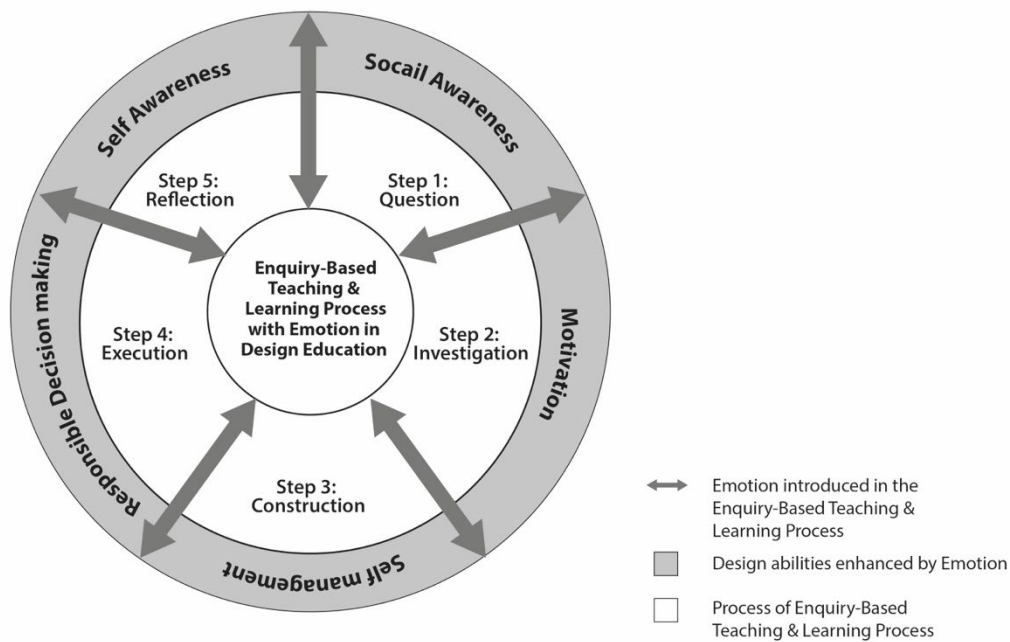


Figure 2. Model for Enquiry-Based Teaching and Learning with Emotion in Design Education.

6. Empirical Study on Applications of Emotional Concerns in Enquiry-Based Teaching and Learning: Hong Kong Visual communication

Some educators have adopted inquiry-based teaching and learning and set their design-related course or programme learning outcomes by using a research plan and research insights. However, few studies have explored how to adopt and implement inquiry-based teaching and learning in design education and the influence of this pedagogy. Based on the above investigation, two Research Questions are developed:

1. How effective is inquiry-based teaching and learning in improving undergraduate design students' ability to retain and understand the material taught in design courses?
2. What are the key factors that design educators should consider when introducing inquiry-based teaching and learning into design curricula to achieve a superior learning outcome for undergraduate design students?

To explore how enquiry-based teaching and learning can be applied effectively in current design education, a study was conducted. One of the core subjects in graphic design, visual communication, at Hong Kong Metropolitan University was used to demonstrate how enquiry-based teaching and learning can change traditional design education. Through comparison of the teaching and learning process and students' feedback, the efficiency of enquiry-based teaching and learning in facilitating design students' learning can be understood.

7. Research Methods

To understand the influence of adopting the enquiry-based teaching and learning process in design studies, student feedback on the Foundation of Visual Communication courses was collected. In the study, 72 design students from undergraduate programmes in Hong Kong participated. They studied Foundation of Visual Communication for two academic years, which were either 2010-12 or 2012-14.

The two cohorts comprised 35 and 37 students. The targeted students comprised second-year students who completed a year of design study. Since they were new to conducting design projects, it was expected that the collected data would not be influenced by factors such as experience and the knowledge provided by tutors and reference books.

