กลยุทธ์การบริหารวิชาการตามแนวคิกระบวนการคิดเชิงออกแบบเพื่อการพัฒนาอย่างยั่งยืนสังกัดสำนักงานเขตพื้นที่การศึกษาประถมศึกษานครราชสีมา เขต 4 [1]

Strategy for Academic Management Based on Design Thinking for Sustainable Development of Nakhoratchasima Primary Educational Service Area Office 4

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บทคัดย่อ

การวิจัยครั้งนี้เป็นการวิจัยเชิงปริมาณโดยมีวัตถุประสงค์เพื่อศึกษาสภาพปัจจุบันและสภาพที่พึงประสงค์ วิเคราะห์จุดแข็ง จุดอ่อน โอกาส ภาวะคุกคาม และความต้องการจำเป็นการบริหารวิชาการตามแนวคิดกระบวนการคิดเชิงออกแบบเพื่อการพัฒนาอย่างยั่งยืน และเพื่อนำเสนอกลยุทธ์การบริหารวิชาการตามแนวคิกระบวนการคิดเชิงออกแบบ เพื่อการพัฒนาอย่างยั่งยืน ตัวอย่างในการวิจัย คือ โรงเรียนในสังกัดสำนักงานเขตพื้นที่การศึกษาประถมศึกษานครราชสีมา เขต 4 จำนวน 124 โรงเรียน ผู้ให้ข้อมูล ได้แก่ ผู้อำนวยการ รองผู้อำนวยการโรงเรียนฝ่ายวิชาการ ครูระดับประถมศึกษาตอนต้น และครูระดับประถมศึกษาตอนปลายรวมทั้งสิ้น 496 คน โดยมีผู้ตอบแบบสอบถาม จำนวน 412 คน คิดเป็น 83.06% เครื่องมือที่ใช้ได้แก่ แบบสอบถามสภาพปัจจุบันและสภาพที่พึงประสงค์ และแบบประเมินความเป็นไปได้และความเหมาะสมของกลยุทธ์ฯ เป็นแบบประเมินค่า 5 ระดับ มีค่า IOC ระหว่าง .67 - 1.00 และมีค่าความเชื่อมั่นเท่ากับ .92 สถิติที่ใช้ได้แก่ ความถี่ ร้อยละ ค่าเฉลี่ย ส่วนเบี่ยงเบนมาตรฐานและค่าดัชนีความต้องการจำเป็นแบบปรับปรุง และการวิเคราะห์เนื้อหา

