Design Thinking as a Teaching Approach for 21st Century Learning

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ABSTRACT

This concept paper discusses a design thinking process and mindset for creatively resolving difficult challenges in education. Teachers nowadays encounter numerous challenges as they prepare to meet the demands of the education 4.0 requirement in the era of the industrial revolution 4.0. Teachers must develop students' skills to meet the demand for a highly skilled and innovative workforce. The growth of the Fourth Industrial Revolution has had a significant impact on teachers' preparation for future students. Students who receive a well-rounded education are more likely to achieve academic and moral excellence, as well as responsibility and total well-being. Teachers should engage in activities such as Industrial Revolution 4.0 and be creative and imaginative in their approach, using various acceptable sources and media to create a more engaging teaching process for 21st-century learning. Teachers can use design thinking as a flexible educational technique to integrate 21st-century skills into their curriculum. Design-Thinking is a teaching approach established in this study to facilitate teachers in implementing Project-Based Learning. This concept paper aims to describe the current state of knowledge to promote research collaboration and discussion on recommended practice approaches and provide future research and practise opportunities.

Keywords: Design Thinking; 21st-Century Learning; Design-Based Learning; Creative and Innovative Thinking; Education 4.0

INTRODUCTION

Education is changing in response of the Industrial Revolution 4.0's rapid expansion of information and communication technology. IR 4.0 is a technological revolution that fundamentally transforms human thought, the global economic system, and social roles (World Economic Forum, 2018). The economic, social, and political systems are changing due to IR 4.0 but so is the educational system. The learning landscape of the 21st century is shifting away from a teacher-centred approach toward a more learner-centred one. It is consistent with Malaysia's Education Blueprint 2013-2025, which intends to equip individuals to enter the workforce based on labour market needs.

New knowledge and practices in education have been developed due to the globalization era, which has prompted rapid growth. An important role is played by technology-integrated education in meeting the technological needs of society as well as preparing students for the future workforce (Sahin & Yilmaz, 2020; Salar et al., 2020). Analytical thinking and innovation, active learning, complex problem solving, critical thinking, and creativity are the top five skills needed by 2025, according to the World Economic Forum's 2020 Future of Employment Report. A report by WEF, 2020, shows that many jobs by 2025 require

technology, computational thinking, data analysis, software development, and innovation. The push for service automation and manufacturing implementation causes the skills requirements for future job markets to need to be assessed and reviewed. Therefore, the education system needs to make changes and paradigm shifts in addressing these global concerns. (Bellanca et al., 2010; Kelly, 2009; Lin & Long, 2020; Tight, 2021). Teachers should no longer rely on the traditional technique of conducting classroom activities. Due to the increasing prevalence of technology in all aspects of life, students must understand how to incorporate technology best to enhance their quality of life. Teachers must accordingly equip themselves with the required knowledge and teaching abilities to prepare students.

On the other hand, students will be unable to improve their abilities if their teachers lack the necessary expertise in instructing them. The teaching and learning methods of the 21st century are critical in the development of instructors' abilities to provide students with a solid grounding in technology. This concept paper proposes knowledge for developing teachers' creativity and innovation skills through the design thinking perspective.

LITERATURE REVIEW

To provide a clearer image of the topics to be explored in this concept paper, literature reviews based on Design Thinking principles were conducted. The researchers discuss the literature review on stages in design thinking in this session.

DESIGN THINKING

Design Thinking is an inventive, creative, and human-centred approach and mindset that involves collaborating with interdisciplinary teams to create goods, services, and experiences focused on the user (Lor, 2017). As a dynamic and non-linear framework (Scheer et al., 2012), Design Thinking follows an iterative process comprised of five stages: (1) Empathize, (2) Define, (3) Ideate, (4) Prototype, and (5) Test.
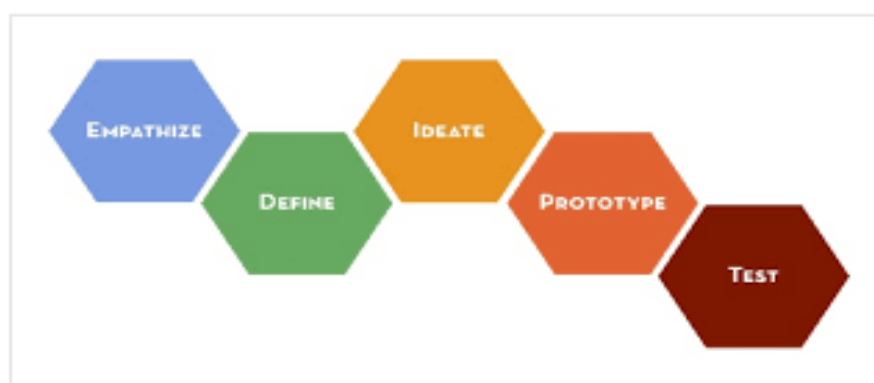

