INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN PROGRESSIVE EDUCATION & DEVELOPMENT

OPEN ACCESS JOURNAL

Vol 13, Issue 3, (2024) E-ISSN: 2226-6348

Design Thinking in Education in Malaysia

Afif Hassan, Isa Hamzah

Faculty of Education, Universiti Kebangsaan Malaysia, 43600, Bangi, Selangor

To Link this Article: http://dx.doi.org/10.6007/IJARPED/v13-i3/22268 DOI:10.6007/IJARPED/v13-i3/22268

Published Online: 26 August 2024

Abstract

Malaysia as an industrialized country needs to remain relevant in order to attract foreign investors. The Industrial Revolution 4.0 that has hit the world has had a great impact not only on the country's economy but also on the field of education. The transformation of education through the introduction of the Education Development Plan (PPP) 2013-2025 is an effort by the Ministry of Education (MOE) to ensure that the IR 4.0 education goals are achieved. Design thinking is fundamental in IR 4.0 education and is also a key thrust in drafting the introduced PPP. The purpose of this concept paper is to comprehensively discuss design thinking from the definition, characteristics to the implementation and assessment of design thinking in the teaching and learning process at the school level. Among the implications of the implementation of design thinking is to produce students who are highly skilled and have a forward mindset and a positive mindset in making changes that benefit the society and the country. In conclusion, design thinking is important in education in Malaysia is not just an approach to solving problems but also a method of thinking that should be nurtured and cultivated in daily life.

Keywords: Design Thinking, IR 4.0 Education, Teaching and Learning Process.

Introduction

The education landscape in Malaysia has seen various transformations since the beginning of the 21st century to ensure that Malaysia remains competitive, especially in the fever of the Industrial Revolution 4.0 (IR 4.0) that has hit the world. The rapid development in the fields of communication, technology and engineering due to the Industrial Revolution 4.0 has driven a change from conventional learning to 21st century learning. 21st century learning has also been nicknamed as IR 4.0 education in the international arena. The essence of IR 4.0 education is to produce students who have high-level skills, think critically and creatively in producing innovative solutions and have a high spirit of collaboration. The government's intention to improve the quality of the existing education system to be on par with the education goals of IR 4.0 can be seen through the introduction of the Education Development Plan 2013-2025 (PPP 2013-2025). Design thinking is a strategy that cannot be separated from IR 4.0 education. When talking about the Industrial Revolution 4.0, we cannot run away from associating it with the use of robotics. Robotics is an innovation born from research in the field of artificial intelligence or Artificial Intelligence (AI). The father of artificial intelligence, Herbert Simon, is a pioneer in the research of design thinking itself. Therefore, a design thinking approach is

very important to be applied in the teaching and learning process to meet the educational aspirations of IR 4.0. This view is in line with the findings by Suhaila Che Noh and Abdul Malek Abdul Karim (2021) who stated that the PPP framework planning 2013-2025 is based on design thinking. Therefore, this concept paper will elaborate on design thinking in more detail in order to provide a comprehensive view of design thinking.

Definition of Design Thinking

The term "design" is not something rare in the ears of the community, especially in Malaysia. The use of this term has been long and very widely used in various fields such as the field of fashion, the field of architecture and even the field of engineering. The actual definition of design is still a matter of debate among scholars in the field of research because there is no absolute definition that can be used to represent the term design. Terence Love (2000) through his article entitled "Philosophy of design: a metatheoretical structure for design theory" stated that theorizing about design goes beyond the paradigm where design is practiced. Design does not become the absolute property of a discipline or a specific field. There are various disciplines related to design such as Design Methodology, Philisophy of Design, Sciences of Design and of course Design Thinking (DT) is also an important sub-discipline in design theory. Design thinking is essential in determining the success of an invention or innovation. This is because as a designer, the individual needs to use high-level thinking skills in understanding human needs and devising an experiment or prototype to achieve an innovative solution. Herbert Simon (1969), who is known as the father of artificial intelligence and also one of the early pioneers who studied the characteristics of design thinking, has defined design thinking as a blueprint designed by a group to change the existing situation to a more ideal or desirable state. By using a design thinking approach, designers are able to make decisions based on an understanding of what humans want for the future rather than relying solely on past research information or making high-risk bets based on mere instinct. According to a critical analysis study conducted by Ulla Johansson-Skoldberg et. al. (2013), design thinking from the perspective of a theoretical perspective refers to; 1) as the creation of artifacts, 2) as the practice of reflection, 3) as a problem-solving activity, 4) as a means of reasoning, and 5) as the creation of meaning. Thinking like a designer can change the way an organization develops their products, services, processes, or strategies. Design thinking brings with it reasonableness from a human point of view by maximizing the use of technology and viability from an economic aspect. It also allows individuals who are not trained in the field of design to use design thinking as a creative approach to deal with various challenges in life. Generally speaking, design thinking is a human-centric approach that incorporates elements of strategy, methodology, and process in the planning and development of innovative products or solutions.