ผลการวิจัยพบว่า สภาพปัจจุบันของการบริหารวิชาการตามแนวคิดกระบวนการคิดเชิงออกแบบเพื่อการพัฒนาอย่างยั่งยืนสังกัดสำนักงานเขตพื้นที่การศึกษาประถมศึกษานครราชสีมา เขต 4 จากการวิเคราะห์สภาพภายในโดยภาพรวมพบว่า มีค่าเฉลี่ยอยู่ในระดับ มาก (= 3.831 S.D. 0.738) และระดับที่พึงประสงค์ ระดับมาก (= 4.350 S.D. 0.839) และความต้องการจำเป็น พบว่า การพัฒนาหลักสูตร และการพัฒนาสื่อ นวัตกรรม เทคโนโลยีเพื่อการศึกษาและแหล่งเรียนรู้อยู่ในกลุ่มสูงซึ่งเป็นจุดอ่อน (PNImodified = .147) และการวัดประเมินผลอยู่ในกลุ่มสูงซึ่งเป็นจุดอ่อน (PNImodified = .141) และปัจจัยภายนอก สภาพเทคโนโลยีอยู่ในกลุ่มสูงซึ่งเป็นจุดอ่อน (PNImodified = .147) การพัฒนาสื่อ นวัตกรรม เทคโนโลยีเพื่อการศึกษา และแหล่งเรียนรู้ อยู่ในกลุ่มสูงซึ่งเป็นจุดอ่อน (PNImodified = .184) ซึ่งนำมากำหนดกลยุทธ์เป็น 3 กลยุทธ์หลัก และ 7 กลยุทธ์รอง ดังนี้ 1) พัฒนาหลักสูตรสถานศึกษาที่เน้นกระบวนการคิดเชิงออกแบบที่เสริมสร้างทักษะความสามารถของผู้เรียน กลยุทธ์รอง (1.1) พัฒนาหลักสูตรและกระบวนการเรียนรู้ที่เน้นกระบวนการคิดเชิงออกแบบที่เสริมสร้างการคิดเชิงนวัตกรรม(1.2) พัฒนากระบวนทัศน์ การจัดการเรียนรู้ให้สอดคล้องกับการพัฒนาที่ยั่งยืน 2) พัฒนาสื่อนวัตกรรม เทคโนโลยีเพื่อการศึกษา และแหล่งเรียนรู้ที่เน้นกระบวนคิดเชิงออกแบบที่เสริมสร้างทักษะความสามารถของผู้เรียน กลยุทธ์รอง (2.1) พัฒนาและส่งเสริมการใช้สื่อนวัตกรรม เทคโนโลยีในจัดการเรียนรู้ที่เสริมสร้างทักษะความคิดเชิงนวัตกรรมอย่างยั่งยืน (2.2) พัฒนาและประยุกต์ใช้สื่อ นวัตกรรม เทคโนโลยีในการบ่มเพาะและต่อยอดพัฒนาความคิดเชิงนวัตกรรม 3) พัฒนากระบวนการวัดและประเมินผลที่เน้นกระบวนคิดเชิงออกแบบที่เสริมสร้างทักษะความสามารถของผู้เรียน

(3.1) พัฒนากระบวนการวัดและประเมินผลผู้เรียนที่สะท้อนคิดเชิงออกแบบและทักษะความสามารถในการคิดเชิงระบบ (3.2) พัฒนาเทคโนโลยีในการวัดและประเมินผลผู้เรียนในการแก้ปัญหาอย่างบูรณาการอย่างสร้างสรรค์ (3.3) พัฒนาระบบการนำผลการประเมินผู้เรียนมาวิเคราะห์พัฒนาต่อยอดนวัตกรรมที่เน้นความยั่งยืน

คำสำคัญ: การคิดเชิงออกแบบ, การพัฒนาอย่างยั่งยืน, การบริหารวิชาการ

Abstract

The qualitative research has to the objectives to investigate the current and desirable states; analyze the strengths, weaknesses, opportunities, threats, and the needs for academic management based on the design thinking for sustainable development; and to propose strategies for academic management based on the design thinking for sustainable development. It adopted a quantitative research approach and included a sample of 124 schools under the Nakhonratchasima Primary Educational Service Area Office 4. A total of 496 informants consisted of school directors, deputy directors in academic affairs, primary school teachers, and secondary school teachers. There were altogether 412 respondents or 83.06%. Instruments employed were a current and desirable states questionnaire, and a strategies feasibility and propriety evaluation form as a 5-point rating scale with IOC in a range of .67 - 1.00 and reliability of .92. Statistics employed frequency, percentage, mean, and standard deviation, including Priority Needs Index ($PNI_{Modified}$), and content analysis.

