Engagement, Empathy, and Creativity: Experiential Learning through Design Thinking for Secondary School Students

Serene CHAN, the University of Hong Kong
Albert S. Y. TSANG, Hong Kong Polytechnic University
Jessie M. L. CHOW, the University of Hong Kong
Brian LEE, Hong Kong Polytechnic University

Paper prepared for the *Annual Meeting of the AERA Education Research Conference*, Chicago, April 2023

Unit: SIG-Experiential Education and Community Engagement: Scholarship and Practice

Descriptors: Experiential Education, Creativity, Collaboration

Abstract

In a world of unprecedented changes and uncertainties, our next generation needs to be equipped with appropriate skills to solve real-world problems. Design thinking, an approach to solving novel problems, can be situated in education to help students learn to solve ill-defined problems, practice empathy, think critically, as well as think creatively. This paper will describe an experiential learning opportunity whereby secondary school students experienced the stages of design thinking through a workshop. There were many gains, including an increase in the students' level of creativity, as well as a heightened awareness of the needs of others. This study shows that experiencing design thinking can be beneficial to secondary students as they acquire essential skills for the future.

Objectives

The future of the world of work has been greatly affected by the COVID-19 pandemic, global recession, and social uncertainties. Equipping our students with the skills to tackle challenges of the future is a crucial objective in education. According to *The Future of Jobs Report 2020*, some of the top skills needed from now until 2025 include critical thinking, problem-solving, active learning, stress tolerance, flexibility, and resilience (World Economic Forum, 2020).

One approach to solving novel problems is design thinking. David Kelley and Tom Kelley, founders of the design thinking company IDEO, advocate a sense of "creative confidence" which can be found though design thinking (Kelley & Kelley, 2014). Having creative confidence may help to close the "innovation gap" to tackle future problems (Stock et al., 2018). Royalty et al. (2019) also states that teaching design thinking to students can promote creativity and problem solving.

Curricula in secondary schools are usually subject-based and knowledge-based. Besides traditional knowledge, schools should offer other kinds of learning opportunities for students, such as community service and career-related experiences. Experiential learning (EL) is a good way to foster whole-person development in young people as they engage in different

opportunities so they can acquire skills for the future. While design thinking is a wonderful option for EL, not many schools include it as it involves designers and a designerly-way of thinking (Cross, 1982), which is challenging for teachers. This paper will report on a design thinking workshop specifically for secondary school students and how it adds to their learning experience.

Theoretical perspectives

Experiential Learning

According to Kolb (2015), experiential learning is "the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience" (p. 51). Kolb's EL theory has four stages, including concrete experience, reflective observation, abstract conceptualization, and active experimentation. Learners engaged in this EL process put theory into practice through *concrete experience* whereas *reflective observation* enables them to make connection to what have been experienced. During *abstract conceptualization*, learners progress from apprehension to comprehension and they will test their new acquired learning through *active experimentation*. In this way, knowledge is linked to "real world" practice (Brooks & Simpson, 2014).

Design thinking

Design thinking is an iterative problem-solving approach where ambiguous problems are solved creatively. Design thinking has had a history of around fifty years and is popular in architecture, business, and industry. There are several stages in design thinking; however, different design thinking approaches use different terms. The IDEO version includes the phases of *empathize*, *define*, *ideate*, *prototype*, and *test* (Kelley and Kelley, 2014). The UK Design Council's framework uses a Double Diamond model, which includes the processes of *discover*, *define*, *develop*, and *deliver* (Design Council, 2022). Neither of the processes are linear. In both frameworks, both divergent thinking and convergent thinking are involved.

EL emphasizes linking knowledge to real world practice. The process of design thinking is similar, as it allows students to learn how designers think, experience the process of design first-hand, and produce an actual model in the end. Design thinking workshops for schools are co-curricular and interdisciplinary, encouraging students to think beyond compartmentalized knowledge (Authors, 2020). In addition, design thinking "utilizes a deep understanding of problems through empathy, collaboration, and integration of knowledge" (Stock et al., 2018, p.222), which are skills that are necessary for the future world of work. As students learn to think like designers, they apply their subject knowledge, construct new knowledge, and develop creativity, communication, and empathy – an understanding of the needs and wants of other people (Brown, 2009). Autonomous learning is also developed in the process.

Inherent in design thinking is creativity. According to Runco (2005), creativity "involves the construction of original and meaningful interpretations of experience, as well as the discretion to know when it is useful to be original and when it is not wise to be original" (p.299). As students engage in the design thinking process, they need to find novel and appropriate ways to tackle real

world problems, exercising their creative muscles. This is also why Royalty et al. (2019) have stated that "design thinking, if practiced well, does promote creative practice." (p. 55).

