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Approaches for Academic Management Development of Secondary School Consortium of Ratchaburi Area 4 Based on the Concept of Design Thinker

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Abstract

This study was a descriptive research. The research purposes were: 1) to study the priority needs in the academic management of Secondary School Consortium of Ratchaburi Area 4 based on the concept of Design Thinker; and 2) to propose approaches for the Secondary Schools Consortium of Ratchaburi Area 4 based on the concept of Design Thinker. The total number of sampled respondents was 503, involving 5 school directors, 36 heads of departments, 92 teachers and 370 students. The research instrument was a set of five-level rating scaled questionnaire for needs assessment, and an evaluation form for the rating of suitability and the feasibility of the proposing approaches. The data were analyzed by frequency distribution, percentage, mean, standard deviation, Modified Priority Needs Index: $PNI_{modified}$ and content analysis.

The findings revealed that: 1) the priority needs index pointed firstly to the development and promotion of learning resources, followed by the students' learning assessment and evaluation, the curriculum development, and the instructional management; 2) there were four main approaches and six sub-approaches for the academic management development, (1) to improve and support the establishment of learning resources that enable the students to focus on prototype-building and action-oriented behaviors, (2) to improve the learning assessment and evaluation by focusing on creativity, (3) to develop the curriculum by focusing on cultivating human-centeredness among students, and (4) to improve instructional management that cultivates the quality of human-centeredness in students.

Keywords: Academic Management, Design Thinker, Secondary School

Introduction

To expedite competitiveness and to assure twenty-year continuity of economic growth of Thailand, the government has launched a long-term economic model called "Thailand 4.0", which mainly focuses on transforming Thailand into a high income nation that is built upon knowledge-based economy driven by science, technology, innovation and creativity. (Thailand's 20 - year national strategic plan, 2018). These challenges will require the education system of Thailand to attempt for better preparation of future graduates, so that they are more proficient and knowledgeable with a wide range of skills needed in a knowledge-based economic nation. (UNICEF Thailand, 2019) Therefore, to educate and train future human resources who can cope more effectively with the fast-paced world of unceasing change, the roles of education must be supported in all levels, especially in the secondary

education when students are at the right age to focus on creative problem-solving skills.

According to Koh et al. (2015), Design Thinking is a mindset that focuses on developing the thinking process that is necessary for empowerment of students' critical and creative thinking abilities that could enable them to innovate. According to ISTE (International Society for Technology in Education) standards, (2000), it is essential for today's schools to equip secondary students with the thinking skills that lead them to be innovative designers. The students must be able to use a variety of technologies within a designed process to identify and solve complex problems, by generating new useful ideas and innovative projects. Design Thinking was the concept introduced by Rowe in 1987 and rose to prominence in the 2000s when it was made popular by David Kelley and Tim Brown of IDEO, a global design company. Design thinking has gained popularity in business and is increasingly becoming popular in the field of education.

Many educational institutions apply the principles of Design Thinking to their curriculum development, courses, and workshops. An example is "Stanford d. school" that serves as a global *center* for high technology and *innovation in Silicon Valley.* However, Design Thinking for education in Thailand has been a minor area of interest and only a few research articles exist.

Design Thinking, as an educational approach, is to *enhance students' problem-solving skills and help them become creative problem solvers,* (Noipinit et al., 2016; Von Thienen et al., 2017). In addition, Scheer and Plattner (2011), Kwek (2011), Brown (2009) note that Design Thinking is an effective approach for schools and educators to apply in education since it motivate students so that they are interested in innovations, and become capable of problem solving, more creative and collaborative.

There are many divergent design thinking process models widely used today. Nevertheless, they all derive from the same principle. That is the design thinking

model proposed by the Hasso-Plattner Institute of Design at Stanford (d. school) which consists of five stages; 1) Empathize, 2) Define, 3) Ideate, 4) Prototype, and 5) Test. Furthermore, d. school states that in order to benefit from the process and build students' creative problem-solving capacity and creativity that lead to innovation, educators are required to start with enabling students to become "design thinkers" first. In addition, many educators states that the most important characteristics of a design thinker are as follows: empathetic, collaborative, systemic vision, bias towards action, growth mindset, and consciously creative.