Figure 1: Design Thinking Process (D.School, 2015)

i. Stage 1: Emphaty

Empathy requires designers to know the people and context in which they engage. This human-centred approach enables designers to appreciate the physical and emotional

requirements of those touched by the design issue, as well as the relevance of those requirements (Brown, 2008; Carroll et al., 2010; Kwek, 2011; Hasso Plattner Institute of Design, 2017). Kwek (2011) indicated in a middle school study that practising design thinking requires empathy and understanding others' needs. Designers spend as much time as possible monitoring consumers and their behaviour in contexts to stimulate the development of empathy. Designers engage in conversation with consumers to elicit experiences and illuminate hidden meanings. Additionally, they observe and listen by guiding users through normal chores or anything else that may elicit deeper questions to foster empathy (Hasso Plattner Institute of Design, 2017).

ii.   Stage 2: Define

"Defining and focusing" the design space is what Define is all about (Hasso Plattner Institute of Design, 2017, p. 3). Designers use what they learned from the previous stage to understand a problem better. The design challenge was developed as an actionable problem statement based on user and context insights by Noweski et al. (2012) and Scheer et al. (2012). Design thinking refers to this process as "acquiring a point of view" (Brown, 2008; Carroll et al., 2010; Goldman & Kabayadondo, 2016; Goldman et al., 2014; Hasso Plattner Institute of Design, 2017). In their research on design thinking in middle schools, Carroll et al. (2010) described a Point of View statement as defining the requirements and insights of the users. Designers examine any trends, activities, or feelings that emerged throughout the early stages of the project. Designers use this data to build a complete picture of their target market and the needs they have (Hasso Plattner Institute of Design, 2017).

iii.   Stage 3: Ideate

Designers 'ideate,' or come up with a variety of creative solutions to a design problem (Brown, 2008; Carroll et al., 2010; Goldman & Kabayadondo, 2017; Hasso Plattner Institute of Design, 2017; Scheer et al., 2012). Throughout this phase, designers and their design teams work together to produce concepts. Designers are encouraged to work together and display their individuality in their work. According to Goldman and Kabayadondo (2017), having fun and creativity is more important than being overly fantastical. Instead of identifying the proper solution, this stage aims to extend participants' perspectives (Rice, 2011; Scheer et al., 2012). Testing and comments allow us to arrive at the best solution afterwards (Hasso Plattner Institute of Design, 2010).

iv.   Stage 4: Prototype

In order to get feedback from the people affected by the design problem, designers must construct a minimum prototype (Brown, 2008; Carroll et al., 2010; Hasso Plattner Institute of Design, 2010; Scheer et al., 2012). Post-it notes, storyboards, and even actual devices can be used as prototypes (Hasso Plattner Institute of Design, 2010). Designers are instructed to get things done to avoid unduly fixated on a single prototype. During the prototype phase, it's preferable to "fail early and often," according to Carrol et al. (2010). (p. 41). Through collaboration with design teams, the goal is to build a mental representation of the notion or concepts (Scheer et al., 2012).

v. **Stage 5: Test**

In this stage, prototypes are put through their paces to get feedback from the public (Brown, 2008; Carroll et al., 2010; Hasso Plattner Institute of Design, 2017; Scheer et al., 2012). Prototypes and solutions can be improved by iterative testing, which helps designers learn more about their users and create a perspective on the design challenge (Hasso Plattner Institute of Design, 2017). During testing, designers send the prototype to users and observe how they engage. Testing should be an experience, not just a demonstration of a prototype, which is the designer's goal (Hasso Plattner Institute of Design, 2017).

