Experiential education in action: Improving learning outcomes for all through design thinking

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Introduction

Adolescents' classroom experiences have a long-term impact on their future education and life chances (Kramer, 1991). Long have achievement gaps among students been recognized, so it is crucial to explore different instructional strategies that can improve learning outcomes for all (Okoye-Johnson, 2011). Design thinking has been widely applied in business settings and a growing trend has been observed in the K12 classroom as well. Yet, little is known on the effects of such application on different learning outcomes (Razzouk & Shute, 2012). In responding to this gap, the current study stems from the second year of a 3-year project that offers subject-based design thinking workshops to secondary schools in Hong Kong. Adopting a mixed-methods approach, this study aims to unpack the learning experiences of students engaged in this innovative curriculum initiative with depth and breadth. Findings inform policymakers and fieldwork practitioners who seek to nurture students for the 21st century.

Theoretical perspectives

Design thinking (DT) refers to the cognitive process employed by designers working on projects (Cross, Dorst & Roozenburg, 1992). In this way, real-world 'wicked' problems are visualized and solved through an 'open' process (Rittel & Weber, 1973). Central to DT is human-centredness and innovation and it has been increasingly recognized and widely adapted by disciplines beyond design schools as an organizational resource (Kimbell, 2011). In education, quite different from a traditional teacher-centred pedagogy, the DT process allows students to have a fuller comprehension of a subject topic by creating an authentic platform for students to articulate a problem, create their own solutions and develop insights (Lord, 2019).

The DT approach intentionally integrates empathy as a component by highlighting client-centredness (Cook & Bush, 2018). Students develop through the process of designing prototypes that consider different stakeholders' perspectives, collaborating with others and at the same time reflecting upon the process (Razzouk & Shute, 2012). This DT process also highly resonates with the experiential learning (EL) cycle (Zidulka & Kajzer-Mitchell, 2018). For instance, in EL, students learn through a four-stage recursive cycle of experiencing, reflecting, thinking and then acting (Kolb, 1984) where the prototyping stage in the DT process involves active experimentation and concrete experience and students also need to constantly refine their prototypes based on observation, feedback and reflections (Deutschmann & Botts, 2015).

DT has become one of most sought after problem-solving skills for students to succeed in this highly interconnected 21st century (Razzouk & Shute, 2012) and research has showcased that these critical skills are learnable (Dym et al, 2005). Regardless of such significance, there is limited literature available on its application in K12 classrooms (Cook & Bush, 2018). Also, little is known on how to assess students' skills developed in DT programmes (Aflatoony, Wakkary & Neustaedter, 2018; Orthel, 2015). In bridging this important research gap, the following research question frames the current study:

In what ways do students benefit from design thinking as a pedagogical innovation in a secondary school context?

Context

This study stems from a 3-year cross-university project offering subject-based design thinking workshops to secondary schools in Hong Kong from 2018 to 2021. The first year is the pilot year with a trial run of these workshops with data being collected in the current study from the second year (semester one only with semester two being affected by the COVID-19) of the project with 5 schools participating.. In each school, around 20 – 25 students participated in 8 to 10 sessions of workshops.

Each series of these workshops followed the DT structure (see Figure 1) where students have to go through the DT process with EL components whereby students connect to the wider community and interact with the end-user of the prototypes, followed by structured reflective time built into each workshop. In design playing, students are encouraged to develop their design ideas through various mini-tasks that are set as games. In design thinking, the students try to approach a social issue with the iterative process of design thinking, namely empathizing, defining and ideating. In design making, students would give shape to their ideas by prototyping with forms and materials and test them with potential users. All the workshops were designed by the experienced designers with constant feedback from the subject teachers of the participating schools.
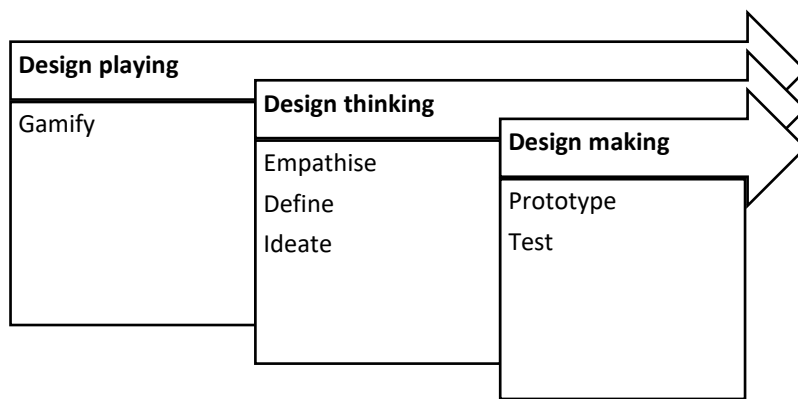