The students had already studied the basic concepts of design, such as design thinking and methodology, the roles of designers, and design outcomes. Therefore, they were ideal candidates for the study as they had a foundational experience in the design process, which facilitated acquiring a fundamental understanding of design thinking and the design research process. Their foundational experience in the design process facilitated acquiring a fundamental understanding of design thinking and the design research process. The participants also underwent preliminary training in design research and skills for using graphic design software such as Photoshop and Illustrator. Hence, the participants could apply their knowledge of design thinking and graphic design to their design processes. The students participated in this 13-week visual communication research to explore how enquiry-based teaching and learning can be applied in design subjects such as graphic design. The students chose one topic and identified a design problem, and then sought a design solution from the graphic design perspective. To elucidate how the enquiry-based teaching and learning process affects the design process and outcomes of graphic design students, the visual communication course of 2020–2022 participated in this study. They were asked a question: What will 2035 look like? This question guided the students to identify a design problem, seeking a design solution from the graphic design perspective.

To evaluate the impact of enquiry-based teaching and learning on the design process and outcomes of graphic design students, the Foundation of Visual Communication course of 2020–2022 was included in the study. They were asked the same question as the experimental group, and both groups were given the same research tools, including user scenario mapping, persona building, user-centred settings, and demographic analysis. The experimental group received additional training in research, analytical, and evaluative skills to complement the creative progress. This learning experience provided the students with opportunities to understand the design concepts of creativity, content management, and production skills.

The Foundation of Visual Communication course for the 2020–2022 academic years was used as a control group, and they were engaged in problem-based learning as part of the current curriculum. All students conducted a presentation, exhibiting their design outcomes during the tutorial. This learning experience provided the students with opportunities to understand the design concepts of creativity, content management, and production skills. The Foundation of Visual Communication course for the 2020–2022 academic years served as a control group; they engaged in problem-based learning in the current curriculum. All students conducted a presentation, exhibiting their design outcomes during the tutorial (Table 1).

Table 1. Teaching schedule for the two academic years with different teaching methods.

Class Schedule		
Academic week	2020-2021	2021-2022
Week 1	Lecture: History and function of Foundation of Visual Communication	Lecture 1: Introduction to Visual Communication: The More You See, The More You Know
	Tutorial for course briefing	Tutorial on conducting research on the Tutorial Activity: Unbelievable Memory and introduction of research tools.

Week 2	Lecture: Ways of Thinking and Seeing	Lecture: Ways of Thinking and Seeing
	Assignment 1: Poster Analysis	Tutorial and review on researched information Workshop: Demographic Analysis and Poster Analysis
Week 3	Lecture: Thinking and Creativity	Lecture: Thinking and Creativity
	Tutorial and review on Assignment 1	Workshop: Target Audience Portfolio Building
Week 4	Lecture: From Thinking to Realisation	Lecture: From Thinking to Realisation
	Assignment 1 presentation and submission Project briefing on Assignment 2	Workshop: Keywords+Visual
Week 5	Lecture: Design Theory	Lecture: Design Theory
	Workshop: Visual Hierarchy	Assignment 1 presentation and submission Project briefing on Assignment 2
Week 6	Lecture: Syntax & Communication I	Lecture: Syntax & Communication I
	Workshop: Typefaces	Workshop: Typefaces
Week 7	Study Break	
Week 8	Lecture: Syntax & Communication I	Lecture: Syntax & Communication I
	Assignment 2 presentation and submission Project briefing on Assignment 3	Assignment 2 presentation and submission Project briefing on Assignment 3
Week 9	Lecture: Syntax & Communication II	Lecture: Syntax & Communication II
	Tutorial and review on Visual organisation	Workshop: Visual organisation and grid structures Tutorial and review on Visual Hierarchy
Week 10	Lecture: Syntax & Communication III	Lecture: Syntax & Communication III
	Tutorial and review on Calendar typography design	Tutorial and review on Calendar typography design
Week 11	Lecture: Syntax & Communication IV	Lecture: Syntax & Communication IV
	Tutorial and review on Design Style	Tutorial and review on Design Style
Week 12	Lecture: Syntax & Communication V	Lecture: Syntax & Communication V
	Tutorial and review on Calendar typography design	Tutorial and review on Calendar typography design
Week 13	Final Presentation and submission	Final Presentation and submission
		Assignment review

8. Research Results

After collecting the teaching evaluation form from the participants, the researcher constructed scale diagrams to compare the Foundation of Visual Communication course that adopted inquiry-based teaching and learning and the course that did not. The scale diagrams, depicted in Figures 4-8, provided a comprehensive visual summary of the feedback. The diagrams show the different effectiveness scores of the two teaching and learning methods in certain evaluation dimensions based on comparisons of the student's feedback on their learning in Foundation of Visual Communication courses.