Secondary School Consortium of Ratchaburi Area 4 is a coalition which consists of five schools: Phothawattanasenee Schoool, Nong Pho Wittaya School, Thamakamwittaya School, Bang Pae Patompittaya School, and Pho Hak Wong Sombun Rat Uppatham School, with the intent of fostering interinstitutional cooperation among five schools, the purposes of which are to enhance services, share resources, and educate students.

According to the vision of the Secondary Schools Consortium of Ratchaburi Area 4, all the schools in this education area have shared the vision which aims to empower their students through the independent study (IS) subject, so that the students are able to use their knowledge to develop innovations. Consequently, the students are required to develop problem-solving skill first. However, the results of external quality assurance evaluation *indicate* that the students in school consortium Ratchaburi area 4 lack the highly important skill of *problem-solving*. Therefore, this study aim firstly to assess the priority needs in the academic management of Schools Consortium in Ratchaburi Area 4 based on the concept of Design Thinker. Secondly, it aim to propose the approaches for academic management development of School Consortium in Ratchaburi Area 4 based on the concept of Design Thinker.

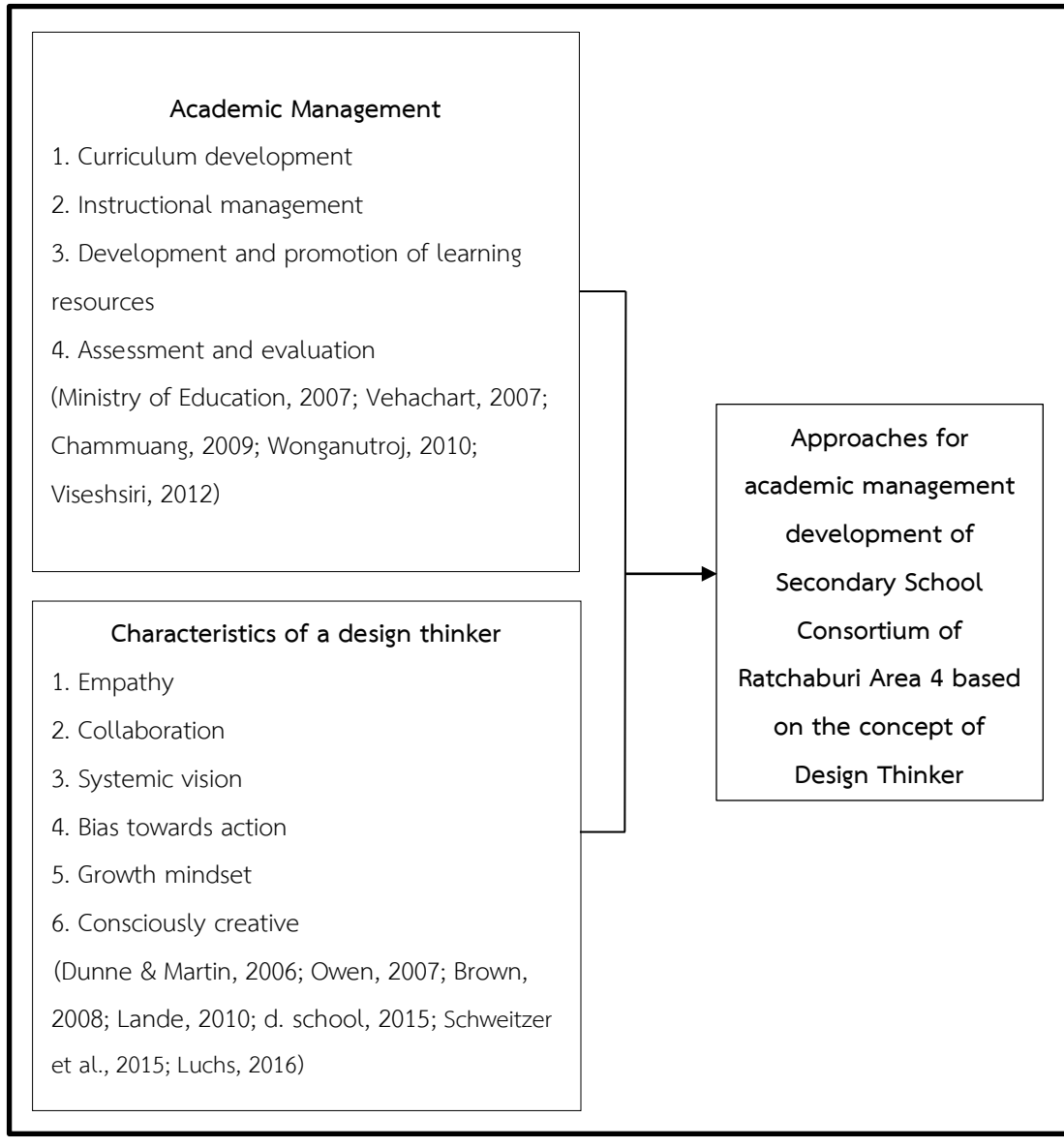
Purpose of the Study

1. To study the priority needs for the academic management based on the concept of Design Thinker in the Secondary School Consortium in Ratchaburi Area 4, and

2. To propose approaches for the academic management development of School Consortium in Ratchaburi Area 4 based on the concept of Design Thinker.

Conceptual Framework

After reviewing various related concepts, theories, and literature, two major concepts are underlying the approaches for academic management of School Consortium in Ratchaburi Area 4 that may lead to the schools' effectiveness in promoting the necessary characteristics of Design Thinker. These two concepts are Academic Management, and Design Thinker. The diagram of the conceptual framework is shown below, followed by the explanation about the two concepts in brief.



1. Academic management consists of four important elements: 1) curriculum development - specifying curriculum purposes and learning experiences to develop a curriculum that emphasizes Design Thinker; 2) instructional management - conducting learning experiences that advocate students to become design thinkers; 3) development

and promotion of learning resources - following up and evaluating the use of learning resources and developing various learning resources that advocate students to become design thinkers and, 4) assessment and evaluation - assessing and evaluating student learning by focusing on the concept of Design Thinker. (Ministry of Education, 2007; Vehachart, 2007; Chammuang, 2009; Wonganutroj, 2010; Viseshsiri, 2012)

