Study of Perspectives towards the Development of the Gamified Computational Thinking Platform with AI Prompt Engineering

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Abstract **– The gamified computational thinking platform with AI prompt engineering was fabricated with the concepts of online learning technology and artificial intelligence technology, combined with the theories of systems approach. The said platform is also intended for use as a supporting tool for self-learning by doing, in which learners are able to interact and have conversation with others promptly through their mobile phones anywhere all the time. In addition, the learning process within this platform is systematically synthesised with the integration of computational thinking concepts and gamification mechanisms, which is said to improve problem-solving skills and digital literacy. The main objective of this study is to see the learning outcomes of learners after getting the enhancement of problem-solving skills and digital literacy after learning with the gamified computational thinking platform with AI prompt engineering. According to the results above, it can be clearly seen that the computational thinking platform with gamification using prompt engineering is composed of all required components and learning processes and it can be applied to promote learners' problem-solving skills, which are considered very necessary for the 21st century learners since these skills can enhance education quality and can support the learning styles in today's digital age.**

Keywords **– Computational thinking, gamification, prompt engineering, problem-solving skills, digital literacy.**

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1. Introduction

The Office of the Basic Education Commission, Ministry of Education, has been relying on the frameworks and guidelines initiated by the 12th National Economic and Social Development Plan, and the National Scheme of Education B.E. 2560 – 2579 in the development of the more appropriate and efficient curricula. The main goal is to develop human beings, the most important resource of the nation, so that they are well-equipped with creative ideas, logical thinking, and systematic thinking. It is also expected that the improved curricula can help them analyze problems or situations carefully and thoroughly, and can be applied in daily life [1]. Education in the New Normal style places great importance on digital environments because it is considered a mechanism needed to head towards Thailand 4.0. In order to move towards Thailand 4.0, education management must be consistent with learners' behavior in the current contexts and meanwhile support the future contexts of learners of new generation education.

The learning management in the 21st century is the management of education with an intention to develop students' learning skills and innovation skills so that they can be well prepared to face the challenges of dynamic world. Technologies, therefore, play a key role in the creation of learning methods that emphasize creativity, collaboration and problem solving [2]. Looking into the educational perspectives, digital technologies have brought about significant changes in the behaviors of learning because the people of all ages and vocations can use these technologies to open for more opportunities and to encourage their lifelong learning), which can lead to the continuous progress towards the goals regardless of time and place [3]. All of these will result in an improvement in the quality of education that offers unlimited access to information sources for Thai people.

This research was carried out based on the relevant theoretical frameworks and researches in order to study the approaches that can promote problem-solving skills and digital literacy, which are important for learners in the 21st century. In addition, the learning characteristics based on these skills are corresponding to the learning styles of Education 4.0. To find out to what extent the computational thinking platform with gamification using prompt engineering is able to promote students' problem-solving skills and digital literacy, especially those in the secondary schools in Thailand, this study includes the following objectives:

OB1: To synthesize the theoretical frameworks and the researches that support problem-solving skills and digital literacy after leaning with the gamified computational thinking platform with AI prompt engineering.

OB2: To develop the gamified computational thinking platform with AI prompt engineering.

OB3: To study the outcomes of problem-solving skills and digital literacy gained from the gamified computational thinking platform with AI prompt engineering.

The hypotheses of this study are established on the basis of the outcomes of problem-solving skills and digital literacy gained from the gamified computational thinking platform with AI prompt engineering; thus, the research hypotheses are established as follows:

H1: The quality of the gamified computational thinking platform with AI prompt engineering is at high level.

H2: The learning achievement score after learning with the gamified computational thinking platform with AI prompt engineering is better than before learning with statistical significance level of 0.01.

H3: The score of problem-solving skills after learning with the gamified computational thinking platform with AI prompt engineering is at good level.

H4: The score of digital literacy after learning with the gamified computational thinking platform with AI prompt engineering is at good level.

2. Systematic Review

To study the outcomes of problem-solving skills and digital literacy gained from the gamified computational thinking platform with AI prompt engineering, the theories below were cautiously analyzed so as to acquire the concepts that are related to this research.

2.1. Problem Solving Skills and Digital Literacy

Problem-solving skills refer to cognitive activities that are considered the highest level of complex thinking and perception, and also involve the use of all cognitive abilities. Everyone who performs problem-solving activities must use his or her memory, perception, reasoning, conceptualization, language, emotions, motivation, self-confidence, and situation control at the same time in order to identify the real causes of problems and define the clear approaches and steps for solving the said problems, which will eventually lead to the step-by-step problem solving until receiving the tangible results [4]. Therefore, problem-solving skills are regarded as thinking processes for seeking ways to solve any obstacles in order to achieve the goal of solving specific problems successfully.

In reference to the study of related theories and researches [4], [5], [6], [7], the problem-solving process can be summarized into 5 steps as follows: (1) Understanding the problem: This step is about the analysis and interpretation of the problem that occurs in order to clearly identify the causes and effects of that problem, which can be done by asking questions and considering various aspects of the said problem. (2) Exploring the problem: It is the examination and analysis of the problem with an attempt to realize the real causes of the problem to be solved. (3) Set up plans to solve the problem: This step is concerning the determination of clear approaches and steps to solve the problem, which will help manage the problem in a more effective manner. (4) Solve the problem: This refers to the implementation of the problem-solving plans with an intention to solve the problem effectively. (5) Summarize and evaluate the problem solving: It is the analysis and verification of the effectiveness of the problem-solving actions. The main objective of this step is to learn from what happened and further develop the future tasks.

Digital literacy refers to knowledge and skills related to the use of digital media, communication tools, or networks to search, create, and utilize information in an intelligent, thoughtful, accurate, and ethical manner. Digital literacy has become a significant pillar in education because it provides opportunities for learners to think, communicate, and work regardless of place and time, which has an effect on their learning success. So, the educational environments that include digital literacy skills can encourage learners to use these skills to develop themselves and produce efficient works through digital technologies and devices in various contexts [8], [9].

2.2. Prompt Engineering

Prompt engineering refers to artificial intelligence that focuses mainly on the creation of new data or contents automatically by means of models and algorithms without human control. Prompt engineering is able to learn from existing data and produce new works by using advanced mathematics and statistics combined with the knowledge of data management and programming [10]. Besides, prompt engineering is an important process to communicate with the models using AI language in order to acquire the desired and high-quality results [11]. This process involves the invention and customization of commands or questions input into the AI system with an aim to have AI respond with accurate and clear data relevant to the desired topics.

The researchers relied on the learning platform "AIThaiGen" [11], which is designated for learning about the use of AI. Learners are able to learn by themselves with this platform since the contents therein are concise and easy-to-understand, and there are some activities for practice as a programming tool to promote learners' problem-solving skills and digital literacy.

2.3. Computational Thinking

Computational thinking process is a step-by-step approach for finding solutions that can be applied by individuals or through a computer. Computational thinking is considered as varied formats of problem-solving processes, such as logical priority, data analysis, step-by-step creation of solutions, and decomposition, all of which can be used to cope with complex problems [12]. Referring to the guidelines above, "computational thinking" is a cognitive skill for solving complex problems by decomposing them into small steps, then organizing and designing steps to find out solutions by means of analytical thinking and logical thinking. Thereby, the designed problem-solving steps should be tested in a systematic manner for further improvement, and this shall further lead the problem-solving methods that can be implemented efficiently [13], [14]. Besides, computational thinking will enable learners to have a sequence of thinking methods that can produce effective results; and this can also be applied to solve problems in different situations in their daily life.

2.4. Gamification Theory

Gamification refers to the style of learning that uses the game mechanisms to provoke and persuade students to learn via digital learning platforms.

The knowledge contents are presented and taught in the formats of game simulations, and this method is believed to reduce pressure, add more fun, and increase learners' engagement in learning including their efficiency in remembering the contents [15], [16].

For this reason, gamification is a teaching technique that applies the basic principles of game mechanism in the instruction management and learning activities in order to stimulate learners' interest in learning and eagerness to participate in learning in a challenging and fun atmosphere. This concept can increase engagement among participants and allow them to practice skills while having fun in working with others. This study is consistent with the concept that gamification as the application of main components of games to motivate learning [17]. To illustrate, response behavior of learners is provoked by game mechanisms. Response behavior refers to the response to basic human needs, such as desire of rewards, need for recognition, eagerness to achieve success, need to express oneself, need for victory in competition, etc. A variety of game mechanisms often applied in learning to arouse learners include points, achievement badges, levels, goals, virtual rewards, leaderboards, etc. It is expected that the gamification mechanisms mentioned above can increase interest and add more fun to learning atmospheres, enabling learners to achieve success in a more rapid manner [18].

In reference to the review of the theories, concepts and literatures that are related to this study, the researchers have found out some significant findings for use in the development of the computational thinking platform with gamification using prompt engineering, the purpose of which is to study the outcomes of problem-solving skills and digital literacy. The emphasis is placed on the combination of artificial intelligence technology with learning models in such a way that it can support the 21st century learning, enabling learners to review lessons anywhere and anytime by means of self-learning. Furthermore, there is an effort to enable learners to develop their thinking skills, memory, understanding, and abilities to use digital technologies, all of which are regarded as the vital skills that promote problem-solving skills and digital literacy for learners in today's learning society.

3. Research Methodology

This research is intended to focus on the study of perspectives towards the improvement of problem-solving skills and digital literacy with the gamified computational thinking platform with AI prompt engineering. Thereby, the research methodology can be summarized as follows.

3.1. Research Design

The study of perspectives towards the improvement of problem-solving skills and digital literacy with the gamified computational thinking platform with AI prompt engineering was conducted with pre-experimental research method using only one group pretest/posttest design. The objective thereof is to find out to what extent the gamified computational thinking platform with AI prompt engineering that was fabricated herein can improve problem-solving skills and digital literacy among the high-school students in Thailand.

3.2. Sample Group

The research participants are divided into 2 groups. The first one comprises 9 specialists chosen by means of purposive sampling and they gave their consent to do the quality evaluation form. These experts come from various institutions and they are specialized in researching and developing the instruction platforms and systems with at least 10 years of experiences. The other group includes 32 students of Wang Nam Yen Wittayakhom School, who have been selected by means of cluster sampling. These students are at grade 9, studying in semester 2 of academic year 2024, and all of them are enrolled in "Computing Science Course". According to educational ethics, both groups were all protected in terms of confidentiality and anonymity.

3.3. Research Tools and Data Analysis

The research instruments used in this study comprises: (1) The gamified computational thinking platform with AI prompt engineering; (2) The evaluation form (5-level rating scale) on the quality of the platform; (3) The measurement form (multiple choice of 4 alternatives) used to measure the learning achievement of the students before and after learning with this platform. The form contains 80 items consistent with the behavioral objectives (cognitive domain) and classified into 3 stages for measurement [19], i.e., remember knowledge, apply knowledge, and transfer knowledge; (4) the evaluation form (4-level rating scale) on problem-solving skills for use in authentic assessment; and (5) the evaluation form (4-level rating scale) on digital literacy for use in authentic assessment.

The statistics used to analyze data are mean, standard deviation, and t-test dependent [20]. All of the evaluation forms in this research were proved by the experts in order to ensure their validity and index of item objective congruence (IOC) before being applied in the survey with the research participants.

All the participants were asked to feel free to make decision and the researchers ensured that the information that the participants had given would not be made public and could not be employed to identify their identities.

3.4. Procedure

The study of perspectives towards the enhancement of problem-solving skills and digital literacy with the gamified computational thinking platform with AI prompt engineering was carried out in compliance to the theories and concepts of systems approach [21], [22], which focuses mainly on the sequential organization of relationships among related elements. The methodology of this research can be classified as below:

Stage 1: Synthesize the theoretical frameworks and the researches that support the improvement of problem-solving skills and digital literacy with the gamified computational thinking platform with AI prompt engineering. The ultimate goal of this stage is to set up the research conceptual framework.

Stage 2: Develop the gamified computational thinking platform with AI prompt engineering. The researchers applied the theoretical frameworks and the researches synthesized in the previous stage to design and develop the gamified computational thinking platform with AI prompt engineering, of which the learning process must be able to promote learners' problem-solving skills and digital literacy. Also, the researchers utilized the learning platform "AIThaiGen" [11], which is designated for self-learning about the use of AI, in this development.

Stage 3: Study the perspectives towards the enhancement of problem-solving skills and digital literacy with the gamified computational thinking platform with AI prompt engineering. This stage is about the study of the learning outcomes of the research participants, which include learning achievement, problem-solving skills, and digital literacy, with an aim to see to what extent the platform developed herein can enhance problem-solving skills and digital literacy of students in Thailand. The criteria set up in the evaluation on problem-solving skills and digital literacy are as follows:

- The score of 15.00 – 20.00 means problem-solving skills/digital literacy are at very good level.
- The score of 10.00 – 14.99 means problem-solving skills/digital literacy are at good level.
- The score of 5.00 – 9.99 means problem-solving skills/digital literacy are at moderate level.
- The score of 0.00 - 4.99 means problem-solving skills/digital literacy need improvement.

4. Results

The results of the enhancement of problem-solving skills and digital literacy with the gamified computational thinking platform with AI prompt engineering are corresponding to the 3 research hypotheses. Thereby, the results acquired can be summarized as follow:

4.1. The Synthesis of the Theoretical Frameworks

After studying, analyzing, and synthesizing the literatures and researches relevant to the theoretical frameworks and the researches that can promote the improvement of problem-solving skills and digital literacy with the gamified computational thinking platform with AI prompt engineering, the researchers acquired some guidelines to define the conceptual framework.

As to the research conceptual framework in Figure 1, the researchers obtained some theoretical frameworks and researches that support the development of problem-solving skills and digital literacy with the gamified computational thinking platform with AI prompt engineering. The said findings include computational thinking process, gamification mechanisms, prompt engineering, learning achievement, problem-solving skills, and digital literacy.

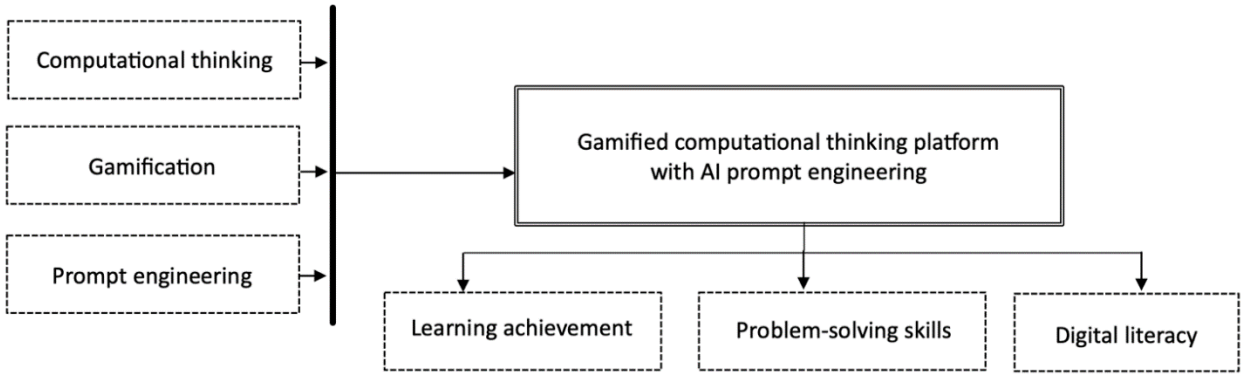

Figure 1. Conceptual framework

Table 1. Synthesis of computational thinking process

Process	[12]	[23]	[24]	[25]	Result
Problem identification					
Problem decomposition	✓	✓	✓	✓	✓
Pattern recognition	✓	✓	✓	✓	✓
Abstraction	✓	✓	✓	✓	✓
Thinking algorithm	✓	✓	✓	✓	✓
Debugging				✓	✓
Prediction					

Table 1 displays the synthesis of computational thinking process gained from the related documents and researches [12], [23], [24], [25], which can be summarized into 5 steps, i.e., problem decomposition, pattern recognition, abstraction, thinking algorithm, and debugging. The synthesis results of the capacity of all steps in the computational thinking process are included in Table 2.

Table 2. Results of the synthesis of computational thinking process

Computational thinking process	Desired characteristics
Problem decomposition	The complex problem is decomposed into small parts so that they can be managed more easily. This decomposition makes it possible to see the said problem more clearly and it is easier to find out the effective solutions.
Pattern recognition	The patterns or relationships in data or situations are identified and analyzed for better understanding and for predicting the outcomes more effectively.
Abstraction	The unnecessary details are removed from the data or the problem in order to see the overall picture and understand the main idea more clearly.
Thinking algorithm	It is about the analysis of the problem in order to find out the solutions in a systematic manner.
Debugging	It is a process of finding and fixing errors in the program so that the program can function more properly and efficiently.

Table 3. Synthesis of gamification mechanisms

Gamification	[26]	[27]	[28]	[29]	[30]	Result
Story		✓				
Goal			✓			
Action space			✓			
Curiosity		✓				
Motivation	✓			✓	✓	✓
Scoring	✓					
Challenge	✓	✓	✓	✓	✓	✓
Choices			✓			
Feedback			✓			
Character		✓				
Collaboration	✓	✓		✓	✓	✓
Rules	✓		✓	✓	✓	✓
Freedom to fail		✓				
Competition					✓	✓
Leaderboard		✓				
Time limit	✓			✓	✓	✓
Rewards	✓			✓	✓	✓
Level	✓	✓		✓		✓

Table 3 represents the synthesis of gamification mechanisms from the relevant documents and researches [26], [27], [28], [29], [30], which consists of motivations, challenges, engagement, rules, competition, time limit, rewards, and levels.

4.2. The Development of the Gamified Computational Thinking Platform with AI Prompt Engineering

The gamified computational thinking platform with AI prompt engineering was designed and developed with the concepts and principles of computational thinking process, which is composed of 5 learning steps (problem decomposition, pattern recognition, abstraction, thinking algorithm, and debugging), integrated with 8 mechanisms used in gamification (motivations, challenges, engagement, rules, competition, time limit, rewards, and levels).

The learning process in this platform is intended to encourage learners to develop their problem-solving skills and digital literacy.

Regarding the activities in this platform, which are designated to promote these skills, the researchers decided to employ the platform "AIThaiGen" [11] as a learning support tool because "AIThaiGen" contains such necessary AI tools as face or image scan by training AI, code programming with Prompt AI, simulation of Smart Home with AI, body organ detection with AI, and simulation of robot control with AI. The results in this case are in consistent with the research hypothesis H1. The gamified computational thinking platform with AI prompt engineering is illustrated in Figure 2.

Table 4. The quality of the gamified computational thinking platform with AI prompt engineering

Items for evaluation	Mean
Quality and design	
1. Ease and convenience to use	4.78
2. Images and language use	4.78
3. Fonts and colors	4.78
4. Compatibility with varied devices	4.89
5. Design of elements in the platform	4.89
6. Design of the platform using AI prompt engineering	4.67
7. Understandability and integrity of the platform	4.78
8. Ability of to facilitate learning activities using gamified computational thinking platform with AI prompt engineering	4.78
9. Design of the tools used to promote problem-solving skills and digital literacy	4.78
10. Overall quality and comprehensiveness	4.78
Overall	4.80
Efficiency and practical application	
11. Ability to respond to interactions	4.78
12. Ability to interact with accuracy	4.78
13. Ability to function with AI prompt engineering	4.67
14. Ability to display accurate and complete details	4.78
15. Ability of the gamified computational thinking platform to enhance problem-solving skills	4.78
16. Ability of the gamified computational thinking platform to enhance digital literacy	4.78
17. Feasibility to apply the gamified computational thinking platform in practical use	4.78
Overall	4.76
Total average score	4.78

According to the quality evaluation results shown in Table 4, it is found that overall quality of the gamified computational thinking platform with AI prompt engineering, as reflected through the total mean of all 17 items, is at very high level (mean = 4.78). Once considering separately, the mean of both "quality and design" (mean = 4.80) and "efficiency and practical application" (mean = 4.76) is at very high level, which is compliant with the hypothesis H1. The aforementioned research results insist that the gamified computational thinking platform with AI prompt engineering can be utilized to enhance students' problem-solving skills and digital literacy through self-learning by doing and the learning activities that encourage active communication. The findings above are in line with the research [31] that the use of technologies in new ways to create amusing learning experiences can promote and support the enthusiasm to achieve the goals, and at the same time it can foster learners' engagement and motivation to learn.

Figure 2. Gamified computational thinking platform with AI prompt engineering

4.3. Results of the Enhancement of Problem-Solving Skills and Digital Literacy with the Gamified Computational Thinking Platform with AI Prompt Engineering

The study of the perspectives of towards the improvement of problem-solving skills and digital literacy with the gamified computational thinking platform with AI prompt engineering was done with 32 participants who are the students of grade 9 at Wang Nam Yen Wittayakhom School.

Derived by means of cluster sampling, these participants were assured to be well protected with the policies of confidentiality and anonymity as to educational ethics.

The outcomes of learning achievement score with the platform were obtained from the measurement form (multiple choice of 4 alternatives) used to measure the learning achievement before and after learning with such platform), in which the questions are consistent with the behavioral objectives (cognitive domain) classified into 3 stages for measurement [19], i.e., remember knowledge, apply knowledge, and transfer knowledge.

This is all to answer the research hypothesis H2.

Table 5. Outcomes of the learning achievement score with the platform (N=32)

Test	Full score	Mean	SD	t-test	Sig.
Pre-test	40	15.80	3.76	6.20	.00**
Post-test	40	21.70	3.60		

*** Significant level of 0.01, df = 31*

Referring to the score of learning achievement of the students before and after learning through this platform shown in Table 5, it is evident that the students who learnt with the gamified computational thinking platform with AI prompt engineering have got higher score of learning achievement. Taking into account the mean score of learning achievement, it is obvious that the mean score after learning among these students (mean = 21.70, SD = 3.60) is higher than that before learning (mean = 15.80, SD = 3.76). Hence, it is evident that the gamified computational thinking platform with AI prompt engineering is able to promote the students' learning achievement with statistical significance level of 0.01, which is in line with the research hypothesis H2.

The evaluation on problem-solving skills after learning with the platform were gained by means of authentic assessment, using 4-level rubric score to measure 5 aspects of problem-solving skills [4], [5], [6], [7], i.e., ability to understand the problem, ability to explore or analyze the problem, ability to set up the problem-solving plan, ability to implement the problem-solving plan, and ability to summarize and evaluate the results of problem-solving process, which are summarized in Table 6. The results above are intended to answer the hypothesis H3.

Table 6. Synthesis of problem-solving skills

Indicators	Desired characteristics
Ability to understand the problem	Able to identify the causes and effects of the problem effectively and then find out the suitable and effective solutions.
Ability to explore or analyze the problem	Able to investigate and analyze the problem so as to clearly identify the root causes of the said problem.
Ability to set up the problem-solving plan	Able to establish clear approaches and procedures to solve the problem.
Ability to implement the problem-solving plan	Able to put the problem-solving plan in practical use so as to solve the problem efficiently and then lead to the concrete outcomes.
Ability to summarize and evaluate the results of problem-solving process	Able to analyze and examine the efficiency of the problem-solving process.

Table 7. Outcomes of evaluation on problem-solving skills after learning with the platform (N=32)

Full score	Mean	SD	Result
20	18.00	0.03	Very good

According to the outcomes of assessment, conducted by means of authentic assessment, on the problem-solving skills of the students after letting them learn wit this platform by means of authentic assessment, using 4-level rubric score to measure 5 aspects of problem-solving skills in Table 7, it is obvious that the students' mean score of problem-solving skills is at very good level (mean score = 18.00), which is consistent with the research hypothesis H3.

The evaluation on digital literacy after learning with the platform were obtained by means of authentic assessment, using 4-level rubric score to measure 5 aspects of digital literacy [8], [9], i.e., literacy in data analysis and evaluation, media literacy, computer literacy, internet literacy, and information and communication technology literacy, which are summarized in Table 8. The results herein are designated to answer the hypothesis H4.

Table 8. Synthesis of digital literacy

Indicators	Desired characteristics
Literacy in data analysis and evaluation	Ability to search, use, and manage different formats of information in an effective manner and with judgment.
Media literacy	Ability to use different formats of media and information effectively, including the skills and bodies of knowledge needed to understand media.
Computer literacy	Ability to use computers and software to work or manage information efficiently.
Internet literacy	Ability to use internet effectively and safely, including understanding of how to correctly search, interpret, and use information from the online sources.
Information and communication technology literacy	Ability to use information and communication technology effectively and properly, including knowledge and skills needed to access, use, and create digital media.

Table 9. Outcomes of evaluation on digital literacy after learning with the platform (N=32)

Full score	Mean	SD	Result
20	18.00	0.01	Very good

The assessment results of digital literacy after learning with the platform by means of authentic assessment, using 4-level rubric score in Table 9, it is found that the students' mean score of digital literacy is at very good level (mean score = 18.00), which is consistent with the research hypothesis H4.

5. Discussion

The gamified computational thinking platform with AI prompt engineering is conducted based on the concepts and principles of computational thinking integrated with mechanisms used in gamification. Furthermore, the researchers also used "AIThaiGen", which is a self-learning platform using AI technology, as a tool to facilitate learning activities to promote problem-solving skills and digital literacy.

The study of the outcomes of problem-solving skills and digital literacy gained from the gamified computational thinking platform with AI prompt engineering was conducted with pre-experimental research method relying on one group pretest/posttest design. The study is aimed to realize to what extent the computational thinking platform with gamification using AI prompt engineering can promote problem-solving skills and digital literacy of secondary school students in Thailand. The results of this study show that (1) The quality of the computational thinking platform with gamification using prompt engineering is at very high level; (2) The learning achievement score after learning is getting better than before learning at statistical significance level of .01; (3) The outcomes of problem-solving skills after learning are at very good level (mean score = 18.00); and (4) The outcomes of digital literacy after learning are at very good level (mean score = 18.00). From the results of the study above, it is consistent with all 4 research hypotheses.

According to the discussion, it is found that the accordance to the study [32] that the adjustment of learning styles and the analysis on learners' behaviors make it possible for instructors to design the contents and activities in consistence with individuals' needs. This can create motivation and meanwhile enhance learning efficiency, which will lead to the improvement of education quality corresponding to the learning formats in such digital age. Therefore, the policies concerning the application of artificial intelligence are considered the main factors to gear up the education strategies and open up for more education opportunities in the future.

Besides, this is also compliant with the researches [33], [34] that the integration of information technology and real-world communication technology in order to promote learning for the new-generation learners can provide them with the learning experiences in the form of blended lessons through cloud technology and interactive augmented reality technology.

The use of current technologies to the full potential not only enables learners to learn anywhere and anytime, but also creates challenges in learning that can lead to the development of digital literacy, and probably also a learning society.

6. Conclusion

The design and development of the gamified computational thinking platform with AI prompt engineering are based mainly on the concepts and principles of computational thinking process, which is composed of 5 learning steps (problem decomposition, pattern recognition, abstraction, thinking algorithm, and debugging), integrated with 8 mechanisms of gamification (motivations, challenges, engagement, rules, competition, time limit, rewards, and levels). It can be clearly seen that this study can stimulate the students to problem-solving skills and digital literacy. For the activities in this platform designated to promote these skills, the researchers rely on the platform "AIThaiGen" as a learning support tool since "AIThaiGen" contains some essential AI tools, e.g., face or image scan by training AI, code programming with Prompt AI, simulation of Smart Home with AI, body organ detection with AI, and simulation of robot control with AI.

It is obvious, as to the aforementioned results, that the gamified computational thinking platform with AI prompt engineering developed in this research contains such essential elements and the learning process that it can be used to promote learners' problem-solving skills. The problem-solving skills are highly significant for learners since these skills enable them to think systematically when trying to solve a problem, and then analyze and interpret the problem in order to find out the causes and effects of the said problem. In addition, problem-solving skills also promote learners to have digital literacy, which will enable them to make the ultimate use of technologies, leading to continuous learning.

References:

[1]. Ministry of Education. (2017). Learning standards and indicators for the Mathematics, Science, and Geography subject groups in the Social Studies, Religion, and Culture subject group (revised edition B.E. 2560) according to the Basic Education Core Curriculum B.E. 2551. Bangkok: Ministry of Education.

[2]. Sapliyan, S., Chatwattana, P., & Nilsook, P. (2023). A constructionist, imagineering learning system with the metaverse: a study of learning outcomes at secondary schools in Thailand. *Global Journal of Engineering Education*, *25*(2), 90-98.

[3]. Ministry of Higher Education. Science, Research and Innovation. *Background Thai MOOC*. Retrieved from: http://mooc.thaicyberu.go.th [accessed: 10 December 2024].

[4]. Badriah, L., et al. (2023). Collaborative mind mapping-assisted RICOSRE to promote students' problem-solving skills. *Participatory Educational Research*, *10*(4), 166-180. Doi:10.17275/per.23.65.10.4

[5]. Rahayu, R., et al. (2023). Problem-solving process of students with a reflective cognitive style based on the action-process-object-schema theory. *European Journal of Educational Research*, *12*(1), 41-58. Doi:10.12973/eu-jer.12.1.41

[6]. Muhassanah, N., & Winarni, A. (2023). Analysis of ProblemSolving Ability Polya Stages of Open University Students in Mathematics Courses. *International Journal of Research in Mathematics Education*, *1*(1), 81-94. Doi:10.24090/ijrme.v1i1.8618

[7]. Poonsawad, A., Srisomphan, J., & Sanrach, C. (2022). Synthesis of problem-based interactive digital storytelling learning model under gamification environment promotes students' problem-solving skills. *International Journal of Emerging Technologies in Learning (iJET)*, *17*(5), 103-119. Doi:10.3991/ijet.v17i05.28181

[8]. Bahri, A., et al. (2022). Students' and Teachers' Digital Literacy Skill: A Comparative Study between Schools, Classes, and Genders in Urban and Rural Areas. *International Journal of Science and Research (IJSR)*, *11*(2), 184-191. Doi:10.21275/SR22130101519

[9]. UNESCO. (2018). *A global framework of reference on digital literacy skills for indicator 4.4.2*. UNESCO. Retrieved from: http://uis.unesco.org/sites/default/files/documents/ip51-global-framework-reference-digital-literacy-skills-2018-en.pdf [accessed: 8 January 2025].

[10]. Lo, L. S. (2023). The CLEAR path: A framework for enhancing information literacy through prompt engineering. *The Journal of Academic Librarianship*, *49*(4), 102720. Doi:10.1016/j.acalib.2023.102720

[11]. Ritthipravat, P., et al. (2022). *AIThaiGen.* Mahidol University, Thailand. Retrieved from: https://aithaigen.in.th [accessed: 23 May 2025].

[12]. Danindra, L.S., Djalil, M., & Hanifah, U. (2022). Computational Thinking Processes of Junior High School Students in Solving Problems of Number Patterns in Terms of Gender Differences. *SHS Web of Conferences*, *149*. Doi:10.1051/shsconf/202214901012

[13]. Denning, P., & Matti, T. (2019). *Computational Thinking*. Library of Congress Under Grant.

[14]. Kaewruang, P., Langka, W., & Charoensuk, O. (2022). The Study of Computational Thinking and Science and Technology (Computing Science) Learning Achievement on Using Logical Thinking to Solve the Problems of Students in Grade 6 By Using Engineering Design Process: A Multivariate Analysis of Covariance. *Academic MCU Buriram Journal*, *7*(2), 65-79.

[15]. Cheong, C., Filippou J., & Cheong, F. (2014). Towards the Gamification of Learning: Investigating Student Perceptions of Game Elements. *Journal of Information Systems Education*, *25*(3), 233-244.

[16]. Faiella, F., & Ricciard, M. (2015). Gamification and learning: a review of issues and research. *Journal of e-Learning and Knowledge Society*, *11*(3), 13-21.

[17]. Nasongkhla, J. (2018). *Digital Learning Design*. Chulalongkorn University Press.

[18]. Jongmuenwai, B., Kongsrima, K., Prachai, S., Jabjone, S., & Suikraduang, A. (2018). Gamification for learning. *Journal of Project in Computer Science and Information Technology*, *4*(2), 34-43.

[19]. Bloom, B. S. (1969). *Taxonomy of educational objectives: The classification of educational goals: Handbook I, Cognitive domain*. David McKay.

[20]. Srisa-Ard, B. (2013). *Basic Research*. Suweerivasarn Press.

[21]. Khemmani, T. (2018). *Science of Teaching: Knowledge of Efficient Learning Process Management*. Chulalongkorn University Press.

[22]. Utranan, S. (1982). Systematic Instructional Management. *Chulalongkorn University*.

[23]. Supiarmo, M.G., Hadi, H.S., & Tarmuzi, T. (2022). Student's Computational Thinking Process in Solving PISA Questions inTerms of Problem Solving Abilities. *Journal of Innovative Mathematics Learning (JIMI)*, *5*(1), 1-11. Doi: 10.22460/jiml.v5i1.p01-11

[24]. Azizah, N. I., Roza, Y., & Maimunah, M. (2022). Computational thinking process of high school students in solving sequences and series problems. *Jurnal Analisa*, *8*(1), 21-35. Doi:10.15575/ja.v8i1.17917

[25]. Susanti, R. D., Lukito, A., & Ekawati, R. (2023). Peirce's Semiotic in Computational Thinking for Mathematical Problem-Solving Process. *Journal of Higher Education Theory and Practice*, *23*(16). Doi:10.33423/jhetp.v23i16.6466

[26]. Ferdianto, F., et al. (2022). Critical Success Factors on Gamification to Support the Learning Process in University. *Environment-Behaviour Proceedings Journal*, *7*(SI10), 89-96. Doi:10.21834/ebpj.v7iSI10.4135

[27]. Rugu, C., et al. (2021). Literature Review on the Analysis of Motivational Elements and Gamification Content in Creating Semantic Barriers. *Turkish Journal of Computer and Mathematics Education*, *12*(3), 120-132.

[28]. De Las Heras, S. C., et al. (2021). A framework for the development of Pedagogical Process Simulators (P2Si) using explanatory models and gamification. *Computers & Chemical Engineering*, *151*, 107350. Doi:10.1016/j.compchemeng.2021.107350

[29]. Najjar, E., & Salhab, R. (2022). Position Paper: Gamification in the Learning Process. *International Journal of Online and Biomedical Engineering (iJOE)*, *18*(1), 148-153. Doi:10.3991/ijoe.v18i01.26609

[30]. Zainudin, Z. A., & Zulkiply, N. (2023). Gamification in learning: Students' motivation and cognitive engagement in learning business using Quizizz. *Asian Journal of University Education (AJUE)*, *19*(4), 823-833. Doi:10.24191/ajue.v19i4.24928

[31]. Zaky, Y. A. M. (2023). Chatbot Positive Design to Facilitate Referencing Skills and Improve Digital Well-Being. *International Journal of Interactive Mobile Technologies (iJIM)*, *17*(9), 106–126.

[32]. Sridam, I., & Sangkharam. P., & Ittipongse, A. (2024). The Role of Artificial Intelligence Technology in Higher Education Institutions. *Journal of Education and Innovation Learning*, *4*(1), 145-159.

[33]. Soutthaboualy, T., Chatwattana, P., & Piriyasurawong, P. (2022). Interactive Augmented Reality Technology via Blended Instruction Lesson on Cloud. *Higher Education Studies*, *12*(3), 9-18. Doi:10.5539/hes.v12n3p9

[34]. Sisamud, K., Chatwattana, P., & Piriyasurawong, P. (2025). The Outcomes of Project-Based Learning System on Metaverse through Design Thinking for Buddhism Innovators. *International Journal of Engineering Pedagogy (iJEP)*, *15*(1), 56–74. Doi:10.3991/ijep.v15i1.51461