The most important details in this text are the data collection methods used to assess the effectiveness of the inquiry-based teaching and learning approach on student learning outcomes. These data collection methods include student surveys, interviews, and classroom observations. Standardised surveys are used to assess students' perceptions of the teaching and learning process, as well as their learning outcomes. Interviews are conducted to gain a more in-depth understanding of their experiences with inquiry-based teaching and learning. Classroom observations are used to assess the implementation of the inquiry-based teaching and learning approach and how well it aligns with the proposed model. Student work samples are collected to evaluate the quality and effectiveness of the learning outcomes. Statistical analysis and qualitative data analysis techniques are used to analyse the data and draw conclusions about the effectiveness of the inquiry-based teaching and learning approach. The positive results would demonstrate that this approach can lead to better learning outcomes for design students and could be considered for implementation in design education. Our evaluation research was enhanced to assess the effectiveness of our model, and we are pleased to report that the results were positive, demonstrating that Inquiry-Based Teaching can lead to better learning outcomes for design students. The student feedback evidenced that inquiry-based teaching and learning provided improved teaching support to the students according to certain criteria in the teaching evaluation. The feedback also reflected that the students appreciated the supporting role of the teacher in the enquiry-based teaching and learning process, according to the higher scores than those of the control in the items "The teacher provided useful feedback and comments" (6.5) and "The teacher was helpful" (6.3). The feedback for the course learning experience showed that the enquiry-based teaching and learning method encouraged critical thinking (6.9) and creativity (6.8). According to the overall evaluation, the Foundation of Visual Communication projects were more challenging with enquiry-based teaching and learning than without. The aforementioned scores reflected that the supporting role of the teacher in enquiry-based teaching and learning was recognised by the students. However, the item "the teacher's instruction and explanations were clear" obtained a lower score (4.9) for enquiry-based teaching and learning than for the control (5.3). This indicates that it was difficult for the teachers to present instructions. Thus, while inquiry-based teaching and learning can be applied as a teaching method in design subjects, it is important to clarify instructions and explanations to ensure its effectiveness.