Results reported that the current and desirable states of academic management based on the design thinking for sustainable development of Nakhonratchasima Primary Educational Service Area Office 4 as analyzed for the internal factors in overall was found with mean at a high level (= 3.831 S.D. 0.738) for the current state, and at a high level (= 4.350 S.D. 0.839) for the desirable state. The needs for curriculum development, development of educational media, innovations, technologies, and learning sources were at a high level, as weaknesses ($PNI_{modified}$ = .147), and the measurement and evaluation was at a high level, as weakness ($PNI_{modified}$ = .141). For external factors, the state of technologies was at a high level, as weakness ($PNI_{modified}$ = .147); and the development of educational media, innovations, technologies, and learning sources was at a high level, as weaknesses ($PNI_{modified}$ = .184). Hence, 3 main strategies and 7 sub-strategies were determined as follows. Main strategy 1: Developing school curriculum focusing on design thinking to enhance learner's skills and abilities. Sub-strategies: 1.1 Developing a curriculum and learning process focusing on design thinking to enhance innovative thinking; 1.2 Developing paradigms and learning management to align with sustainable development. Main strategy 2: Developing educational media, innovations, technologies, and learning sources focusing on design thinking to enhance learner's skills and abilities. Sub-strategies: 2.1 Developing and promoting the use of media, innovations, and technologies in learning management to enhance sustainable innovative thinking skills; 2.2 Developing and applying media, innovations, and technologies to cultivating, extending, and developing innovative thinking. Main strategy 3:

Developing a measurement and evaluation process focusing on design thinking to enhance learner's abilities. Sub-strategies: 3.1 Developing a process to measure and evaluate learners to reflect their designed thinking, systems thinking skills and abilities; 3.2 Developing technologies to measure and evaluate learners in integrative and creative problem solving; 3.3 Developing a system to bring the learner evaluation results to the analysis and development for extending sustainable innovations.

Keyword: Design Thinking, Sustainable Development, Academic Management

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Introduction

The 21st century competition on the innovative design and creation is regarded the key substance. Creativity and innovation, critical thinking and problem solving, communication, and collaboration are essential skills (Mandi Dimitriadis, 2022). Today, design thinking is not an exclusive skill of only designers, but it can be applied to develop learners to become critical thinkers, talented designers, competent communicators, collaborators, as people involved in society (Luka, 2020) Malekzai (2023) conducted a research on design thinking for creativity and innovation at schools and found that several impacts had posed the need to change strategies. Traditional tactics are deemed ineffective and behind the times for changes, and it is necessary to use new tools and methods such as teaching students design thinking. Excellent design thinking abilities can help students solve highly complicated challenges and adapt to unanticipated circumstances (Luka, 2020). The design process requires in-depth cognitive processes, and character and attitudinal attributes such as resilience and innovation (Bennett & Cassim, 2017). Design thinking is an effective teaching technique as students learns to solve the real-world problems. Using this method in a classroom is however complicated (Rusmann & Ejsing-Duun, 2022). To prepare students for new skills essential to future works, it is necessary to teach students on how they can use their thought effectively. The positive change brought by the design thinking is the culture change of work collaborations as it cultivates optimistic and action-oriented attitudes toward each other, promotes learning exchange to collectively develop innovations and respect towards one another (Rusmann & Ejsing-Duun, 2022).

Educational management following the National Educational Plan (2017 – 2036) in line with the principles for national development as defined in The Thirteenth National Economic and Social Development Plan embraced the 5 principles including 1) Restructuring of production towards innovation-based economy; 2) Developing human towards the new age world 3) Directing towards the society of opportunity and fairness; 4) Transitioning the production and consumption towards sustainability; and 5)

Enhancing Thailand's competency to cope with risks and changes under the new emerging diseases. Accordingly, the goals and indicators of educational management need to align with the framework of goals for economic, social, and environmental development which is sustainable development as defined by the United Nations. The concept of educational administration and management complying with the national education plan adopted the 4 key principles on education for all, inclusive education, sufficiency economy, and all for education. It also regards the sustainable development goals: SDGs (2030).