Characteristics of Design Thinking

Study Regarding the characteristics that describe specific properties in design thinking was pioneered by Simon (1969). Although Simon personally does not use the term design thinking explicitly in his research, his cognitive approach in the decision-making process and his definition of design as the transformation of an existing situation into a desired situation is often referred to by researchers in research related to design thinking. Study by Ineta Luka (2014), Ulla Johansson-Skoldberg et. al. (2013), and Pietro Micheli Et. al.

(2018) shows There are ten key characteristics that are often discussed in design thinking research, namely; cooperation, constructiveness, curiosity, empathy, holistic, human-centered, openness, non-judgment, ambiguity and etymality.

Basically, the implementation of design thinking does not only refer to the thought process but also includes the paradigm of design thinking as a mentality that needs to be practiced in daily life. The most important feature of design thinking is that it is human-centric rather than technology-centric or method-centric. Human desires, wants, abilities and limitations become the center of reference from the beginning to the end of the process of implementing design thinking. Therefore, this approach needs to be empathetic in understanding the problems faced in order to come up with the best solution. When understanding the problem at hand, various views and inputs will be accepted, hence the need for openness and non-judgment in the design thought process. In addition, design thinking is also iterative in nature where the phases in design thinking form a cycle that is related to each other. This unique property allows the practitioner to freely move from one process to another or go back to the previous process for the purpose of improvement. Design thinking, then, is an ongoing process and has its own sustainability.

Solutions through design thinking also prioritize collaboration from various individuals or parties with different backgrounds to produce multidisciplinary innovations. Design thinking is also said to be a constructive approach because it is a solution-centric approach in an effort to find the most ideal answer or output for the problem at hand. Nevertheless, design thinking also has a vague nature. The ambiguity here means that there is no absolute solution in design thinking. A problem can have various possibilities in its solution. The settlement chosen must meet the wishes and abilities of the parties involved. In conclusion, design thinking is a holistic process because it encompasses a very broad context for the practitioner or its use.

Expansion of Design Thinking

The term design thinking was first used in 1987 by Rowe when he published his book titled "*Design Thinking*". However, according to Ineka Luka (2014), the concept of design thinking has existed for a long time since the early 1960s in line with the growth of the discipline related to creativity in the field of psychology. The technology magnate of the time, Herbert Simon also began studying the characteristics describing design thinking in 1969. The 1980s saw the emergence of the era of human-centered design and design-centric business management as argued by Schon (1983), in his book entitled "*The Reflective Practitioner: How professionals think in action".*

Then in 1991, the first symposium was held at the University of Deft, the Netherlands. The symposium aims to gather researchers in the field of design thinking research. In the early 90s also a design consultancy company called IDEO was established. IDEO became the first design company to provide public access to their design process, design methods and design thinking and in the years that followed, IDEO became a major contributor to the growth of design thinking, especially in the field of education, which will be discussed in more detail later. The transition from the 20th century to the 21st century led to rapid growth in the field of design thinking with the production of a variety of scholarly materials that debate design thinking.

Design Thinking Model

Herbert Simon (1969), who was an early pioneer in the field of design thinking research has introduced seven stages in the design thinking process, namely; 1) identify, 2) study, 3) find ideas, 4) prototype, 5) select, 6) implement, and 7) learn (Ineta Luka, 2014). Scholars from various fields have adapted the seven stages of design thinking and introduced various models of their own design thinking. However, the most significant and often referenced model to date is the Iteration Design Thought Process model introduced by *the Institute of Design at Stanford* or also known as *d.School* in 2009 as shown in Figure 6.1. This model classifies design thinking into two main categories which are the problem phase and the solution phase. The problem phase consists of understanding, observation and expression of opinion while the solution phase consists of idea generation, prototaio construction and testing. Through this approach, there is an interaction between the problem phase and the solution phase that connects each process directly and indirectly. The unique nature of this design thinking approach allows practitioners to freely move from one process to another or revert back to the previous one.