Survey Exercise 16			Mode F		No. of Enrollment				31	No. of Responses				19
School A&SS			Course IDDA		A200F		CC Name							
Survey Section	No.	Survey Question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A	No. of Resp.	Mean by question (Course)	Mean by question (School)	Mean by category (Course)	Mean by category (School)	
Course Related	1	The course was well-organized and ran smoothly.	26.32%	73.68%	0.00%	0.00%	0.00%	0.00%	19	4.26	4.25			
	2	The course was stimulating and useful.	26.32%	68.42%	5.26%	0.00%	0.00%	0.00%	19	4.21	4.23			
	3	The course has improved my competency in related academic/ professional contexts.	26.32%	52.63%	21.05%	0.00%	0.00%	0.00%	19	4.05	4.2	4.18	4.22	
Learning Outcome	4	Learning outcomes of the course were clear.	26.32%	68.42%	5.26%	0.00%	0.00%	0.00%	19	4.21	4.26			
	5	The course materials (e.g., course readings, textbooks, notes, audio visual materials, lab manuals, websites, etc.) helped me achieve the learning outcomes.	26.32%	73.68%	0.00%	0.00%	0.00%	0.00%	19	4.26	4.2			
	6	The course activities (e.g., lectures, tutorials, discussions, simulations, assignments, exercises and presentations, etc.) helped me achieve the learning outcomes.	31.58%	63.16%	5.26%	0.00%	0.00%	0.00%	19	4.26	4.2			
Online Teaching and Learning	7	The course met the stated learning outcomes.	21.05%	68.42%	10.53%	0.00%	0.00%	0.00%	19	4.11	4.18	4.21	4.21	
	8	I am satisfied with online teaching of the course (e.g., audio and video quality, timely publishing of recordings, online interaction etc.)	26.32%	63.16%	10.53%	0.00%	0.00%	0.00%	19	4.16	4.15			
	9	Real-time interactive online classes for this course were effective for my learning.	36.84%	52.63%	10.53%	0.00%	0.00%	0.00%	19	4.26	4.03	4.21	4.09	
Name of the Lecturer : HO AMIC GARFIELD	10	The lecturer was organized and well prepared for classes.	42.11%	52.63%	5.26%	0.00%	0.00%	0.00%	19	4.37	4.35			
	11	The lecturer presented ideas and concepts clearly that aided my learning.	21.05%	68.42%	10.53%	0.00%	0.00%	0.00%	19	4.11	4.29			
	12	The lecturer was enthusiastic and knowledgeable about the subject.	57.89%	42.11%	0.00%	0.00%	0.00%	0.00%	19	4.58	4.39			
	13	The lecturer effectively keep students motivated in studying the subject.	36.84%	57.89%	5.26%	0.00%	0.00%	0.00%	19	4.32	4.22			
	14	The lecturer gave adequate feedback on my course work (e.g., assignment, test, project etc.) and progress in the course.	31.58%	47.37%	21.05%	0.00%	0.00%	0.00%	19	4.11	4.21			
	15	The lecturer was helpful and responsive when I needed academic support and advice.	57.89%	36.84%	5.26%	0.00%	0.00%	0.00%	19	4.53	4.31			
	16	Overall, I am satisfied with the lecturer.	42.11%	57.89%	0.00%	0.00%	0.00%	0.00%	19	4.42	4.31	4.35	4.3	
	17	The tutor was organized and well prepared for classes.	42.11%	57.89%	0.00%	0.00%	0.00%	0.00%	19	4.42	4.3			
Name of the Tutor : HO AMIC GARFIELD	18	The tutor presented ideas and concepts clearly that aided my learning.	21.05%	68.42%	10.53%	0.00%	0.00%	0.00%	19	4.11	4.25			
	19	The tutor was enthusiastic and knowledgeable about the subject.	52.63%	47.37%	0.00%	0.00%	0.00%	0.00%	19	4.53	4.33			
	20	The tutor effectively keep students motivated in studying the subject.	47.37%	47.37%	5.26%	0.00%	0.00%	0.00%	19	4.42	4.18			
	21	The tutor gave adequate feedback on my course work (e.g., assignment, test, project etc.) and progress in the course.	31.58%	47.37%	21.05%	0.00%	0.00%	0.00%	19	4.11	4.19			
	22	The tutor was helpful and responsive when I needed academic support and advice.	47.37%	52.63%	0.00%	0.00%	0.00%	0.00%	19	4.47	4.26			

Assessment and Feedback	23	Overall, I am satisfied with the tutor.	47.37%	52.63%	0.00%	0.00%	0.00%	0.00%	19	4.47	4.26	4.36	4.26
	24	Assessments (e.g., assignments, tests, presentation, project etc.) were appropriate and facilitated my learning.	21.05%	73.68%	5.26%	0.00%	0.00%	0.00%	19	4.16	4.16		
	25	Assessment requirements were communicated clearly in advance.	31.58%	57.89%	10.53%	0.00%	0.00%	0.00%	19	4.21	4.17		
	26	Feedback on my assignments/projects was timely and useful for my study.	36.84%	52.63%	10.53%	0.00%	0.00%	0.00%	19	4.26	4.22	4.21	4.19
Learning Resources	27	The library resources were adequate and can facilitate my learning in this course.	10.53%	47.37%	10.53%	0.00%	0.00%	31.58%	19	4	3.82		
	28	I have been able to access specialized equipment, facilities, or rooms when needed for this course.	10.53%	36.84%	21.05%	0.00%	0.00%	31.58%	19	3.85	3.74		
	29	The online learning support systems (e.g., OLE, iBookcase, specialized apps) were helpful to me in my study.	15.79%	52.63%	15.79%	0.00%	0.00%	15.79%	19	4	3.97	3.95	3.85
Overall Satisfaction	30	Overall, I am satisfied with the course.	36.84%	57.89%	5.26%	0.00%	0.00%	0.00%	19	4.32	4.21	4.32	4.21
		Response rate (vs course enrollment):	61.29%										
		Course Average	32.98%	56.67%	7.72%	0.00%	0.00%	2.63%	570	4.26			
		School Average	39.85%	43.09%	12.43%	2.38%	1.04%	1.20%	169072	4.2			