During the past decade, there has been an increase of incorporating design thinking into school educational management especially among lower secondary school students (Li & Zhan, 2022). Nakhonratchasima Primary Educational Service Area Office 4 has continued to drive the implementation to raise the academic achievement among its affiliated schools, but the result of academic assessment reported a less success than expected. Students' academic achievement in each learning substance group was below 50% of the full marks (Nakhonratchasima Primary Educational Service Area Office 4, 2023). The global competitiveness ranking among children and youth from 141 countries indicated that Thailand's competitiveness ranking has dropped from 38th to 40th place, and one of the factors that pulled down Thailand's ranking was critical thinking teaching with the lowest scores of only 37 out of 100. A research conducted by Pungpond Rukumnuaykit and Yotsawee Saifah (Ministry of Education (2020) had investigated the factors on students, schools, time use, and families and found that there were only 1.09 % of Thai students who had scores above 60% in every subject. Additionally, students with good learning outcomes had significantly lower analytical thinking skills and public mind than those with lower learning outcomes. Students with extra-tutorial session had better analytical thinking ability than those without it, suggesting that the existing school education system did not support student development in critical thinking. It thus requires that people involved should consider improving curriculum and instructional process that aims to facilitate enhanced analytical thinking development of students. Knowledge on academic management should also be established and applied to leap forward the development of organizational management. These will result in the development of education to affect the desired quality of students and subsequent community development in terms of socio-economic and environment aspects that promote sustainable development.

Research Objectives

The researcher specified the research objectives as follows.

1. To investigate the current and desirable states of academic management based on the concept of design thinking process for sustainable development of the Nakhonratchasima Primary Educational Service Area Office 4.

2. To analyze the strengths, weaknesses, opportunities, threats, and the needs for academic management based on the design thinking for sustainable development of the Nakhonratchasima Primary Educational Service Area Office 4.

3. To propose the strategies for academic management based on the design thinking for sustainable development of the Nakhonratchasima Primary Educational Service Area Office 4.

Methodology

In this research on academic management strategies based on the design thinking for sustainable development of the Nakhonratchasima Primary Educational Service Area Office 4, the researcher carried out the following procedures.

Stage 1: Investigating the current and desirable states of academic management based on the concept of design thinking process for sustainable development of the Nakhonratchasima Primary Educational Service Area Office 4. The background information of questionnaire respondents was analyzed using descriptive statistics to find frequency distribution and percentage. The current and desirable states were analyzed and mean, and standard deviation were determined. The analysis was performed for the overall state and for separated states by internal and external environments.

Stage 2: Analyzing the strengths, weaknesses, opportunities, threats, and the needs for academic management based on the design thinking for sustainable development of the Nakhonratchasima Primary Educational Service Area Office 4. The result from stage 1 was taken to the analysis.

Stage 3: Preparing the drafted strategies for academic management based on the design thinking for sustainable development of the Nakhonratchasima Primary Educational Service Area Office 4. The drafted strategies were evaluated by 15 experts individually and revised accordingly. The finalized strategies for academic management based on the design thinking for sustainable development of the Nakhonratchasima Primary Educational Service Area Office 4 were proposed.

Results

The determination of strategies was based on the investigation of current and desirable states of academic management with the design thinking process for sustainable development of the Nakhonratchasima Primary Educational Service Area Office 4. The overall current state was found with a high level of mean ($\overline{X}$ = 3.811). Investigation of individual aspect suggested a high level of mean for curriculum development ($\overline{X}$ = 3.831), followed by a high level of learning management and arrangement of extra-curricular activities ($\overline{X}$ = 3.823).

Regarding the current state of external factors, the 4 aspects of external factors including the economic state, technological state, political state, and social state were found with a high level of mean ($\overline{X}$ = 4.408). For individual aspect, technological state was at a high level ($\overline{X}$ = 4.434), followed by political state at a high level ($\overline{X}$ = 4.432). The analysis showed the strengths as learning management and arrangement of extra-curricular activities ($PNI_{modified}$ = 0.131); the weaknesses as curriculum development

($PNI_{modified}$ = 0.147), development of educational media, innovations, technologies and learning sources ($PNI_{modified}$ = 0.147), and measurement and evaluation ($PNI_{modified}$ = 0.141).

Opportunities and threats included the following.

1) Social state ($PNI_{modified}$ = 0.134) was the opportunities for learning management and arrangement of extra-curricular activities, which was the threats for curriculum development, measurement and evaluation, and development of educational media, innovations, technologies, and learning sources.