Divergent thinking represents the potential for creative thinking and problem solving (Runco, 2009). Divergent thinking is a kind of thinking that moves in different directions, looking for alternative solutions. According to Torrance (1990), fluency, flexibility, and originality are the main features of creativity. Creativity tests that measure a person's fluency, flexibility, and originality may be one possible way to ascertain a person's level of creativity.

Context of the current study

The current study is a component of a larger education project. This 6-year project aims to infuse social innovation and design thinking into the secondary school curriculum (Authors, 2020). Co-curricular design workshops were conducted in secondary schools, facilitated by professional designers and social innovators. Through the workshops, students learn to solve problems like a designer (Cross, 1982). Even though students are not designers, they can learn the design process and use it to innovate and solve problems creatively. As social innovation is one of the main aims of the workshops, students implement people-centered design in order to respond to unmet societal needs. In the workshops, students are given scaffolds to learn design thinking, where there are tools for various processes, including brainstorming ideas, conceptualizing ideas, planning, and decision-making. In Figure 1, a sample session from a workshop from School B is shown where students used the tool of designing a questionnaire to understand the needs of their target audience.

Methods

Participants

Convenience sampling (Johnson & Christensen, 2010) was employed as the students were participants in the design thinking workshops. Students from two of the project schools took part in this study including 30 students from School A and 20 students from School B. School A was an all-boys' school while School B was co-educational. The students were aged 15 to 17. For School A, their design thinking project was on making positive changes to the surrounding areas of the school, and School B's project was to create stop-motion animations to explain basic economic concepts.

After the workshops, 7 students from School A (all boys) and 5 students (2 boys and 3 girls) from School B participated in focus group interviews. Table 1 shows the information of the focus group participants of the two schools.

Methodology

A mixed-methods approach is employed in this study, using Triangulation Design (Creswell & Plano Clark, 2007). In this design, quantitative and qualitative data on the same topic are obtained. In this study, a divergent thinking task was administered to all participants, and focus group interviews were conducted for selected participants of the two schools. The findings from the two sources inform each other for a better understanding of the research problem.

Data sources

a) Divergent thinking task

A divergent thinking task was administered to the students in both schools at the beginning and also at the end of the design thinking workshops. The task item and scoring followed a section of the scientific creativity test for students by Hu and Adey (2002). The instructions were as follows:

> Please write down as many as possible uses as you can for *a box*. Evaluation will be based on the number, flexibility, and originality of your answers. You have 3 minutes.

Separate scores for fluency, flexibility, and originality were obtained, as well as an aggregate total score.

b) Focus group interviews

Separate focus group interviews for School A and School B were conducted. The focus group interviews were recorded and transcribed verbatim. Content analysis (Onwuegbuzie et al., 2009) was employed to generate themes.

Preliminary Findings

Divergent thinking task

The total number of participants who have completed the divergent thinking task are shown in Table 2.

The fluency, flexibility, and originality scores of the pre-test and post-test were compared. The pre-test results are shown in Table 3. The data shows that the students of the two schools performed similarly in divergent thinking.

There was also comparison of divergent thinking scores before and after the design thinking workshops. The results are shown in Table 4. According to the data, there was a significant change in divergent thinking from the pre-test to the post-test. With the aid of paired T-tests, it was found that all pairs have significant differences after the workshop ($p<.01$). The effect sizes of the three pairs (Fluency, Flexibility and Originality) are around 0.6. This means that the improvements in the three subscales of divergent thinking are similar.

Focus groups

In the focus group interviews, students were asked what they have learned in the design thinking workshops. Overall, the students expressed that they gained knowledge of specific skills (such as making a stop-motion video), improved communication and teamwork, acquired a heightened awareness of the needs of others, and had an increase in self-confidence as well as creativity. Selected findings will be reported here.

In terms of creativity, out of the 12 students interviewed, 10 of them felt that their creativity has been enhanced through the process of the workshop, the problem-solving activities, and from seeing things from different perspectives. Here are the responses from two students:

> I think my creativity has slightly increase through this workshop, because I have been able to think of more ideas. Through discussing and collaborating with others, creativity can be enhanced as we stimulate the thinking of one another. (Student from School A)

> Yes, my creativity has been enhanced. It's like the question asking, "How many uses can you think of for a box?" I try to think of ideas I have never thought about, and I think I should be more observant of my surroundings. There are normal uses for a box, as well as other uses, for example using a box to hit someone or for storing accessories. (Student from School B)

The students were also asked about their definitions of creativity. Seven of them included the element of originality and five of them included divergent thinking. Some of their definitions also fell into other categories, and a list of definitions can be seen in Table 5. The student definitions highlighted certain aspects of creativity. The concept of originality and fluency in divergent thinking match the definition of creativity in the literature (Runco, 2005; Torrance, 1990).

