Using Constructivist Integrated Gamification and AI Assisted Learning Tool to Enhance Reading Comprehension for Forth Grade Students

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Abstract

This paper aims to present the result of development of The Constructivist Learning Environment Integrated Gamification with Artificial Intelligence Assisted Learning Tool to Enhance Reading Comprehension for Fourth Grade Students. Survey research was employed in this study to collect the experts' evaluation based on three main aspects: content, media, and design aspects. Contextual utilization was also used to try out the learning environment with students. The participants in this study include 6 experts and 9 pilot students. The result of this study revealed that there are five main elements: (1) Problem base and learning tasks, (2) Learning resources, (3) Collaboration, (4) Scaffolding, and (5) Coaching. Experts' review found that (1) Content aspect was appropriate, comprehensive, and up to date for students to use in their studies. The presentation format, including text, images, and animations, was consistent and conducive to learning. The language used was clear, concise, and easy to understand with links to external re-sources. The content is applicable to real-life. (2) Media aspect was the design elements (compression) were appropriate, stable, eye-catching, and interesting. The presentation format was effective, and the main color structure was comfortable. (3) Design aspect found that the problem-based learning design is interesting as it closely relates to real-life situations. The content was organized according to the principles of reading comprehension and included an AI chatbot to help learners with word meanings, The Collaboration Center encouraged learners to work in groups and exchange ideas and perspectives to efficiently solve problems. However, the Scaffolding Center needed improvement in terms of clarity and language use. The Coaching Center had teachers acting as coaches to provide guidance and help learners with tasks. Contextual utilization had shown that students should work in groups of 3 learners for effective collaboration. Student satisfaction survey showed high satisfaction levels. English reading comprehension scores have a passing score of 70%., the font size and internet speed could be the issue that should be considered in future study.

Keywords: Gamification, Constructivism, AI-Assisted Learning Tool, Reading Comprehension.

1 Introduction

The rapid changes in society and the environment have resulted in various issues such as inequality, poverty, and global warming. The United Nations has established 17 Sustainable

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Development Goals (SDGs) to tackle these problems to reinforce the concept of "no one will be left behind." and achieve sustainable development by 2030[1][2]. Education plays a critical role in accomplishing these objectives, as it enables individuals to comprehend and analyze information, become global citizens, and improve their ability to coexist in a global society [3]. Proficiency in English, which is an international language, is also crucial for sharing knowledge with other countries and creating job opportunities domestically and internationally [4][5]. Unfortunately, students' reading skills are currently inadequate due to ineffective teaching methods utilized by educators.

Students' reading skills are currently low due to improper teaching methods by teachers, leading to a lack of real reading skills development [6]. In the Program for International Student Assessment (PISA) assessment of 65 countries, Thai students scored an average of 422 in reading quality, compared to the overall average of 492, ranking 50th [7]. Some English teachers in Thailand focus on translation, vocabulary memorization, and grammar rules rather than promoting thinking skills, leading to difficulties in understanding and summarizing knowledge from reading [8]. Teachers should use appropriate teaching and learning activities to help students understand different types of publications and consider factors such as attitudes, prior knowledge, and family support that affect students' reading.

The researcher found that learners had a poor learning experience in the basic English course due to the focus on vocabulary memorization and book-based learning without opportunities for independent knowledge building. This made English courses uninteresting and boring for learners. The researcher turned to constructivist theory, which emphasizes learners' role in building their knowledge through the thinking process and used it to organize learning activities for learners to create stable and sustainable knowledge.

Ban Khanuan School students have low achievement in English reading due to their negative attitudes towards English learning. The researcher is interested in using gamification, a technique that applies game mechanics in non-gaming contexts to motivate and engage learners [9]. Gamification is based on game design fundamentals, such as points, levels, rewards, and leaderboards. but for the education in Thailand or even in Asia, gaming is a new issue that has not received attention yet. Which is a gamification being one of the solutions that can enhance teaching and learning to be more effective [10]. The researcher also suggests using chatbots, an AI-assisted learning tool that can act as a data source and coach to advise learners in gamification. The application of these technologies in education can enhance teaching and learning effectiveness.

From the above, the researcher is interested in integrating constructivist learning environment design into gamification and applying artificial intelligence assisted learning tool to gamification. To help learners can learn and develop the ability for English reading comprehension. To make the learners interested, motivated, have a good attitude, and enthusiasm for learning English reading comprehension. Create interest in creating a learning environment that promotes and develops learners' knowledge by creating self-knowledge for 4th grade students of Ban Khanuan School and build knowledge that is stable and sustainable.