2. Characteristics of a Design Thinker consist of six important elements: 1) Empathy – observing which focus on human-centeredness and concern about the environment; 2) Collaboration - working with others and ability to express ideas; 3) Systemic Vision - holistic and mindfulness of process; 4) Bias towards action - focus on action-oriented behavior and prototype-building; 5) Growth Mindset - optimism and flexibility; and, 6) Conscious Creativity - creativity and ability to create new things. (Dunne & Martin, 2006; Owen, 2007; Brown, 2008; Lande, 2010; d. school, 2015; Schweitzer et al., 2015; Luchs, 2016)

Research Methodology

The study was conducted by using a descriptive research method. According to the research objectives, there were two major procedures.

1. Study the priority needs for the academic management based on the concept of Design Thinker in the Secondary Schools Consortium in Ratchaburi Area 4. The research procedure was quantitative, covered the population that comprised five secondary schools: Phothawattanasenee Schoool, Nong Pho Wittaya School, Thamakamwittaya School, Bang Pae Patompittaya School and Pho Hak Wong Sombun Rat Uppatham School. The number of sampled respondents was 503, selected through simple random sampling method (Yamane, 1973). The samples comprised five school directors, 36 heads of departments, 92 teachers, and 370 students within the consortium. The research instrument used in this specific

procedure was a two-part five-level rating scale questionnaire. The first part was about the respondents' background, the second part was about the current state and the desirable state of academic management towards Design Thinker, and the third part was suggested approaches for academic management. The data was analyzed using frequency distribution, percentage, mean, standard deviation, $PNI_{modified}$ and content analysis, to justify the priority needs.

2. Propose approaches for the academic management development of School Consortium in Ratchaburi Area 4 based on the concept of Design Thinker by using findings from questionnaires and literature reviews to draft the approaches. The findings were evaluated by three highly competent experts to justify appropriateness and feasibility of the desirable approaches. The data were analyzed by using frequency distribution. Afterwards, the researcher revised the drafted approaches to propose the complete version of the approaches.

Findings of the study

1. The priority needs index pointed firstly to the development and promotion of learning resources ($PNI_{modified}$ = 0.578), followed by the students' learning assessment and evaluation ($PNI_{modified}$ = 0.543), the curriculum development ($PNI_{modified}$ = 0.461), and the instructional management ($PNI_{modified}$ = 0.425), respectively.

The results of the priority need index of academic management development of Secondary School Consortium of Ratchaburi Area 4 based on the concept of Design Thinker were as presented in the table below.