METHADOLOGY

This concept paper reviews the need of implementing design thinking into instructional strategies. The main objective of this study is to summarise the current state of knowledge to foster a better understanding of the role of design thinking in education. This study does not involve any participants, and the findings will be discussed based on the literature reviews.

FINDINGS

The researchers discuss the findings based on numerous previous reviews of the literature in the field of design thinking:

SCHOLARS	METHADOLOGY	FINDINGS
Razzouk and Shute (2012)	A systematic review of 45 documents	The authors highlight the following design-thinker characteristics: 1) human- and environment-centered concern 2) ability to visualize 3) predisposition toward multifunctionality 4) systemic vision 5) ability to use language as a tool 6) affinity for teamwork 7) avoiding the necessity of choice
Johansson-Sköldberg, Woodilla, and Çetinkaya (2013)	Literature review based on the research consisted of 168 items, comprised of academic articles, books and blogs / other social media	The 3 main ways design thinking is characterized in the business context are, according to the authors, 1) IDEO's Way of Working with Design and Innovation 2) Way to Approach Indeterminate Organizational Problems, and a Necessary Skill for Practicing Managers 3) Part of Management Theory

Lor (2017)	A review and analysis of 68 journal articles, books and reports	Design thinking as applied in education can be narrowed down to 3 dimensions: 1) Design thinking in curriculum design 2) Design thinking as a teaching-learning approach 3) Teacher training & support for design thinking.
Elsbach and Stigliani (2018)	A systematic review	3 insights about the relationship between design thinking tools and organizational cultures. (1) the effective use of design thinking tools in organizations had a profound effect on organizational culture. (2) organizational cultures influenced (both positively and negatively) the use of design thinking tools. (3) using design thinking tools produced both physical artifacts (e.g., prototypes, drawings, design spaces) and emotional experiences (e.g., the experience of empathy or surprise/delight).
Micheli, Wilner, Bhatti, Mura and Beverland (2018)	A systematic review of 104 articles	The authors identified 10 principal attributes of design thinking in the management context: 1) User-centeredness and involvement, 2) Problem solving, 3) Iteration and experimentation, 4) Interdisciplinary collaboration, 5) Ability to visualize, 6) Gestalt view, 7) Abductive reasoning, 8) Blending analysis and intuition,

		9) Tolerance of ambiguity and failure 10) Creativity and Innovation
McLaughlin, Wolcott, Hubbard, Umstead and Rider (2019)	A Qualitative review of 15 articles	They identified 2 purposes for the use in education 1) enhancing creativity and innovative thinking skills of individuals, 2) informing curricula and programs.
Carlgren et al. (2016)	Interview study in 6 large companies	5 themes characterizing design thinking practice in businesses: 1) User focus, 2) Problem framing, 3) Visualization, 4) Experimentation 5) Diversity
Rauth et al. (2010)	17 semi -structured interview	Their analysis identified different competencies as a result of design thinking education, such as prototyping skills, emotional skills, capability of adopting perspectives, empathy and a certain mindset.
Camacho (2018)	A Qualitative interview	3 basic traits of design thinking as system-oriented, human-centered, and creation-based.

Table 1: Table Findings From Selected Scholars

DISCUSSION AND CONCLUSION

Teachers' professional development in 21st-century learning is related to expertise in instructional planning in this concept paper. In the context of education 4.0, this concept paper tries to fill the gap generated by other studies on 21st-century education. Exposure to design thinking may help students succeed since it fosters creativity and innovation, essential for the Industrial Revolution 4.0's future workforce. For education 4.0, this concept paper is intended to guide Malaysian teachers interested in incorporating design thinking into the lesson in to foster student creativity and innovation. Carroll (2014) found that children need instruction to become self-directed learners. Additional research is needed to determine how guidance might promote in the development of design thinking skills. Teachers need to be mentored properly before incorporating design thinking in the classroom. Teachers interested in encouraging children to express their ability to think creatively and innovatively can benefit from this study. The authors hope this will raise their level of understanding and

awareness.

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