Figure 1. The structure of the design thinking workshops

For instance, in a project on responding to the needs of a local old community district (on the topic of ageing under Liberal Studies), students came up with the idea of making use of discarded T-shirts to up-cycle chair upholstery for public furniture at a gathering spot for the elderly in that neighborhood. The students had to re-define their assumptions as well as the preliminary insights from observation in the district, through prototyping and interacting with the old people in the district.

Methodology

We adopted a mixed-methods approach to understand students' benefits in these DT workshops. After obtaining approval from the university Institutional Review Board, the research team deployed the quantitative data with a quasi-experimental pretest-posttest design ($n = 115$) with a control group ($n = 120$) matched by the 5 participating schools. The data collected included the demographics, 41-item Chinese learners' twenty-first century competencies questionnaire that assessed 7 factors of 21st century competencies: Conception of learning, ICT, problem-solving, communication and collaboration, critical thinking, cross-cultural communication and advanced literacy (Cai, Gu & Wong, 2017). Qualitative data was collected through post-programme semi-structured focus group discussions. A random sample of 38 students out of the 5 schools was invited for a 45-minute focus group discussions that centred on students' learning experiences and challenges in these workshops. This design allows us to combine breadth (quantitative) and depth (qualitative) into the analysis.

Statistical analysis was conducted using SPSS 21 for the quantitative data. An iterative approach was adopted to analyze the qualitative data with three stages of data coding and data reduction: open, axial and selective coding across the data (Strauss & Corbin, 1998). All these stages were processed separately until a consensus was reached for the final framework among the research team.

Findings

Quantitative analysis from the repeated measure ANOVA indicated that the DT workshops had significant effects on the conception of learning, $F(1, 223) = 6.26$, $p = .01$, problem-solving, $F(1, 223) = 6.37$ $p = .01$, as well as critical thinking $F(1, 220) = 8.68$, $p = .00$. When looking at the effects across different ability groups based on school bandings (Schools are categorized as 3 different bandings in Hong Kong with Band 1 the highest banding and Band 3 the lowest), the DT workshops had more prominent effects on band 2 schools than band 1 schools. For instance, there were significant effects on conception of learning, $F(1, 221) = 6.30$, $p = .01$, problem-solving, $F(1, 221) = 17.85$, $p = .00$ and advanced literacy, $F(1, 218) = 4.15$, $p = .04$.

The findings confirm that these subject-based DT workshops are effective in improving critical 21st century competencies for all students. They were seen to benefit from improving their skills on learning how to learn and how to think critically. Interestingly, students of lower academic ability report more significant gains from these DT workshops than students from higher

academic ability. This observation aligns with other literature showing how students from more disadvantaged backgrounds reveal the largest gains in DT (Cook & Bush, 2018). This important finding informs educators on how DT as a pedagogy can bridge the achievement gap and improve learning outcomes for all.

Recurring qualitative themes complicate our quantitative findings but help to unpack the learning experiences of these students. They include observation of meta-cognitive skills, mode of learning, communication and collaboration, knowledge-related domain, and attitude and mindset (see Table 1). Aligning with the quantitative data, DT as a pedagogy can nurture important meta-cognitive skills like critical thinking, problem-solving and creativity (Extract 1). The qualitative findings give contextual details by explaining how this DT classroom manifests in the eyes of the beholders.