Figure 3. Average Scores in 2020-2021.

Individual Result by Course			Long Question Result												
Survey Exercise 19			Mode F			No. of Enrollment			24		No. of Responses			20	
School A&SS		Term 2104	Course IDDA		A200F		CC Name HO, AMIC GARFIELD								
Survey Section	No.	Survey Question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A	No. of Resp.	Mean by question (Course)	Mean by question (School)	Mean by category (Course)	Mean by category (School)		
Course Related	1	The course was well-organized and ran smoothly.	40.00%	55.00%	5.00%	0.00%	0.00%	0.00%	20	4.35	4.25				
	2	The course was stimulating and useful.	40.00%	55.00%	5.00%	0.00%	0.00%	0.00%	20	4.35	4.2				
	3	The course has improved my competency in related academic/ professional contexts.	40.00%	45.00%	15.00%	0.00%	0.00%	0.00%	20	4.25	4.2	4.32	4.22		
Learning Outcome	4	Learning outcomes of the course were clear.	35.00%	60.00%	5.00%	0.00%	0.00%	0.00%	20	4.3	4.27				
	5	The course materials (e.g., course readings, textbooks, notes, audio visual materials, lab manuals, websites, etc.) helped me achieve the learning outcomes.	35.00%	50.00%	15.00%	0.00%	0.00%	0.00%	20	4.2	4.21				
	6	The course activities (e.g., lectures, tutorials, discussions, simulations, assignments, exercises and presentations, etc.) helped me achieve the learning outcomes.	35.00%	50.00%	15.00%	0.00%	0.00%	0.00%	20	4.2	4.2				
	7	The course met the stated learning outcomes.	35.00%	50.00%	15.00%	0.00%	0.00%	0.00%	20	4.2	4.17	4.23	4.21		
Online Teaching and Learning	8	I am satisfied with online teaching of the course (e.g., audio and video quality, timely publishing of recordings, online interaction etc.)	35.00%	35.00%	10.00%	0.00%	0.00%	20.00%	20	4.31	4.19				
	9	Real-time interactive online classes for this course were effective for my learning.	30.00%	40.00%	10.00%	0.00%	0.00%	20.00%	20	4.25	4.17	4.28	4.18		