Table 1 The priority needs index of academic management of Secondary School Consortium in Ratchaburi Area 4 based on the concept of Design Thinker.

Academic Management								
Characteristics of Design Thinker		1. Curriculum Development		2. Instructional Management	3. Development and Promotion of Learning Resources		4. Assessment and Evaluation	**Toal average/ Order**
		1.1 Specifying curriculum purposes. (1)	1.2 Specifying learning experience (2)	2.1 Conducting learning experience (3)	3.1 Improving and supporting the establishment of learning resources (2)	3.2 Following-up and evaluating the use of learning resources (1)	4.1 Assessing and evaluating of student learning	
1. Empathy	Observing	0.463 (6)	0.509 (2)	0.027 (12)	0.519 (10)	0.592 (6)	0.566 (5)	0.446 (12)
	Human-centered focus	**0.597 (1)**	**0.554 (1)**	**0.593 (1)**	0.623 (2)	0.574 (9)	0.551 (6)	0.582 (1)
	Environment-centered concern	0.410 (10)	0.481 (6)	0.453 (9)	0.551 (8)	0.578 (8)	0.464 (11)	0.489 (8)
2. Collabo-ration	Work with other disciplines	0.338 (12)	0.490 (4)	0.455 (8)	0.463 (12)	0.630 (2)	0.482 (10)	0.476 (11)
	Express ideas	0.441 (8)	0.378 (12)	0.441 (11)	0.496 (11)	0.589 (7)	0.520 (8)	0.477 (10)
3. Systemic vision	Holistic	0.462 (7)	0.495 (3)	0.499 (5)	0.567 (7)	0.615 (5)	0.444 (12)	0.513 (6)
	Mindfulness of process	0.375 (11)	0.429 (8)	0.489 (7)	0.535 (9)	0.494 (11)	0.590 (2)	0.485 (9)
4. Bias towards action	Focus on action-oriented behavior	0.416 (9)	0.416 (10)	0.492 (6)	**0.685 (1)**	0.620 (4)	0.586 (3)	0.535 (4)
	Build prototype	0.506 (5)	0.421 (9)	0.565 (2)	0.570 (5)	**0.668 (1)**	0.581 (4)	0.551 (3)
5. Growth mindset	Optimistic	0.509 (4)	0.403 (11)	0.452 (10)	0.586 (4)	0.578 (8)	0.538 (7)	0.511 (7)
	Flexible	0.539 (3)	0.488 (5)	0.516 (4)	0.568 (6)	0.546 (10)	0.518 (9)	0.529 (5)
6. Consciously creative	Creative	0.543 (2)	0.477 (7)	0.519 (3)	0.621 (3)	0.627 (3)	**0.691 (1)**	0.579 (2)
Total average		**0.461**		**0.425**	**0.578**		**0.543**	
Priority need index order		**3**		**4**	**1**		**2**	

According to the results of the priority need index in table 1, the researcher ranked the priority need index of academic management and selected the first priority needs index of each element in the Design Thinker characteristics to propose the approaches.

Afterwards, the qualitative data from the questionnaire and literature review were used to develop the drafted approaches. After the experts evaluated the suitability and feasibility of the approaches by three qualified experts, the draft then was revised according to the experts' comments into the complete version of the approaches. There were four main approaches and six sub-approaches as follows.

Approach 1: Improve and support the establishment of learning resources that enable the students to focus on prototype-building and action-oriented behaviors.

1.1 Improve the following-up and evaluation of learning resource usages by the students for prototype-building.

1.2 Improve and support the establishment of a Makerspace that enables the students to focus on action-oriented behaviors.

Approach 2: Improve the learning assessment and evaluation by focusing on creativity.

2.1 Support the learning assessment and evaluation through action-oriented learning activities.

Approach 3: Develop the curriculum by focusing on cultivating human-centeredness among students.

3.1 Revise the curriculum purposes by focusing on human-centeredness.

3.2 Improve the curriculum by specifying the learning experiences focusing on of human-centeredness.

Approach 4: Improve instructional management that cultivates the quality of human-centeredness in students.

4.1 Support the action-oriented learning activities.

Discussion

The priority needs of academic management of Secondary School Consortium in Ratchaburi Area 4 based on the concept of Design Thinker.