Later, *d.School* refined their previous model and introduced a new model, the Five Phases of Design Thinking model as shown in Figure 6.2. The Five Phases Model of Design Thinking has become a reference for various educational institutes in teaching the pedagogy of design thinking, including Genovasi Malaysia. Along with the name of the model itself, there are five phases that need to be passed in the design thought process. The phases are as follows; Phase 1: Empathy, Phase 2: Identify, Phase 3: Idea Formation, Phase 4; The prototype and the last is Phase 5: Testing. The use of this design thinking model can be explained in more detail by using a situation where a teacher of a Basic Computer Science (ASK) subject is asked by the administrator to produce a teaching and learning module. The first phase, the Empathy Phase, is the phase to understand the problems faced. Teachers in this phase will try to understand the problems faced by students in learning theoretical topics in ASK subjects. Teachers can use various ways to understand the problems they are facing, such as holding dialogue sessions with students or discussions with other fellow teachers. The next phase, the Identify Phase, is to identify the root cause of the problem and the objective of the solution. It should be noted that there is no absolute solution to a problem and not all solutions are suitable for practice because they must be adapted to the needs of the user in this situation which is the student. Teachers work with students and fellow teachers to examine what problems are faced until there is a need to change the way ASK theory topics are delivered. The needs or problems faced can be concretely defined through the formulation of questions starting with "*How can teachers be...?*". Therefore, the modules built are based on a specific and detailed question for example; How can teachers engage students to be more active in learning ASK theoretical topics with interest?

Moving on to the next phase, the Idea Generation Phase where brainstorming *methods* are used to produce creative innovations to solve the problems identified in the second phase. This phase should involve the involvement of several relevant parties. Ideally, in this phase, partnerships from individuals from different backgrounds are encouraged in order to form ideas that cross various disciplines. Teachers can get input from individuals with industry experience because inspiration through experience is very valuable and can help in providing a more effective learning impact to students. For example, a software engineer can share his experience and provide awareness on the importance of learning ICT topics for his

chosen career. Through brainstorming, learning methods that are identified as effective or do not need to be listed so that they can be utilized for the next phase. Problems or challenges that arise are also identified.

The fourth phase, namely the Prototype Phase, is the development of materials or outputs or innovations that can be used as solutions to problems to be solved based on the ideas obtained in the third phase. In this phase, teachers have started to build and produce teaching and learning modules that suit the needs of students and meet the learning objectives. The modules built must also have innovative features and discipline-based elements. The last phase, the Testing Phase, is where validation is carried out to ensure that the prototype built can solve the problems faced. Once the module is successfully completed, teachers can use the module in the teaching and learning process. Through the modules produced, the implementation of learning activities will be tested and evaluated. Students will be asked to answer reflection questions along with feedback to get more information on the effectiveness of the modules built. Any weaknesses and room to upgrade the quality of the modules may be implemented from time to time.

Based on the examples given, it can be concluded that the Five Phase Model Design by *d.school* which was initially introduced for the field of business management and the technical field is also very suitable for adoption in the field of education. According to Lesley-Ann Noel et al (2019), Design thinking strategies in learning have a significant impact on the empowerment of student learning and improve the quality of education on its own. The application of design thinking in learning will be explained further in the next chapter. The benefits of design thinking are not only to student learning but also to the quality of teacher teaching. This argument is in line with the findings by IDEO (2012), which states that the design thought process has helped teachers see that they have a responsibility to be agents of change in teaching and learning. Design thinking gives teachers powerful tools in creating meaningful change in education. Recognising the importance of the design thinking model to the field of education, IDEO (2012), has published a special module for educators titled "*Design Thinking For educators*" which describes the phases in design thinking in detail. In the module, IDEO also introduced a design thinking model specifically for educators to use in designing their own teaching and learning processes.