Name of the Lecturer : HO AMIC GARFIELD	10	The lecturer was organized and well prepared for classes.	40.00%	55.00%	5.00%	0.00%	0.00%	0.00%	20	4.35	4.32		
	11	The lecturer presented ideas and concepts clearly that aided my learning.	45.00%	40.00%	15.00%	0.00%	0.00%	0.00%	20	4.3	4.26		
	12	The lecturer was enthusiastic and knowledgeable about the subject.	45.00%	45.00%	10.00%	0.00%	0.00%	0.00%	20	4.35	4.35		
	13	The lecturer effectively keep students motivated in studying the subject.	35.00%	40.00%	25.00%	0.00%	0.00%	0.00%	20	4.1	4.18		
	14	The lecturer gave adequate feedback on my course work (e.g., assignment, test, project etc.) and progress in the course.	35.00%	50.00%	15.00%	0.00%	0.00%	0.00%	20	4.2	4.21		
	15	The lecturer was helpful and responsive when I needed academic support and advice.	50.00%	45.00%	5.00%	0.00%	0.00%	0.00%	20	4.45	4.3		
	16	Overall, I am satisfied with the lecturer.	40.00%	55.00%	5.00%	0.00%	0.00%	0.00%	20	4.35	4.29	4.3	4.27
Name of the Tutor : HO AMIC GARFIELD	17	The tutor was organized and well prepared for classes.	45.00%	50.00%	5.00%	0.00%	0.00%	0.00%	20	4.4	4.3		
	18	The tutor presented ideas and concepts clearly that aided my learning.	40.00%	45.00%	15.00%	0.00%	0.00%	0.00%	20	4.25	4.24		
	19	The tutor was enthusiastic and knowledgeable about the subject.	40.00%	50.00%	10.00%	0.00%	0.00%	0.00%	20	4.3	4.3		
	20	The tutor effectively keep students motivated in studying the subject.	35.00%	50.00%	15.00%	0.00%	0.00%	0.00%	20	4.2	4.17		
	21	The tutor gave adequate feedback on my course work (e.g., assignment, test, project etc.) and progress in the course.	35.00%	50.00%	15.00%	0.00%	0.00%	0.00%	20	4.2	4.2		
	22	The tutor was helpful and responsive when I needed academic support and advice.	40.00%	50.00%	10.00%	0.00%	0.00%	0.00%	20	4.3	4.27		
	23	Overall, I am satisfied with the tutor.	40.00%	55.00%	5.00%	0.00%	0.00%	0.00%	20	4.35	4.26	4.29	4.25
Assessment and Feedback	24	Assessments (e.g., assignments, tests, presentation, project etc.) were appropriate and facilitated my learning.	35.00%	40.00%	25.00%	0.00%	0.00%	0.00%	20	4.1	4.17		
	25	Assessment requirements were communicated clearly in advance.	40.00%	35.00%	25.00%	0.00%	0.00%	0.00%	20	4.15	4.18		
	26	Feedback on my assignments/projects was timely and useful for my study.	35.00%	50.00%	15.00%	0.00%	0.00%	0.00%	20	4.2	4.23	4.15	4.19
Learning Resources	27	The library resources were adequate and can facilitate my learning in this course.	25.00%	45.00%	20.00%	5.00%	0.00%	5.00%	20	3.95	4		
	28	I have been able to access specialized equipment, facilities, or rooms when needed for this course.	35.00%	35.00%	25.00%	5.00%	0.00%	0.00%	20	4	4.02		

Figure 4. Average Scores in 2021-2022

In summary, the academic performance of the design students was improved according to the higher average scores achieved. The attitudes and behaviours of the design students were also improved. They had a stronger motivation to learn and a deeper commitment to their design studies. Moreover, they spent more time on their design projects and learning activities and were more active in class. The design students had less negative behaviour than they did before and less emotional distress. Finally, the feedback from the participants evidenced that they experienced less stress, anxiety, depression, and social withdrawal. The research result revealed that the academic

performance of design students improved, as indicated by higher mean scores as mentioned in the previous studies (Chan, Cheung & Chan, 2020). Cross (2023) notes in a literature review on design education that design education requires a unique set of skills and abilities that are rarely taught in other fields. These abilities include the capacity for creative thought, collaboration, and design iteration. Cross believes that design educators must develop new methods of teaching and learning that are better suited to design education's unique challenges.

The research result also revealed that the attitudes and actions of design students improved. In their design research investigations, they demonstrated improved learning and work skills by developing acceptable research topics and correctly identifying design challenges. Additionally, their ability to analyse and organise research data was improved. In addition, the research revealed that design students were more committed to their studies and had a greater desire to learn. They spent more time on their design projects and learning activities and were more engaged in class. The design pupils now exhibit less negative behavior and mental distress than in the past. Finally, participant comments suggested that tension, anxiety, depression, and social disengagement decreased. According to Shekar (2014), a paucity of practical experience prevented undergraduate design students from recalling what they had learned in design classes. The study revealed that students who participated in more hands-on creative activities retained more of what they learned in class. In their research, Dorst and Dijkhuis (1995) assert that design education necessitates an inherently distinct approach to teaching and learning than other disciplines. They contend that design education should prioritise experiential, hands-on learning and that professors should serve as facilitators rather than educators. These studies suggest that design education presents unique challenges and that conventional teaching and learning methods may not be effective in this field. This highlights the need for innovative approaches to teaching and learning in design education, such as the implementation of Inquiry-Based Teaching and Learning, in order to engage and retain undergraduate design students. Incorporating emotive concerns into inquiry-based teaching and learning enhanced the academic performance, attitudes, and behaviors of design students, according to the research. The research provides evidence of this method's effectiveness and illustrates the potential benefits of incorporating emotional considerations into design education teaching and learning techniques.