1. Development and Promotion of Learning Resources ($PNI_{modified}$ = 0.578)

The first priority needs index was the development and promotion of learning resources ($PNI_{modified}$ = 0.578). It could be seen that the School Consortium in Ratchaburi Area 4 gave priority to the development and promotion of the learning resources; this went in accordance with its strategic policy regarding the school indicator, which was the percentage of the schools that fostered the educational environment suitable for the students to learn effectively. In accordance with Lor Rex (2017) school should develop and promote learning resources to cultivate design thinking skills and mindsets among students.

1.1 The highest priority needs index of the following-up and evaluation of the learning resource usages subcomponent was the following-up and evaluation of the use of learning resources by the students for the prototype-building. According to Educational Resource Acquisition Consortium (2008) and PEI Department of Education (2008), the following-up and evaluation of the learning resource usages play an important role in enabling students to be creative and become innovators. It also helped the teachers with designing interesting contents. El Mhouti et al. (2013) studied how to evaluate the quality of digital learning resources and found that the lack of following-up and evaluation of the use of learning resources caused the ineffective use of learning resources. Moreover, it was worth noticing that Ministry of Education Thailand (2001) stated that the following-up and evaluating the use of learning resources in three stages: before, during and after using learning resources.

1.2 The highest priority needs index of the establishment of various learning resources subcomponent was the establishment of learning resources that advocated students to focus on action-oriented behaviors. The results suggested that the respondents had the highest expectation for schools to create and develop various learning resources. Kwek (2011) also discussed that school should advocate learning by allocating learning resources to boost creativity, collaboration, and confidence. Lor Rex (2017) emphasized that to successfully adopt Design Thinking process, school was required to develop and provide various learning resources to support the goal of teaching empathy, human-centeredness, and other Design Thinker mindset.

2. Assessment and Evaluation ($PNI_{modified}$ = 0.543)

The second priority needs index was the assessment and evaluation ($PNI_{modified}$ = 0.543). The results reflected that assessment and evaluation still unable to support students to become design thinkers. The schools placed importance on assessment and evaluation as seen from the great emphasised on test taking in previous evaluations. As a result, the students would concentrate on remembering rather than using thinking process. The assessment and evaluation processes should serve not only as an instrument to measure students learning but also as a feedback for their further development. Gallagher (2018) explained that teachers normally used a standardized test to assess and evaluate students' learning. However, it ineffectively reflected the real performance of the students. Furthermore, Stanford d. school, where the Design Thinking course was offered, did not use formal assessment to assess students' creative abilities either. Therefore, it was essential for a school to develop assessment and evaluation to enable students to become design thinkers.

3. Curriculum Development ($PNI_{modified}$ = 0.461)

The third priority needs index was curriculum development ($PNI_{modified}$ = 0.461).

This might be due to the fact that the school directors and the teachers acknowledged the problems of implementing the core curriculum and the school curriculum without integrating or promoting the students to construct their own knowledge through problem-based learning until reaching innovation. Dunne and Martin (2006), Koh et al. (2015) suggested that schools enrich the curriculum development and changed from content-based curriculum to problem-based one in order to foster students to become design thinkers. The benefit students would receive from curriculum development was that they would be equipped with complex problem-solving skills that were indispensable for future careers.

4. Instructional management ($PNI_{modified}$ = 0.425)

The fourth priority needs index was instructional management ($PNI_{modified}$ = 0.425). The current state was moderate ($\bar{X}$ = 3.01) and the desired state was the highest ($\bar{X}$ = 4.29). Instructional management had moderately operated in schools. On the other hand, the data suggested that the respondents had a high expectation for schools to enhance instructional management. This was because the school directors, teachers, and students recognized the importance of the practical lesson that allowed students to practice. However, with some incongruence in time and the curriculum, it was hardly possible for such lessons to take place in school. In accordance with Kwek (2011), who suggested that school should enhance instructional management to foster students to become design thinker, adopting the complex problem solving, building prototype, and multidisciplinary collaborative approach would prompt students to develop design thinker mindset such as creativity, empathy, and human-centeredness. The provided instructional management did not place emphasis upon content-oriented education in order to be able to solve the future problems. Carrol (2014) also suggested that school could provide instructional management that enhances design thinker mindset, particularly on human-centeredness, empathy, prototyping

and collaboration through the learning approach called project-based learning which could be adopted in STEM subject.