Assessment & Assessment of Design Thinking in Education

In an effort to ensure that Malaysia remains relevant and competitive in line with the Industrial Revolution 4.0 (IR 4.0), the government through the Ministry of Education has outlined a number of appropriate changes in the Education Development Plan (PPP) 2013-2025. The main change in this PPP document is the implementation of the 21st Century Learning strategy which is also better known as PAK 21. The four main elements that form the basis of PAK 21 are communication, collaboration, creativity and critical thinking. When comparing the elements of PAK 21 with the characteristics of design thinking, it can be concluded that design thinking is the best approach in maximizing the PAK 21 strategy in the teaching and learning process (PdP) at all levels of education. This argument is in line with the views of Suhaila Che Noh and Abdul Malek Abdul Karim (2021) who propose that design thinking is the most important strategy in increasing creativity and innovation to meet the aspirations of IR 4.0 education. Therefore, the next question that plays in the mind is how can assessment and assessment based on design thinking be carried out in schools? How Wrigley

& Kara Straker (2015) in his study explain the paradigm shift that occurs in the pedagogy of form thinking. He uses a *ladder diagram* framework to break down the levels in the pedagogy of design thinking and explain the principles behind it in more detail. Based on Figure 1, design thinking in education can be formulated as a holistic and comprehensive process that includes the factual dimension, conceptual dimension, procedural dimension and most importantly, the meta-cognitive dimension. For the practice of design thinking in learning, students will start from the bottom or the most basic level, which is to identify and understand the existing problem statement and then explore each phase of design thinking in stages until students reach the professional level where they can choose and evaluate the most innovative and ideal solution for their problem statement.

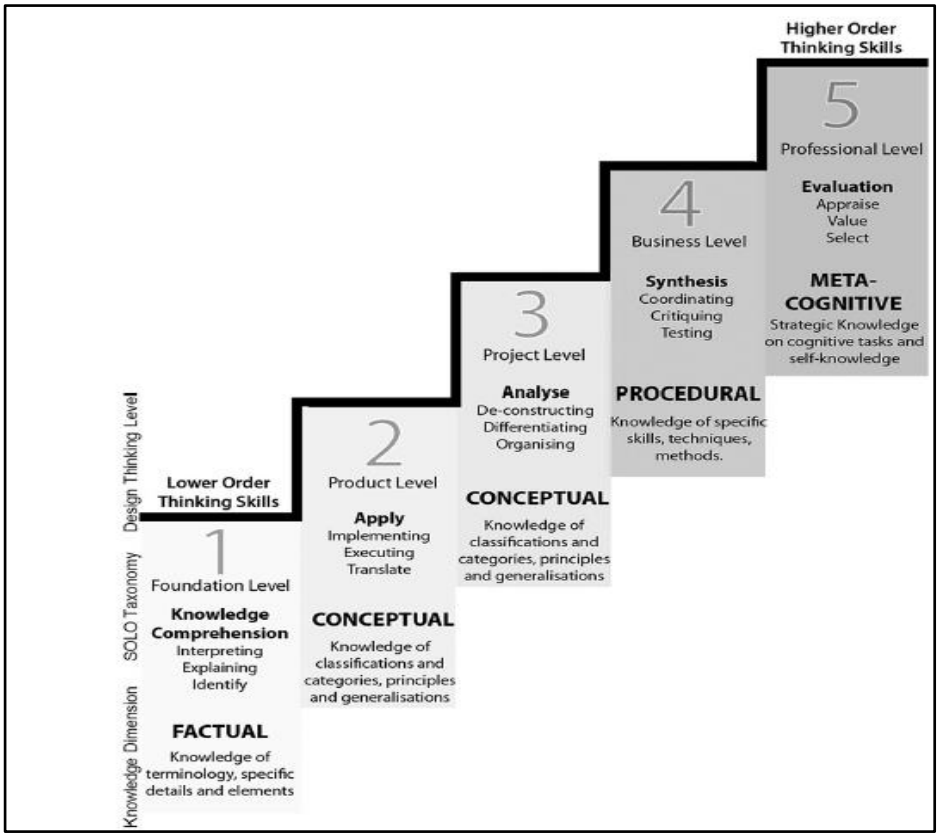

Figure 1: Ladder Diagram for Design Thinking Pedagogy
(Cara Wrigley & Kara Straker, 2015)