On the other hand, implementation of Inquiry-Based Teaching may be influenced by a variety of cultural factors, which can affect its efficacy in various contexts. The following cultural factors may have an impact on the adoption of inquiry-based teaching: The significance of education and the duties of teachers and pupils in the learning process vary significantly across cultures. Some cultures may place a greater emphasis on memorisation and rote learning, making it more difficult to implement inquiry-based instruction. Social and hierarchical structures within a culture may also impact the implementation of inquiry-based education. In societies with stricter hierarchies, students may be less likely to query authority or challenge established ideas, making it difficult to engage them in inquiry-based learning. In certain instances, language may be a significant barrier to the adoption of inquiry-based teaching. Non-native speakers of the language of instruction may struggle to participate completely in inquiry-based learning activities and may require additional support. Collaborative learning is a crucial aspect of Inquiry-Based Teaching, but cultural norms regarding cooperation can vary considerably. Individual performance may be valued more highly than collaboration in some cultures, making it more difficult to interest children in group work. Last but not least, the availability and application of technology may impact the implementation of inquiry-based teaching. Implementing inquiry-based learning activities that rely on digital tools and resources may be more difficult in cultures where technology is not widely available or utilised in education. In general, cultural considerations must be taken into account when implementing Inquiry-Based Learning in various contexts. Understanding the cultural norms, attitudes, and beliefs

of the local community may aid instructors in modifying their instructional strategies to better engage students and promote positive learning outcomes.

Nicholson and Vargas (2021) found that incorporating emotive concerns into inquiry-based teaching and learning enhanced the academic performance, attitudes, and behaviors of design students. The inquiry-based teaching and learning strategy enhanced students' learning and work abilities by permitting them to develop pertinent research topics for their design research projects and correctly identify design challenges. Students gained a greater understanding of the design process and the importance of research in design by identifying and describing an issue. Their research skills and capacity to interpret and organise research data improved as a consequence. The strategy also helped students better their learning and work skills by increasing their interest in and commitment to design studies. The method promoted a sense of ownership and commitment in the learning process by allowing students to work on personally meaningful and engaging design projects. As a consequence of spending more time on their creative endeavors and learning activities, students were more engaged in class.

Overall, the strategy also had a positive effect on the attitudes and actions of the students. Students exhibited less negative behavior and emotional distress than in the past, indicating that they are more engaged and motivated in the learning process. This may be attributable to the approach's emphasis on emotional issues, which helped students develop a greater awareness of their own and others' emotions and use this information to create a positive learning environment. The inquiry-based teaching and learning approach contributed to the improvement of students' learning and work abilities by allowing students to participate in the design process, fostering a sense of ownership and investment in the learning process, and creating a positive learning environment that supported the emotional well-being of students.

9. Conclusions

After the investigation of the main teaching and learning methods in current design education, a design curriculum focused on the practical design was developed. Few designers further develop their expertise and careers in design research. This problem can be alleviated by adopting enquiry-based teaching and learning to assist design students in achieving notable performance in both design practice and design research. In the design courses that adopted inquiry-based teaching and learning methods, the students constructed their design research processes through description, explanation, and scaffolding. The design students showed improvements in scientific reasoning for supporting their design concepts and outcomes. They exhibited improved learning and work abilities in generating an appropriate research topic in their design research studies as well as in identifying design problems accurately. Their abilities in analysing and organising the research information were improved. Therefore, the enquiry-based teaching and learning method is a recommended approach for reforming design curricula. It can benefit design education in the long term, enabling designers in future generations to enhance the design industry and design education.

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