Approaches for academic management development of Secondary School Consortium Ratchaburi Area 4 based on the concept of Design Thinker

Approach 1: Improve and support the establishment of learning resources that enable the students to focus on prototype-building and action-oriented behaviors

1.1 Improve the following-up and evaluation of learning resource usages by the students for prototype-building

According to the Saskatchewan, Ministry of Education (2008), school should follow up and evaluate of the learning resource usages that advocate teaching and learning, as well as support students to achieve curriculum objectives by allowing students to build prototype, discover, and explore. Moreover, Prince Edward Island Department of Education (2008), elaborated the four evaluation criteria which consisted of curriculum content, instructional design, technical design, and social considerations, all of which were needed to acknowledge hands-on activities. The evaluators were required to consider whether the learning resources would benefit the teaching and learning goals especially prototyping and creativity. Furthermore, it needed to serve various styles of teaching and learning. The evaluation should be conducted annually by the evaluation committee consisted of school director, teachers and students.

1.2 Improve and support the establishment of a Makerspace that enables the students to focus on action-oriented behaviors

It was undeniable that nowadays learning resources in schools were the important factor that endorsed the students' learning and developing of 21st century skills, especially the Makerspace which helped integrating the knowledge through

practice to foster their own innovation. An effective way of fostering students to experience hands-on learning was that school should invest in providing the Makerspace for students since it would inspire them with creativity and encourage innovation. (The White House Office of the Press Secretary, 2014). Students would have a chance to work with others, learn to solve problem, and, most importantly, from action-oriented behavior. Taylor (2016) and Graves (2014) also proposed that Makerspace was a place equipped with tools, materials, media and resources that could stimulate students to be creative and innovative from experimenting, building prototype and making new project with students from different disciplines.

Approach 2: Improve the learning assessment and evaluation by focusing on creativity

2.1 Support the learning assessment and evaluation through action-oriented learning activities

Hawthorne et al. (2014) proposed that the creativity assessment and evaluation could be conducted through Design Thinking process which was to observe, brainstorm, synthesize, prototype, and iteration. Furthermore, Royalty et al. (2014) developed the instrument which evaluated creativity using Torrance Tests of Creative Thinking (TTCT) that reflected creative problem-solving in real world situation. It was suggested that the assessment and evaluation focusing on creativity should accentuate students' key competencies included flexibility, comfort with ambiguity, creative process, tolerating failures, and creative problem solving.

Approach 3: Develop the curriculum by focusing on cultivating human-centeredness among students

3.1 Revise the curriculum purposes by focusing on human-centeredness

The characteristics of Design Thinker were an important aspect for developing and preparing the students to be innovative designers. The school curriculum needed

to adjust curriculum purposes and learning experiences to be compatible with students' needs as well as the ever-changing world so that the students could create innovation from their experience. Wonganutroj (2010) proposed five procedures of curriculum development: 1) analyzing learner's needs, 2) setting out the intent of curriculum, 3) selecting and structure the content, 4) selecting the learning experience, and 5) assessment. Moreover, Carroll (2014) stressed that curriculum should focus on Design Thinking mindset (empathy, human-centered focus) and also the end goals should be prompting students to be innovators - capable of developing innovation, solving problem, as well as working with others. What was worth taking point was that the curriculum developers were required to understand the need of the end-users, namely the students. Christoph Meinel Hasso-Plattner-Institute (2020) proposed that setting out the clear purposes of curriculum helped accelerate students to achieve the purposes and helped teachers to effectively manage learning activities. Though the process of Design Thinking, which was considered as skill-based outcomes, could be learned in a short period of time with the assistance of teachers, the Design Thinking mindset such as human-centered and empathy as put in affective outcomes would require more time to develop and need constructive feedback from teacher. Therefore, teachers should pay attention to and give more time on learning experience in which students develop empathy, human-centered focus, or in-depth interview.

3.2 Improve the curriculum by specifying the learning experiences focusing on of human-centeredness

Carroll (2014) explained that students need to be the center of learning. The lesson should focus on learning from activity, authentic and practical experiences rather than content-based curriculum. The design of learning experience would change from content-based curriculum to problem-based. Duening (2008) recommended that it is necessary to provide collaborative atmosphere, emphasizing on student engagement

and interdisciplinary learning. The emphasis should be placed on activities, projects, or real-life problems where student can develop empathy and human-centeredness and be able to solve problems for their users. Dunne & Martin (2006) further explained that the advantage of this learning experience was that students have a chance to experience self-directed learning, and thus know how to solve problems, which were applicable skills for their future.