2) Economic state ($PNI_{modified}$= 0.135) was the opportunities for learning management and arrangement of extra-curricular activities, measurement and evaluation, and development of educational media, innovations, technologies, and learning sources, which was the threat for curriculum development.

3) Political state ($PNI_{modified}$= 0.136) was the opportunities for learning management and arrangement of extra-curricular activities, which was the threats for curriculum development, measurement and evaluation, and development of educational media, innovations, technologies, and learning sources.

4) Technological state ($PNI_{modified}$ = 0.147) was the threats for measurement and evaluation, and development of educational media, innovations, technologies, and learning sources, but was the opportunities for curriculum development, learning management and arrangement of extra-curricular activities.

The analysis of strengths, weaknesses, opportunities, and threats was taken to determine strategies for school management based on the design thinking process for sustainable development of the Nakhonratchasima Primary Educational Service Area Office 4, which comprises 3 main strategies and 7 sub-strategies below.

Main Strategy 1: Developing a school curriculum focusing on design thinking to enhance learner's skills and abilities.

Sub-Strategy 1.1: Developing a curriculum and learning process focusing on design thinking to enhance learner's innovative thinking.

Sub-Strategy 1.2: Developing a paradigm and a learning management to align with sustainable development.

Main Strategy 2: Developing educational media, innovations, technologies, and learning sources focusing on design thinking to enhance learner's skills and abilities.

Sub-strategy 2.1: Developing and promoting the use of media, innovations, and technologies in the learning management to enhance learner's sustainable innovative thinking skills.

Sub-Strategy 2.2: Developing and applying media, innovations, and technologies to cultivate, extend, and develop innovative thinking of learners.

Main Strategy 3: Developing a measurement and evaluation process focusing on design thinking to enhance learner's skills and abilities.

Sub-strategy 3.1: Developing a process to measure and evaluate learners to reflect their design thinking, systems thinking skills and abilities.

Sub-Strategy 3.2: Developing technologies to measure and evaluate learners in integrative and creative problem solving.

Sub-Strategy 3.3: Developing a system to bring the results of learner evaluation to further analyze and develop to extend sustainable innovations of learners.

Research Findings

The present research result clearly showed that the current state of academic management was at a high level similarly to the desirable state, suggesting that schools placed importance on the design thinking process but it was not much effective. The issue of concern according to the 2019 World Economic Forum (WEF) Report is that Thailand's competitiveness ranking has dropped from 38th to 40th place due to the critical thinking teaching with the lowest scores of only 37 out of 100. Hence, in educational management process, strategies should be explicitly identified and can be put into concrete actions. In addition, schools should organize the learning and extra-curricular activities to develop a design thinking process that enhances students' ability to work with others. In this study, one of the main strategies being proposed is to develop school curriculum that focuses on the design thinking process to enhance students' skills and abilities, with sub-strategies including the development of curriculum and learning process focusing on design thinking to enhance learner's innovative thinking; and the development of a paradigm and learning management to align with sustainable development. This will guide in formulating a school management plan directing to developing a curriculum that is practical to instructional management with an aim to develop students' knowledge and abilities in creative thinking to develop innovations. Similarly to the guidelines for management development and curriculum development with integrated design thinking process for sustainable development suggested by Dechakup and Yindeesuk (2017) education in Thailand 4.0 comprises 1) curriculum construction skills, 2) child-oriented instructional management, 3) classroom innovation implementation skills, 4) classroom learning assessment skills, 5) classroom action research skills, 6) classroom management skills, and 7) character development skills. In addition, a competency-based curriculum management and development as a solution for Thai education was introduced by Rangubtook (2020) It is a curriculum oriented to students and aimed at developing and equipping students with required skills, link across disciplines, and real life practicality. The curriculum allows for flexibility and adjustability upon different needs of students, teachers, way of life, culture, ethnicity, as well as the social and global contexts. Consistently, Jimatong and Wibooncharoensuk (2023) suggested that learning management applying the design thinking process may rise primary school students' abilities in analytical thinking to solve problems with thorough observation and probably profound learning than the normal learning. In this way, students learned through experiences and problem solving with sequential solutions. They were able to think analytically and critically to build up creative solutions using informed surrounding factors and learning from diverse views. These encouraged students to use problem solving skills more efficiently. Khamthana (2020) in a study on the development of a design thinking