Students also felt that they have had a heighted awareness of the needs of others. This is related to *empathize* in the design thinking process. In particular, the project of School A was on improving the surrounding areas of their school. As stated by one of the students, "I have been able to understand the needs of the community as we have found out more about the problems in our community. It is good to think of possible solutions for the problems." While the project of School B did not have the same context, one student mentioned that she learned that "Designing something needs to match your target audience."

Conclusions

Through this design thinking workshop, secondary students have been able to experience the process of being a designer in creating products that can make a difference to their audience in the community. The triangulation of the quantitative and qualitative data show that the students' creativity, in particular divergent thinking, was enhanced after the workshop. A concern is that there may be a practice effect from the pre-test to the post-test. For future studies, the post-test can be modified, asking students to list the different uses of another object, for example, a paper clip.

It can be seen that the process of EL, when integrated with design thinking in secondary schools, is a practical and useful approach for students to learn skills that they may not normally learn in the regular school curriculum. As schools collaborate with designers in the project, students are able to engage in a designerly-way of thinking. This is certainly an important means for students to acquire the skills of creative thinking, critical thinking, flexibility, and empathy to meet the uncertainties and competition in an increasingly globalized world.

Figure 1

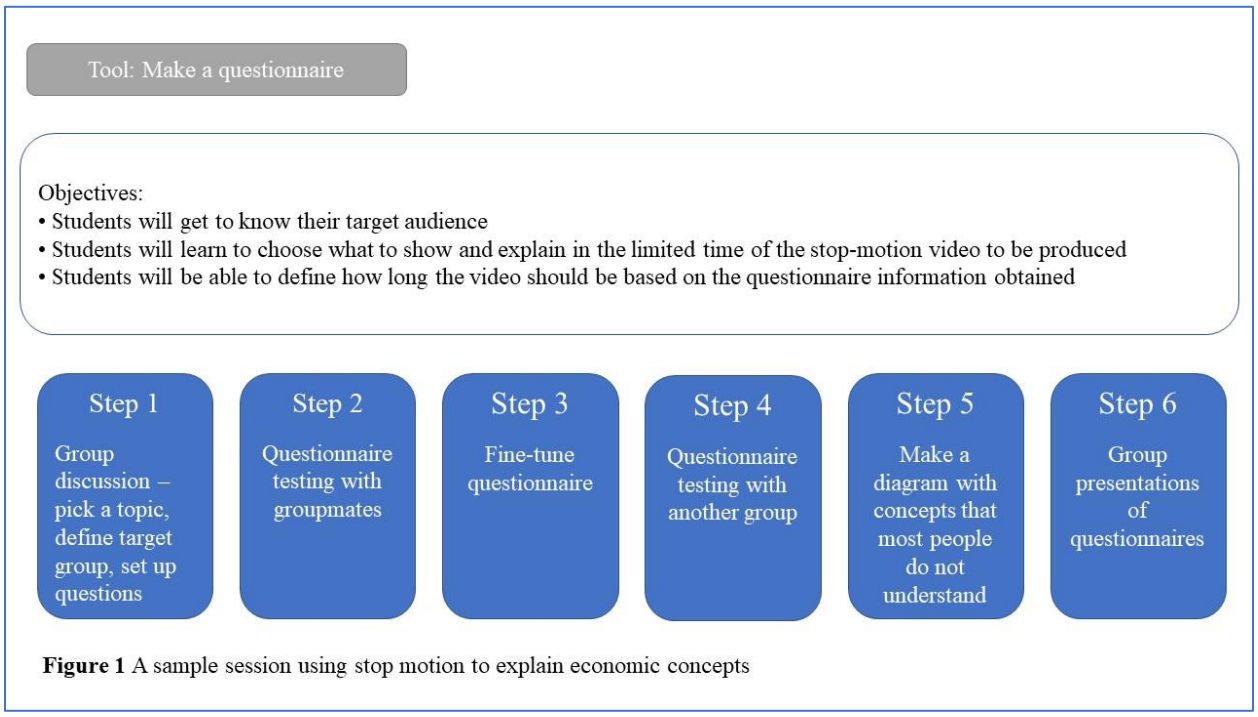

Figure 1 A sample session using stop motion to explain economic concepts

Tables

Table 1 Information of the participants

	School type	Total number of workshop participants	Number of focus group participants
School A	All-boys	30	7
School B	Co-educational	20	5
Total		50	12

Table 2 Number of participants who completed the divergent thinking task

	Pre-test	Post-test
School A	30	21
School B	19	18

Table 3 Comparison of divergent thinking over two schools in the pre-test (*n*=49)