Besides being seen as a holistic learning strategy, based on a ladder diagram by Wrigley & Straker (2015), design thinking is also very suitable to be practiced for all levels of students' intellect because the level of mastery in design thinking consists of various levels starting from low to high levels (Higher Level Thinking Skills, KBAT). This view is in line with the findings of a study by Mazarul Hasan Mohamad Hanapi et al (2022) which states that implementation and assessment do not have to be done simultaneously but should be done in stages according to the level of students' tendencies and mastery. The implementation of phases in design thinking does not necessarily have to be carried out at the same time during the learning and teaching process. The main feature of design thinking is student-centered, so its implementation should be tailored by the teacher based on the level of mastery and inclination of students. Teachers can plan their daily lessons based on a design thinking

approach such as introducing Phase 1: Empathy Phase which is an understanding of a problem or process through discussion and sharing between students.

Based on the recommended learning methods by Wrigley & Straker (2015), almost all of the proposed learning methods involve group activities. This is because collaboration and openness, which are key attributes in design thinking, require the involvement of many parties or individuals. Thus, it can be concluded that group learning plays a very important role in the pedagogy of design thinking. In the context of education in Malaysia itself, group learning has been applied for a long time over the past decades as an example of coursework on folio production in the subject of Local Studies or Geography as well as coursework in the subject of Life Skills. Then, through the transformation of PPP education 2013-2025, it was rebranded as Project-Based Learning or better known as PjBL. The PjBL learning method is the most suitable method to introduce and apply design thinking pedagogy to students at the school level. This view is supported by several studies such as Ahmad et al (2021), Mazarul Hasan Bin Mohamad Hanapi et al (2022), and Keleman et al (2021) stated that with PjBL, students are exposed to important skills in design thinking such as collaborative skills, inquiry skills, critical and creative thinking skills and also the ability to give insights. The question is, how can teachers introduce design thinking through PjBL to students? Teachers can introduce design thinking directly or indirectly to students depending on the level of mastery and acceptance of a concept. According to Hanapi et al (2022), secondary school students have to go through the phases in the design thinking strategy when carrying out PjBL activities and the teacher only acts as an observer. Teachers can then introduce the ideas behind the phases they go through and relate them to design thinking at the end of the PjBL activity. In addition, teachers can also directly introduce the phases of design thinking when carrying out PjBL activities.

The Ministry of Education's efforts to achieve the goals of IR 4.0 education can not only be seen through the introduction of the PAK 21 strategy but also through the formulation of content in the writing of textbooks. The writing of textbooks under the Primary School Standard Curriculum (KSSR) and Secondary School Standard Curriculum (KSSM) has adapted problem-solving methods based on a design thinking approach in their examples or descriptions.

Past Studies

Noel et al (2019), conducted a study entitled "*Design Thinking and Empowerment of Students in Trinidad and Tobago*" which focused on the design thinking approach to student empowerment in rural areas. The purpose of the study was to explore how design thinking can be used in developing curricula that can empower students' education in rural schools with limited resources. A specific curriculum based on design thinking has been developed to be applied to students during the summer camp workshop. In addition, the Shor framework (1992), is also the basis for the implementation of workshops to empower education that encourages students to become thinking citizens, agents of change and social critics. Interactive discussions are encouraged between students and trainees during the workshop. Students use design thinking strategies to actively identify problems through dialogue sessions and propose innovative solutions to community problems. The findings of the study showed that students were more in control of their learning and that this student-centred

strategy successfully fostered critical awareness and social development among students even with limited resources.

A study titled *"Ninth-grade Students' Perceptions On The Design-Thinking Mindset In The Context Of Reverse Engineering*" was conducted by Luecha Ladachart et. al. at a school in Thailand in 2021. The objective of this study is to investigate students' perceptions of design thinking before and after reverse *engineering* projects are implemented. Most design thinking-based learning uses *a forward engineering* approach where students are trained to design unknown solutions. For students who are new to design, starting with *forward engineering* may not be very effective. This study uses *a reverse engineering* approach where students study existing products. The Likert Scale has been used to measure 6 aspects in design thinking, namely; 1) feel comfortable with uncertainty and risk, 2) be human-centered, 3) be aware of the process and its impact on others, 4) collaborate with diversity, 5) be oriented toward learning by making and testing, and 6) be confident and optimistic about using creativity. The findings of the study showed that students had a more proactive perception of design thinking when reverse *engineering strategies* were used. *Reverse engineering* can be used as a starting point for students to learn fundamental aspects of design thinking such as human-centeredness, creativity, and collaboration.