curriculum for promoting innovation competency of nursing students at Boromarajonani College of Nursing in Ratchaburi province provided a conclusion that the design thinking curriculum was effective to enhance innovation competency of nursing students.

Result on the priority needs showed that the development of educational media, innovations, and technologies was at a high level of need, suggesting that, other than curriculum development, the need for this area was also high. It is thus necessary to introduce a strategy to ensure that the instructional management attains the learning goals by determining a strategy for developing educational media, innovations, technologies, and learning sources focusing on the design thinking process to enhance students' skills and abilities. This is the application of development concept based on the design thinking to outline educational media development. The proposed strategy contains a sub-strategy for developing and promoting the use of media, innovations, and technologies that enhance a sustainable innovative thinking and skills; and a sub-strategy for developing and applying media, innovations, and technologies to cultivate and further develop innovative ideas. A policy can be formulated accordingly for the learning management to affect students' skills in developing innovations in a sustainable manner. Chamchoy (2012) described that the current age world of the 21st century is the time for knowledge-based-economy where factors of production and competition are changing and become intangible. Innovation development is one way to help every organization to establish a stronger standpoint as innovative organization with the goals to survive, grow, and build sustainable competitive performance. Instructional management needs to take into account the development of a measurement and evaluation process that underlines the design thinking process to enhance students' skills and competencies, as a strategy for comprehensive educational management process. According to the Ministry of Education (2020) the knowledge and understanding of instruction providers might not be inclusive for the curriculum content; technological illiteracy might tarry the instruction; the convey of knowledge and instructional management might be loosen, instructors might have insufficient time to teach but excessive tasks, and so on. In this respect, educational management towards the 21st century with respect to evaluation should emphasize on evaluation for learning development. This includes the measurement and evaluation of students' skills, process, competency, and potentiality, as well as their authentic learning outcomes. Curriculum and instructional management to foster innovative competency of students needs to integrate different and modern learning styles. The key concepts is self-construction of knowledge (Constructivism) in which learners build their knowledge from the relations of what they experienced with their pre-existing knowledge and understanding. Instructors take part to encourage learners' mental effort, questioning, and finding answers through learning by doing so that they investigate and acquire thorough knowledge by themselves in a real situation in combination with design thinking as an important tool to create innovations systematically. Results of the present study also found that technological state had the highest mean. This is because information technology has now come to play a crucial role in educational administration of school administrators and effective learning management of school teachers. Information technology also facilitates in carrying out various school affairs.

The study by Liangcheepchop (2018) stated that the application of technologies in school academic management will have a positive effect and support students' learning with new methods via a variety of technologies. According to Thailand Development Research Institute (2014) learning must combine technologies with the content and teaching methods using technologies to support new learning theories and in developing content and skills. In addition to making use of technology in the learning management process, technology can also be utilized in the process to measure and evaluate learning outcomes, facilitating teachers to evaluate learning outcomes conveniently and quickly with reduced time. The evaluation results can also be taken to develop and correct shortcomings in learning management instantly. It is an innovation used as a tool for measuring and evaluating effectively and rapidly. Moreover, the application of computer programs can support student measurement and evaluation. Examples of innovations in evaluation include the development of test banks, registration via computer network and internet, using smart cards to use the services of educational institutions, using computers for grading, etc. (Puarungtoj et al., 2017). Rungruanphon et al. (2019) mentioned about the change of measurement method to focus more on practicality and creativity. Grading should be adjusted taking into account students with analytical thinking ability to solve problems, creativity, and practicality to be graded high instead of measuring their recognition ability to answer the test or documentary report. This is a pivotal factor to strengthen academic administration in terms of content management, data collection, systemic learning, and rapid and continual learning evaluation system.