	School A *n*=30		School B *n*=19		Total *n*=49		ANOVA	
	M	SD	M	SD	M	SD	F-score	p-value
Fluency	6.40	2.28	6.11	2.35	6.29	2.29	0.189	.666
Flexibility	5.13	2.19	4.16	1.98	4.76	2.15	2.477	.122
Originality	8.13	4.39	7.11	4.67	7.73	4.48	0.607	.440
Divergent Thinking	19.67	8.61	17.37	8.51	18.78	8.55	0.837	.365

Table 4 Comparison of the results of divergent thinking from pre- and post-tests with paired T-tests (*n*=38)

	Pre-test		Post-test				
	Mean	SD	Mean	SD	T	p-value	Effect Size
Fluency	5.92	2.058	7.79	3.338	-4.043	<.001**	0.649
Flexibility	4.29	1.723	5.82	2.690	-3.746	.001**	0.601
Originality	6.87	3.899	10.42	5.717	-3.796	.001**	0.610
Divergent Thinking	17.08	7.209	24.03	11.146	-4.047	<.001**	0.650

**p<.01

Table 5 Student definitions of creativity

Category	Quote
Originality	• It's something you make from nothing. • Creativity is producing a new item that has not existed before. • Creativity is thinking or making something completely novel. • Creativity is starting from zero and coming up with different ideas. • Creativity is being original, different from other people. • My definition of creativity is thinking of lots of ideas that are interesting and new. • Creativity is the ease of thinking up new ideas that are unique.
Divergent thinking (fluency)	• Creativity is finding it easy to think of many ideas. • Creativity is like when we were asked how many uses we can think of for a box. • Creativity is starting from zero and coming up with different ideas. • You need to think of many ideas. The more ideas you have, the more creative you are, and having creative ideas can attract others' attention. • My definition of creativity is thinking of lots of ideas that are interesting and new.
Process	• The process of thinking up to the actual production can also be considered creativity. • The process of getting your ideas to materialize.
Product	• You will have a product in the end. • I think creativity is how to make something fun and attractive to others.
Remaking	• It is the modernizing of an old way of doing things.
Art-related	• Creativity is also related to art.
Breaking boundaries	• Creativity is breaking boundaries. The boundaries are different for each person. Your own thinking can limit your imagination.

References

Authors. (2020).

Brooks, L., and Simpson, L. 2014. “Experiential learning in higher education: Implications for improving employability of FCS graduates.” *Journal of Family and Consumer Sciences, 106*(2), 16.

Brown, T. (2009). *Change by design*. HarperCollins.

Creswell, J. W., & Plano Clark, V. L. (2007). *Designing and conducting mixed methods research*. SAGE Publications.

Cross, N. (1982). Designerly ways of knowing. *Design Studies, 3*(4), 221-227.

Design Council. (2022, June 8). *Framework for Innovation: Design Council's evolved double diamond*. Design Council. https://www.designcouncil.org.uk/our-work/skills-learning/tools-frameworks/framework-for-innovation-design-councils-evolved-double-diamond/

Hu, W., & Adey, P. (2002). A scientific creativity test for secondary school students. International Journal of Science Education, 24(4), 389-403.

Johnson, B., & Christensen, L. (2010). *Educational research. Quantitative, qualitative and mixed approaches*. Sage.

Kelley, T. & Kelley, D. (2014). *Creative confidence: Unleashing the creative potential within us all*. William Collins.

Ketterman, S. (2019, March 28). *Exploring the reasons for design thinking criticism*. Toptal Design Blog. https://www.toptal.com/designers/product-design/design-thinking-criticism

Kolb, D. A. (2015). *Experiential learning: Experience as the source of learning and development* (2nd ed.). Pearson Education.

Onwuegbuzie, A. J., Dickinson, W. B., Leech, N. L., & Zoran, A. G. (2009). A qualitative framework for collecting and analyzing data in focus group research. *International Journal of Qualitative Methods, 8*(3), 1–21.

Royalty, A., Chen, H., Roth, B., & Sheppard, S. (2019). Reflective tools for capturing and improving design driven creative practice in educational environments. In *Design Thinking Research* (pp. 49–65). Springer International Publishing.

Runco, M. A. (2005). Creative giftedness. In R. J. Sternberg & J. E. Davidson (Eds.), *Conceptions of giftedness* (2nd ed., pp. 295-311). Cambridge: Cambridge University Press.

Runco, M. (2009). Divergent thinking. In B. Kerr (Ed.), *Encyclopedia of giftedness, creativity, and talent* (pp. 253-253). SAGE Publications.

Stock, K. L., Bucar, B., & Vokoun, J. (2018). Walking in another's shoes: Enhancing experiential learning through design thinking. *Management Teaching Review, 3*(3), 221–228.

Torrance, E. P. (1990) *Torrance tests of creative thinking*. Scholastic Testing Services.

World Economic Forum (2020). *The Future of Jobs Report 2020*. World Economic Forum.