The next study is titled "*Teaching and Learning Design Thinking (DT):How Do Educators See DT Fitting into the Classroom?*" was conducted by Eden Hennessey and Julie Mueller which was published in 2020. The researchers have collaborated with industry technology experts and a target group among educators to explore the level of teachers' understanding of the design thinking process. A study was also conducted to find out the perception of educators on the appropriateness of the implementation of design thinking in their classrooms. The results of the study show that most educators have basic knowledge about design thinking and there are some educators who are already familiar with the processes in design thinking as a result of exposure from STEM subjects. Educators have also been found to have a positive receptivity to the implementation of design thinking in the classroom. Although they acknowledged that there are constraints that will be faced such as how students are assessed and accepted, teachers are ready to take on the challenge of applying design thinking in their lesson plans.

Local researchers Ahmad, Samsudin, and Amzah (2021), conducted a quasi-experimental study entitled "The Impact of the STEM Club Design Thinking Approach Module on Higher Level Thinking Skills (KBAT)" to investigate the effectiveness of the design module on the improvement and retention of KBAT among primary school students. Plattner's (2009), model is used as the basis in the development of this module covering six phases, namely Understanding, Observation, Viewpoint, Idea, Prototype, and Test which occur in a reciprocal manner between the steps. By applying this module during STEM Club activities, students are free to go back and forward in carrying out the phases according to their own pace and mastery. The effect of using the module was measured three times using the KBAT test, namely before the intervention (pre-test), after the intervention (post-test) and after three months of intervention (follow-up post-test). The results of the study found that the application of this module in learning had a positive and significant impact on the improvement of KBAT achievement and retention among students. The application of this module in learning provides a huge space for students to improve their creativity and

innovative thinking skills through hands-on activities in real-life contexts and challenge students' higher-order thinking abilities.

The concept paper titled *"Design Thinking Mindset To Enhance Education 4.0 Competitiveness In Malaysia*" by Noh and Karim (2021), provides an understanding of the conceptual framework to improve teachers' competence in enhancing creativity and innovation using design thinking to meet the educational aspirations of IR 4.0. The study explores the issues and challenges faced in adapting IR 4.0 teaching. Although the Education Development Plan 2013-2025 has outlined the implementation of a problem-solving thinking development model that supports epistemological shifts through design thinking in producing a high-quality learning environment, the findings show a lack of empirical studies on the application of design thinking and its implementation process in the educational context in Malaysia. However, in contrast to overseas, various studies on the use of design thinking as a strategy in applying empathy, problem-solving, prototyping and multidisciplinary collaborative approaches in teaching creativity, and building creative confidence and innovative minds have been conducted. The researchers also found a lack of awareness among teachers about the importance of design thinking practices in achieving the educational goals of IR 4.0. In addition, the findings showed that 45% of teachers never practiced creative thinking and another 70% of teachers stated that they only occasionally practiced creative thinking in their teaching. Creative thinking is very important because it is one of the basic characteristics and key elements in design thinking but if teachers as implementers also do not practice it, the goal of IR 4.0 education to normalize design thinking will not be achieved.

Researchers from Colombia, Rye, and Crites (2019), conducted an exploratory case study entitled "*Innovating language curriculum design through Design Thinking: A case study of a blended learning course at a Colombian University*" based on the implementation of design thinking in the language curriculum planning process carried out during the program reform by the university administrators. Although curriculum reform is an initiative of the higher-ups, with the adoption of this strategy, the process of designing the curriculum becomes a *bottom-up* process with collaboration between all members of the group. The study found that the end result of curriculum design using a design thinking approach was an innovative and robust outcome because it was co-created by group members comprising different backgrounds, educational experiences, teaching philosophies, and work styles.

The study titled "*Design thinking - A revolutionary new approach in tourism education?*" by Sándorová et al (2019), conducted to identify the suitability of the implementation of design thinking in the teaching and learning of non-STEAM-based subjects. Design thinking has long been widely used as a teaching method in architecture courses as well as economics-related courses. However, in recent years, design thinking has shown its great potential for applicability not only in the field of technology but also to the field of service and education. The findings of the study show that the use of this strategy as a teaching method in tourism courses has received positive and constructive feedback from lecturers and students. Design thinking can not only be considered as an appropriate and modern method to educate aspiring managers in the field of tourism but also beneficial to students to use in their later jobs.