Theme	Code	Count
Meta-cognitive skills	Critical thinking	34
	Problem-solving	33
	Creativity	20
	Self-awareness	4
	Time-management	4
	Reflection	1
Mode of Learning	Learning by doing	25
	Learning process	20
	Authentic learning	13
	Learner's autonomy	13
	Deep learning	6
	Motivating	5
	Interdisciplinary learning	1
Communication & collaboration	Collaborative learning	24
	Conflict resolution	9
	Articulating ideas	7
	Accepting others' perspectives	5
Knowledge-related domain	Transferable knowledge/ skills	19
	Understanding education system	16
	Learning content	3
	Understanding social issues	2
Attitude & mindset	Empathy	20
	Persistence	5
	Flexibility	3
	Resilience	1
	Cultivating an innovative mindset	1

Table 1. Themes and codes from the qualitative analysis

Extract 1:

> 'These workshops enlarge our learning process in regular lessons. In school, they teach us the knowledge directly. In these workshops, we need to experience everything by ourselves and then we need to make use of everything that I know to complete the tasks. I feel like I learn how to use my knowledge to solve a problem.'

Extract 2:

> 'Liberal studies class pre-sets a few topics and in regular classes, we focus on techniques for writing essays. But these workshops deepen our understanding in social problems of Hong Kong. And we have lots of chances to trial out our experiments and it is very interactive.'

For instance, these workshops create a platform for students to actively experiment which is very different from the regular class (Extract 2). DT is an iterative and interactive process, through which learners can progress towards a more complex form of problem solution (Do & Gross, 2001). The EL elements in these workshops also connect the students to a wider perspective of understanding social issues.

Extract 3:

> 'I learn how to design one thing based on the needs of the recipients but not on my own needs. From which I need to balance everyone's interest and look at a bigger picture. My thinking becomes wider and I learn how to communicate and problem-solve better with my teammates through the process of coming up one theme and then put into practice to prototype.'

Extract 4:

> 'Now I feel like things are not like what I used to think. For instance, when I interact with my granny, I only feel annoyed. But now in front of the elderly, I don't feel annoyed and I only want to understand them more. Perhaps they have very unique expertise. For instance, the elderly in my group learn how to knit to combat dementia. They are actually not as needy as I imagine.'

Our findings also support how students learn to be empathetic towards others' needs (Plattner, 2010) through the workshops. Our data challenges previous findings that high school students tend to be fixated on one single solution with little understanding of their client's perspective (Becker & Mentzer, 2015) whereas in our data, empathy was found to be a recurring theme (Extract 3 & 4).

(More themes will be shared in the presentation)

Scholarly significance

The findings support DT as an effective pedagogy improve learning outcomes for all and significantly students from lower banding schools show more significant gains. This critical finding contributes to the ongoing narrative on closing the achievement gap in K12 classrooms; more research in this direction will be crucial. The emergent themes outlined in the study also contribute to a framework of understanding salient learning outcomes through the application of DT in K12 classrooms and bridge this important research gap. DT nurture salient 21st century competencies including metacognitive skills, collaboration and empathetic mindset.

The study also demonstrates factors for effective DT curriculum design in secondary schools. The DT workshops carefully integrate the EL component with a special focus on the real-world applications that echo previous literature on effective curriculum in DT (Aflatoony, Hawryshkewich & Wakkary, 2018). By connecting to the subject disciplines, these workshops help students develop transferrable skills that are arguably difficult to develop in a lecture-based classroom.

Existing educational practices are notoriously content oriented (Gee, 2005). We need to help our students connects knowledge to application. DT as a pedagogical innovation integrated with an EL cycle helps students put theories into practice and most importantly, nurtures global citizens who understand issues from multiple perspectives and who eventually work together for the common good. Nurturing creative thinkers who possess empathy towards others is not just a means to prepare our students for an uncertain future but also, a positive contribution to the global village where we all reside.

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