Approach 4: Improve instructional management that cultivates the quality of human-centeredness in students

4.1 Support the action-oriented learning activities

It is suggested that the school should organize the lessons where students' human-centeredness and empathy are nourished, leading to further innovations. In order to support that, problem-based learning and experiential learning should be adopted as the main methods. Roozenburg et al. (2011) claimed that, in teaching and learning that aimed to develop a human-centered attitude, students were required to work with real people who will be their product/ innovations users. Kolb (1984) also proposed that human-centered attitude can be developed through experiential learning. For instance, the assigned project work should promote authentic learning experience that is challenging but not intimidating for the students to accomplish with their existing skills. The role of teachers was just to give feedback, not to provide information or to teach. Moreover, the teachers had to urge student to ask the right questions, observe, and interview in order to foster them to have human-centered attitude and be capable of building a meaningful innovation for users. Dewey (1938) suggested that school should employ problem-based learning approach so that students will have a chance of learning by doing. He emphasized that the problems used in learning should be real-life problems. Students are required to use human-

centered approach to engage in acquiring information and understand the users' needs.

Recommendations

1. The school director should focus on the following-up and the evaluation of the use of learning resources that support students' prototyping as a priority. According to the findings of the study, the current state of the following-up and evaluation of the learning resources usage that support students to build prototype was low. Learning resources evaluation should be conducted annually before, during, and after using by the evaluation committee which consisted of a school director, teachers and students. The evaluation consists of four criteria to consider which are curriculum content, instructional design, technical design and social considerations. Furthermore, the school director needs to ensure that the learning resources will not fail to support the various styles of teaching and learning.

2. The school director should implement a Makerspace as a learning resource to help students focus on action-oriented behaviors. With Makerspace, students will have a chance to work with others, experiment, learn to solve problems, and most importantly, foster action-oriented behaviors. The school director needs to assure that the Makerspace is equipped with tools, materials, media and resources that could prompt students to be creative and use practical methods which involve dealing with problems.

3. The school director should enforce the creativity assessment and evaluation by focusing on creative problem-solving in real world situation. According to the findings of the study, the school should clearly set the creativity assessment and evaluation criteria. Furthermore, the evaluation could be assessed through creative problem-solving in real world situation and conducted through Design Thinking

process: observe, brainstorm, synthesize, prototype, and iteration. Furthermore, students will be assessed in terms of the key competencies such as flexibility, comfort with ambiguity, creative process, tolerating failures, and creative problem solving.

4. The school director should revise curriculum purposes and specify learning experiences in the aspect of human-centered focus. According to the findings of the study, the school director needs to ensure that every teacher has a deep comprehension of the aim of the curriculum which focus on Design Thinking mindset (e.g., empathy and human-centeredness) and also the end goals were enabling students to be innovators who could create solutions that reflect strong focus on understanding the needs and desires of the end users. The design of learning experience changes from content-based curriculum to problem-based one and pays particular attention on interdisciplinary atmosphere that encourage students to develop empathy and human-centeredness and be able to solve problems for their users.

5. The school director should develop instructional management by encouraging teachers to utilize experiential learning and problem-based learning in their classrooms. According to the findings of the study, the school director needs to assure that teachers thoroughly and accurately understand the aforementioned learning approaches, which are expected to be implemented in the curriculum integration and used efficiently by the teachers. Students are the center of learning while teachers shift their roles from a lecturer to a facilitator. Moreover, these approaches promote the development of creative problem solving, prototyping, and, particularly, human-centered attitude which enhance creating solutions that reflect strong emphasis on understanding the needs and desires of the end users.

Future Research

Since the human-centeredness mindset has the highest priority need index in both of subcomponents in curriculum development, it is necessary for secondary schools to recognize the importance of human-centeredness and cultivate in-depth exploration of how human-centeredness could be integrated in curriculum for interdisciplinary application. The future research could explore how to develop the human-centered curriculum to prompt students to truly work together in an interdisciplinary environment as the key point of Design Thinking is to allow students from different disciplines to creatively work together.

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