Implications and Recommendations to the Teaching and Learning Process

According to Beckman & Barry (2007), design thinking is an ideal learning cycle where it consists of four phases as follows; experience, reflect, think and act (Ineta Luka, 2014). According to Ineta Luka (2014), the learning of design thinking is a holistic process because the process of knowledge creation is a combination of analytical elements and synthetic elements as stated by (Owen, 2007). In reality, practice and theory are very difficult to balance in the field of education, especially. Yet by adopting a design thinking approach that gives equal priority to theory and application, this stigma can be set aside. In order to come up with an innovative solution, students will use their analytical and synthetic skills to the fullest to build new knowledge by thinking critically and creatively. Therefore, learning based on design thinking produces highly skilled students because they practice a superior and comprehensive learning cycle

Not only capable of triggering highly skilled coatings, design thinking strategies are able to produce students who have a forward mindset and a positive mindset in making changes that benefit the society and the country. As aspiring leaders and tenocrats for a multiracial country, students should be educated to be open and tolerant of dissent. The design thinking approach is the most appropriate method because the essence of this process involves group learning. Therefore, most of the activities recommended by the Ministry of Education in the PAK 21 strategy consist of group activities such as *Simultaneous Round Table, Word Web team, Gallery Tour* and *Three Stray, One Stay.*

Project-based learning or PjBL is one of the main activities in design thinking pedagogy. The implementation of PjBL not only helps students master academic knowledge effectively but also helps in the development of students' soft capital such as leadership skills, communication skills and tolerance. However, the implementation of PjBL is one of the main reasons why teachers and students are reluctant to practice design thinking strategies in PdP. Mazarul Hasan Bin Mohamad Hanapi et al (2022), in his study stated that teachers face challenges in implementing PjBl as the main instrument in teaching due to time constraints and student acceptance. PjBL usually takes at least two weeks or more to complete a project. The acceptance of students is also quite passive when they feel that the workload increases with the implementation of PjBL especially when all subject projects need to be carried out simultaneously. As an implementer, teachers can facilitate and reduce the workload of students as well as teachers themselves by drafting a project that integrates several subjects. Science teachers can take the initiative by proposing collaborative teaching with Malay language teachers, Mathematics teachers and Design and Technology teachers in the implementation of this project. Teachers involved can design and refine the implementation of the project by including the necessary elements for the assessment of their respective subjects. Through the application of cross-curricular elements in the implementation of PjBL, it will reduce the workload of teachers and students as well as shorten the project implementation time with a combination of the time of the subjects involved as well as encourage the learning of design thinking in PdP.

Conclusion

The practice of design thinking in pedagogy has a great and positive impact on the world of education in Malaysia in particular. The government's goal to remain competitive in the competition of the Industrial Revolution 4.0 in the international arena in the future can

be achieved if the quality of the country's education system is successfully improved by the application of design thinking. Holistic design thinking in producing innovative solutions makes this approach ideal for use as a teaching and learning strategy at all levels of educational institutes. The success of the design thinking approach in education has been successfully proven by foreign countries such as neighboring Thailand and Singapore. In the early days of its implementation, design thinking was more focused on STEM-based subjects but this approach can actually be applied to other subjects as well. International studies in recent years have also begun to discuss the impact of the implementation of design thinking on non-STEM subjects, and there are even studies that debate the use of design thinking in education management and curriculum planning. Although design thinking is the basis for drafting the PPP 2013-2025, its implementation in Malaysia, especially at the school level, is very weak and teachers' acceptance of this approach is very underwhelming. The results of the literature highlight also found a lack of empirical studies on the effectiveness and acceptance of design thinking by teachers and students. Therefore, this question is very interesting to be explored as a further study. Design thinking is an important strategy in education in Malaysia to produce a competitive generation in the 21st century. Policymakers, teachers, parents, the community, and students themselves should embrace design thinking with open arms and open arms to welcome it as a new skill that must be mastered. Design thinking is not just an approach to solving problems but also a method of thinking that must be nurtured and cultivated in daily life.

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