References

Bennett, A. G., & Cassim, F. (2017). How Design Education Can Use Generative Play to Innovate for Social Change: A Case Study on the Design of South African Children's Health Education Toolkits. 11(2).

Chamchoy, S. (2012). Concept of Innovation for School Management in the 21st Century. Journal of Education Naresuan University, Faculty of Education, Naresuan University, 14(2), 117-128.

Department of Economic and Social Affairs. (2023). Sustainable Development Goals: SDGs 2030. http://tdri.or.th/wpcontent/uploads/2014/06/wb103.pdf [16 August 2023].

Dechakupt, P. and Yindeesuk, P. (2017). *7Cs Skills of Teachers 4.0.* Bangkok: Chulalongkorn University Press.

Khamthana, P. (2563). *A Handbook for Design thinking Curriculum for promoting Innovation Competency of Nursing Students, Boromarajonani College of Nursing, Ratchaburi.* Bangkok: Charansanitwong Printing Co.,Ltd.

Jimatong**,** N. and Wibooncharoensuk, P. (2023). *Teaching with Using Design Thinking for Primary Grade Students.* Thai Journal Citation Index Center*,* 8(4).

Li & Zhan, 2022 Li, T., & Zhan, Z. (2022). A Systematic Review on Design Thinking Integrated Learning in K-12 Education. Applied Sciences, 12(16), 8077. https://doi.org/10.3390/app12168077

Liangcheepchop, P. (2018). *Academic Management Strategies of Primary Schools based on the Concept of Thais 4.0*. Chulalongkorn University, Faculty of Education.

Luka, I. (2020). Design Thinking in Pedagogy. Journal of Education Culture and Society, 5(2), 63–74. https://doi.org/10.15503/jecs20142.63.74

Malekzai, Z. (2023). Design Thinking for Creativity and Innovation at Schools. Program Master of Arts in education: https://pressbooks.pub/

Mandi D. (2023). Makers Empire: https://creativespacessummit.com/Speaker/mandi-dimitriadis/

Ministry of Education. (2000). Interested Article, Research Indicating Students with Good Marks Having Lower Analytical thinking Skills-Public Mind, https://www.moe.go.th/

Ministry of Education. (2000). *Policy and Main Emphasis of the Ministry of Education, Fiscal Year 2000*. https://www.bkkedu.in.th/

Nakhonratchasima Primary Educational Service Area Office 4. (2023), https://www.korat4.go.th/

Office of the Permanent Secretary for Education. (2020). Strategic Plan of the Ministry of Education (2020 – 2022). (n.d.)

Office of the National Economic and Social Development Board. (2018). *20-Year National Strategy* (2017-2036).

Puarungroj, W. et.al., (2017). *Trends in Modern Teaching and Learning Methods using. Online Formative Assessment Tools*. Walailak Journal of Learning Innovations, 3(2), 45-68.

Rusmann, A., & Ejsing-Duun, S. (2022). When Design Thinking Goes to School: A Literature Review of Design Competences for the K-12 Level. International Journal of Technology and Design Education, 32(4), 2063 - 2091. https://doi.org/10.1007/s10798-021-09692-4

Rengubtook, W. (2020). *Thai Learners' Key Competencies in a VUCA World.* Journal of Teacher Professional Development, 1(1), pp. 8-11.

Rungruanphon, W., Wattanasuwan, K. and Teerakapiban. S. (2019). *Revising the Curriculum and Teaching Style to Prepare Marketers for the Thailand 4.0 Era*. Journal of Multidisciplinary Academic Research and Development, 1(1), 2019: 1-27.

Thailand Development Research Institute. (2014). *Formulation of Strategies for Basic Education Reform with Accountability*. Retrieved from:

World Economic Forum (WEF) 2019. https://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf