The Project-Based Learning Model Using Gamification to Enhance 21st Century Learners in Thailand

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Abstract
This research are develop the project-based learning model using gamification which can be used as a guideline to develop the project-based learning system using gamification to enhance 21st century learners through the six steps of project-based learning process and instruction activities using gamification; thereby, users can interact and exchange knowledge with one another through the social network, encouraging them to have creative thinking skills, which is needed for 21st century learners. The objectives of this research are (1) to study and synthesise the conceptual framework of the project-based learning model using gamification to enhance 21st century learners, (2) to develop the project-based learning model using gamification to enhance 21st century learners, and (3) to study the results after using the project-based learning model using gamification to enhance 21st century learners. The participants in this research include seven experts from various institutions, all of whom are specialised in design and development of instruction models and instruction systems. The research tools consist of (1) the project-based learning model using gamification to enhance 21st century learners, and (2) the evaluation form on the suitability of the project-based learning model using gamification to enhance 21st century learners. According to the results, which are in line with the expectation of the researchers, it is found that (1) the overall suitability of the development of the project-based learning model using gamification to enhance 21st century learners (overall elements) is at a very high level, and (2) the overall suitability of the development of the project-based learning model using gamification to enhance 21st century learners is at a very high level.

Keywords: project-based learning using gamification, 21st century learners, creative thinking

1. Introduction
The major goal of education development in the National Education Plan B.E. 2560–2574 is to create an education system with high quality and efficiency, and then use it as the main mechanism to enhance the potential and the competence of human capital, and to support education, learning and dynamic challenges in the 21st century (Office of the Education Council, 2016). Learners must be encouraged to seek knowledge by themselves and take actions in order to develop different skills and have positive attitudes towards lifelong learning. Meanwhile, learners must have engagement in learning management plans and assessment of learning. Learning activities must motivate learners to learn and exchange their knowledge with one another, giving them opportunities to think, analyze, and criticize what they have experienced. Accordingly, instructors must design the learning in such a way that it facilitates self-learning, corresponds to the interest of learners, and complies with real life (Chatwattana, 2021; Boonphak, 2020). Additionally, the said learning designs must enable learners to solve problems in different scenarios by means of both analysis and synthesis. All of the aforementioned are considered the main principles to promote education for learners in the digital age.

The Partnership for 21st Century Skills (The Partnership for 21st Century Skills, 2017) proposed a conceptual framework for learning in the 21st century to assist learners to succeed in both life and career. The said conceptual framework is related to the integration of knowledge and specific skills. To apply learning skills in the 21st century successfully, it is highly essential for learners to have knowledge and understanding of the main academic contents along with critical thinking skill, problem-solving skill, creative thinking skill, communication skill, and collaborative skill (Wannapiroon & Nilsook, 2013).
Due to the world’s current situations, a number of higher education institutes have begun to adjust the formats of freedom of knowledge and access to the knowledge sources in order to deal with the rapid change of technology and digital innovations for society. Consequently, this leads to a change in education known as “Education Transformation” (Thanachawengsakul & Thanyavinichakul, 2020), in which learners have more chances to access to learning resources that mostly focus on new learning styles, like hands-on learning, with integration of knowledge from different fields so as to provide necessary skills in the 21st century. Creative thinking plays a very important role in promoting education for digital learners. Therefore, the current education management needs to be transformed to a brand new and different format, and in such a way that it can promote proactive learning, analytical thinking, problem-solving skill, and rational thinking, all of which are believed to generate necessary skills for learners in the digital age (Chatwattana, 2021).

Project-based learning (PjBL) is a learning management process that encourages learners to take actions and have engagement in every step of learning, ranging from exploration, learning plan, learning design, creation and application of knowledge, and evaluation. At the meantime, instructors are acting as learning managers, facilitators or advisors, who are responsible for assisting learners to eventually complete their projects (Nilsook, Chatwattana, & Seechaliao, 2021; Vogler et al., 2018; Dole et al., 2016). Project-based learning management is a policy designated specifically for vocational and technical education in Thailand. The graduates are required to produce inventions and innovations relevant to their major subjects, and they are expected to be well equipped with communication skill, critical thinking skill, creative thinking skill, and collaborative skill, which are all in line with the 21st century skills. In addition, it is compulsory for educational institutes to make instructors and learners understand the methods of instruction management in order to equip learners with desired characteristics (Nilsook et al., 2021).

Gamification is a style of learning that uses game mechanisms to stimulate and motivate learning through a digital learning platform. The contents of knowledge in gamification are conveyed in the form of game simulation, which encourages learners to have more engagement in learning with amusement, low pressure, and more efficiency in memorizing the contents (Cheong et al., 2014; Faiella & Ricciard, 2015). Gamification is the most popular strategy in existence today. The major elements of gamification include point, badge, level, leaderboard, reward, time, and challenge. With these gamification techniques, the users will able to encourage more consumers or learners to participate in activities, and be more inspired (Chujitarom, 2020).

Creative thinking refers to emotional feeling, analytical thinking, thinking for solutions, and modification of existing things systematically. It also means the invention of the brand-new things that are not similar to the original ones and the others’, which leads to new things and new solutions which are beneficial to society.

According to the aforementioned principles and theories, the researchers have had an idea to apply the project-based learning model using gamification in the instruction design for 21st century learners. This is intended to increase the motivation to learn among learners by means of brainstorming when they are carrying
out their projects. Not only that, the project-based learning management using gamification can promote learners to have creativity that can be well adopted in their daily life.

2. Research Objectives and Hypothesis

The following research objectives have been formulated:

O1: To study and synthesise the conceptual framework of the project-based learning model using gamification to enhance 21st century learners.

O2: To develop the project-based learning model using gamification to enhance 21st century learners.

O3: To study the results after using the project-based learning model using gamification to enhance 21st century learners.

The following research hypothesis have been formulated:

H1: The suitability of the project-based learning model using gamification to enhance 21st century learners is at a high level.

3. Methodology

This research is related to the design and development of the project-based learning model using gamification to enhance 21st century learners, and the research methodology includes the following.

3.1 Research Participants

Seven experts from various institutions specialised in the design and development of instruction models and instruction systems.

3.2 Research Tools and Statistics Used for Data Analysis

To develop the project-based learning model using gamification to enhance 21st century learners, the researchers employed the following research tools, i.e., (1) the project-based learning model using gamification, and (2) the evaluation form on the suitability of the project-based learning model using gamification. The statistics used for data analysis are mean and standard deviation.

3.3 Research Methodology

The researchers designed the methodology based on the concepts and the theories of the system approach (Khemmani, 2010; Utranan, 1982) and based the design and the development of this model on SDLC technique (Robert et al., 2013). The methodology can be summarised into three steps as below.

Step 1 is related to the study, the analysis, and the synthesis of the literature works and research studies relevant to the development of the project-based learning model using gamification to enhance 21st century learners in order to find out the guidelines needed to establish the conceptual framework of this research, i.e., instruction system (Khemmani, 2010; Utranan, 1982), project-based learning (Nilsook et al., 2021; Vogler et al., 2018; Dole et al., 2016), gamification (Cheong et al., 2014; Faiella & Ricciard, 2015), 21st century learners, and creative thinking.

Step 2 is about the development of the project-based learning model using gamification to enhance 21st century learners. In this step, the researchers adopted the principles of system approach in the design and the development, which consist of four factors, i.e., input factor, learning process, output, and feedback.

Step 3 is concerning the study of results after using the project-based learning model using gamification to enhance 21st century learners. The researchers used the research tools to study the results after this model had been used by seven participants derived by means of purposive sampling. These participants come from various institutions and all of them are all experts specialised in design and development of instruction models and instruction systems. The mean score range and interpretation of results (Kanasutra, 1995) are listed in Table 1.

<table>
<thead>
<tr>
<th>Average score range</th>
<th>Meaning of interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.50–5.00</td>
<td>The suitability is at a very high level.</td>
</tr>
<tr>
<td>3.50–4.49</td>
<td>The suitability is at a high level.</td>
</tr>
<tr>
<td>2.50–3.49</td>
<td>The suitability is at a moderate level.</td>
</tr>
<tr>
<td>1.50–2.49</td>
<td>The suitability is at a low level.</td>
</tr>
<tr>
<td>1.00–1.49</td>
<td>The suitability is at a lowest level.</td>
</tr>
</tbody>
</table>
4. Results and Discussion

The results of the development of the project-based learning model using gamification to enhance 21st century learners can be summarised as below.

4.1 Results of the Synthesis of the Conceptual Framework of the Project-Based Learning Model Using Gamification

According to the study, the analysis, and the synthesis of the literature works and research studies relevant to the development of the project-based learning model using gamification to enhance 21st century learners, the researchers found out the guidelines needed to establish the conceptual framework of this research, i.e., instruction system, project-based learning, gamification, 21st century learners, and creative thinking. The conceptual framework herein is illustrated in Figure 2.

![Conceptual framework](image)

Figure 2. Conceptual framework

4.2 Results of the Development of the Project-Based Learning Model Using Gamification

The development of the project-based learning model using gamification to enhance 21st century learners is intended to be used as a guideline to design and develop the project-based learning system using gamification. The said system is thought to promote creative thinking, the necessary skill for 21st century learners that can be applied in analytical thinking, thinking for solutions, and modification of the existing things systematically, leading to new things and new solutions that are beneficial to society. The design and the development of this learning model are based on system approach, which includes four elements, i.e., input factor, learning process, output, and feedback, as shown in Figure 3.

![Project-based learning model using gamification](image)

Figure 3. Project-based learning model using gamification to enhance 21st century learners
Figure 3 represents the project-based learning model using gamification to enhance 21st century learners, which consists of four main elements as follows.

1) Input factor: It refers to the elements relevant to the design and the development of the project-based learning model using gamification to enhance 21st century learners, which consists of analysis of characteristics of learners and instructors, instruction activities using gamification, and learning technology.

2) Learning process: The researchers synthesised the project-based learning process, focusing on the learning process management that encourages learners to take actions and have engagement in every step of learning. Thereby, the said learning process is combined with instruction activities using gamification, and it consists of six steps, i.e., preparation, topic definition, writing the outline, creation, presentation, and evaluation. The gamification is instruction activities which define by instructor to promote the learners to have communicate and solve problems from interactive and collaboration that can increase efficiency of learning in class.

3) Output: It refers to the outcome generated from the learning process, which is creative thinking skill. Creative thinking skill is associated with the use of thinking, analysis, and synthesis to innovate novel and unique things. This skill is said to unleash the creativity within learners and then encourage them to have more confidence and realize their own potential, which can be found in their work pieces. The said work pieces may probably be further modified to be inventions or innovations afterwards.

4) Feedback: This refers to the information derived from the output, which is then used to enhance the learning process and the input factor. The feedback herein is the results of the measurement on creative thinking skills.

4.3 Results of the Study on the Suitability of the Project-Based Learning Model Using Gamification

In reference to the development of the project-based learning model using gamification to enhance 21st century learners, the researchers had studied suitability of the development of the project-based learning model using gamification by seven participants derived by means of purposive sampling. These participants come from various institutions and all of them are all experts specialised in design and development of instruction models and instruction systems. The results can be concluded as seen in Tables 2 and 3.

Table 2. Results of evaluation on the suitability of the project-based learning model using gamification to enhance 21st century learners (overall elements)

<table>
<thead>
<tr>
<th>Items for evaluation</th>
<th>Assessment results</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The principles and concepts of the project-based learning model using gamification to enhance 21st century learners can be applied to develop the instruction system.</td>
<td>4.57 0.53</td>
<td>Very high</td>
</tr>
<tr>
<td>2. The elements of the project-based learning model using gamification to enhance 21st century learners cover all main elements required in the instruction system.</td>
<td>4.57 0.53</td>
<td>Very high</td>
</tr>
<tr>
<td>3. The theories of the project-based learning model using gamification to enhance 21st century learners are comprehensive and appropriate for designing the conceptual framework.</td>
<td>4.57 0.53</td>
<td>Very high</td>
</tr>
<tr>
<td>4. The sequence of elements in the design of the project-based learning model using gamification to enhance 21st century learners is clear and consistent.</td>
<td>4.43 0.53</td>
<td>High</td>
</tr>
<tr>
<td>5. The ordering of the elements in the project-based learning model using gamification to enhance 21st century learners is appropriate and easy to understand.</td>
<td>4.29 0.76</td>
<td>High</td>
</tr>
<tr>
<td>6. The overall elements in the project-based learning model using gamification to enhance 21st century learners are complete and can be used as a guideline to further develop the project-based learning system using gamification to enhance creative thinking in the future.</td>
<td>4.57 0.79</td>
<td>Very high</td>
</tr>
<tr>
<td>Overall average</td>
<td>4.50 0.59</td>
<td>Very high</td>
</tr>
</tbody>
</table>

According to Table 2, it is found that the overall suitability of the development of the project-based learning model using gamification to enhance 21st century learners (overall elements) is at a very high level (Mean = 4.50, SD. = 0.59). It can be concluded that the project-based learning model using gamification to enhance 21st century learners has all complete elements and it complies to the project-based learning management process, which can be used as a guideline to further develop the project-based learning system using gamification. Whereby, the said system is expected to enable learners to have creative thinking skills, which is indispensable for 21st century learners. This corresponds to the research of Chatwattana (2021), who said the application of concepts and theories of system approach to design and develop learning models together with the management of learning environments and instruction activities for learners by making use of the existing technologies shall lead to the learning society. It is also consistent with the research of Nittayathammakul et al. (2022), who stated that the use
of cognitive tools in education can promote learning, which can be conducted by organizing instruction activities via learning environments.

Table 3. Results of evaluation on the suitability of the project-based learning model using gamification to enhance 21st century learners

<table>
<thead>
<tr>
<th>Items for evaluation</th>
<th>Assessment results</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. Input factor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1 Analysis of characteristics of learners</td>
<td>4.86</td>
<td>Very high</td>
</tr>
<tr>
<td>1.2 Analysis of characteristics of instructors</td>
<td>4.71</td>
<td>Very high</td>
</tr>
<tr>
<td>1.3 Instruction activities using gamification</td>
<td>4.71</td>
<td>Very high</td>
</tr>
<tr>
<td>1.4 Learning technology</td>
<td>4.86</td>
<td>Very high</td>
</tr>
<tr>
<td>2. Learning process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1 Project-based learning process</td>
<td>4.71</td>
<td>Very high</td>
</tr>
<tr>
<td>2.2 Instruction activities using gamification</td>
<td>4.71</td>
<td>Very high</td>
</tr>
<tr>
<td>3. Output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creative thinking</td>
<td>4.86</td>
<td>Very high</td>
</tr>
<tr>
<td>4. Feedback</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The measurement on creative thinking skill</td>
<td>4.71</td>
<td>Very high</td>
</tr>
<tr>
<td>Overall average</td>
<td>4.77</td>
<td>Very high</td>
</tr>
</tbody>
</table>

In reference to Table 3, it is found that the overall suitability of the development of the project-based learning model using gamification to enhance 21st century learners is at a very high level (Mean = 4.77, SD. = 0.43). It can be summarized that the project-based learning model using gamification to enhance 21st century learners has all complete elements and it can be used as a guideline to further develop the project-based learning system using gamification. In this system, the instruction activities in the format of gamification are employed to motivate and promote learning among learners so that they will have creative thinking skills that are needed for 21st century learners. This is in accordance with the research of Nilsook et al. (2021), who mentioned that project-based instruction management is regarded as a learning process that can develop and equip learners in vocational education of Thailand with the skills needed to survive in the 21st century. The steps in such instruction management can be adopted to other instruction management in order to support learner-centered learning and enhance efficiency of class learning. It also encourages learners to possess problem-solving and critical thinking skills. Thanks to the appropriate integration of technologies in this digital era and the learning management, learners are able to produce their own work pieces through the assigned projects, which shall promote them to have creativity, collaborative skill, collaborative learning, and communication skill.

5. Conclusion

Once considering education management for learners of the new generation, an important thing that instructors had better keep in mind is the management of educational models that can be adapted to correspond to the current situations, leading to continuous learning. Furthermore, instructors must employ the learning models that match with the different behaviors of today’s learners who are prone to prefer challenges, freedom to learn, and self-learning. Project-based learning (PjBL) is a learning management process that encourages learners to take actions and have engagement in every step of learning, ranging from exploration, learning plan, learning design, creation and application of knowledge, and evaluation. At the meantime, instructors are acting as learning managers, facilitators, or advisors, who are responsible for assisting learners to eventually complete their projects.

The project-based learning model using gamification to enhance 21st century consists of four main elements, i.e., (1) input factor, consisting of analysis of characteristics of learners and instructors, instruction activities using gamification, and learning technology, (2) Learning process, which encourages learners to take actions and have engagement in every step of learning, consisting of six steps, i.e., preparation, topic definition, writing the outline, creation, presentation, and evaluation; thereby, in the steps of creation and presentation, the instruction activities using gamification are employed to motivate and encourage learners to learn, (3) output, which refers to creative thinking skills, and (4) feedback, which is the measurement of the results of creative thinking skills.

According to the results of evaluation on the project-based learning model using gamification to enhance 21st century, it is found that (1) the overall suitability of the development of the project-based learning system using gamification to enhance 21st century learners (overall elements) is at a very high level (Mean = 4.50, SD. = 0.59),
and (2) the overall suitability of the development of the project-based learning system using gamification to enhance 21st century learners is at a very high level (Mean = 4.77, SD. = 0.43).

References


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