2   Theorical Framework

The Constructivist Learning Environment Integrated Gamification with Artificial Intelligence Assisted Learning Tool to Enhance Reading Comprehension for Fourth Grade Students was designed based the theoretical and designing frameworks below:
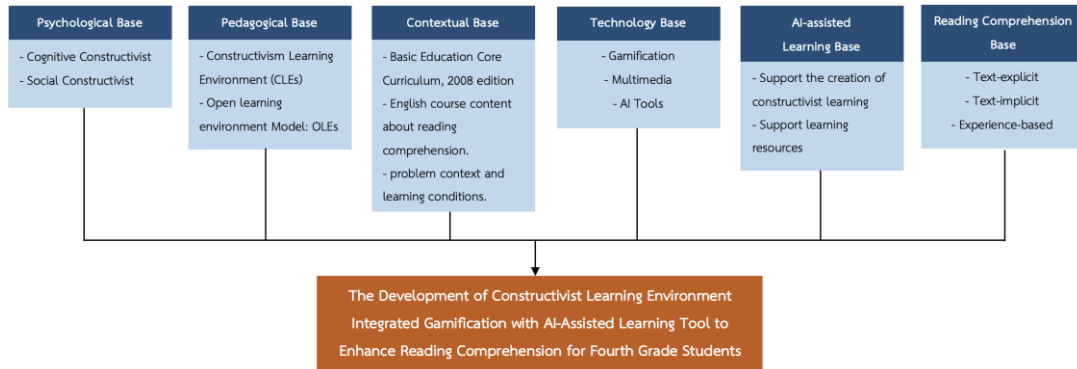

Figure 1: Theoretical framework of Constructivist Learning Environment Integrated Gamification with AI-Assisted Learning Tool to Enhance Reading Comprehension for Fourth Grade Students
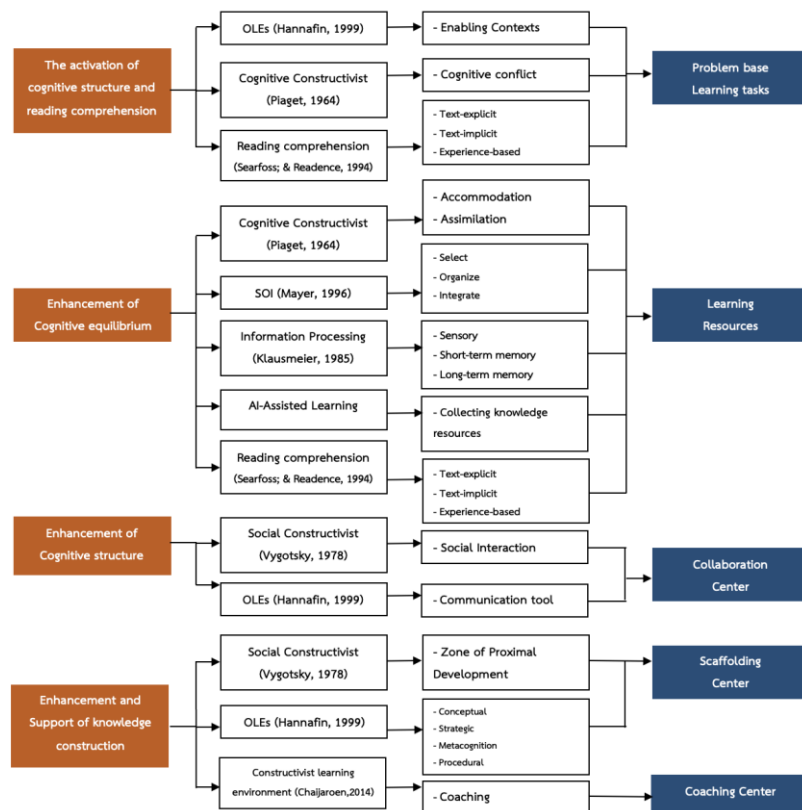

Figure 2: Design Framework of Constructivist Learning Environment Integrated Gamification with AI-Assisted Learning Tool to Enhance Reading Comprehension for Fourth Grade Students

From Theoretical framework and Design Framework became five elements: (1) Problem base & Learning tasks (2) Learning Resources (3) Collaboration Center (4) Scaffolding Center (5) Coaching Center
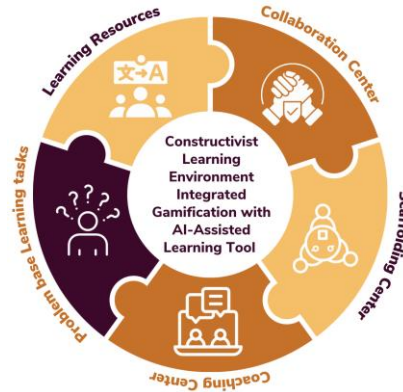

Figure 3: Five elements of Constructivist Learning Environment Integrated Gamification with AI-Assisted Learning Tool to Enhance Reading Comprehension for Fourth Grade Students

3 Methodology

3.1 Target Group

Target groups included 6 experts: 3 experts for content aspect, media aspect, and design aspect and 3 experts for measurement and evaluation aspect and 9 pilot students.

3.2 Research Instruments and Data Analysis

Research instruments included Learning Environment Assessment Forms (Content, Media, and Design) for experts [11]. The data was analyzed using summary interpreting.

3.3 Data Collection Process

The data collection process in this study could be described: (1) Submitted the learning environment to experts for evaluation, (2) reviewed the comments and suggestions received from experts, (3) tried out with 9 pilot students by let the pilot students learn with learning environment integrated gamification with artificial intelligence assisted learning tool and observe the learning process of students, (4) after finished class. Give the pilot students do a post-test and a satisfaction questionnaire.

4 Result

4.1 Result of the development

There are five elements of learning environment from Figure 3 such as (1) Problem base and learning tasks which put students to cognitive conflict and arouse students to find the solution to the problem as well as practice the reading comprehension through learning tasks, (2) Learning resources which provide essential information to help student adjust their cognitive conflict and Chatbots are also used to help learners search for vocabulary information in the learning resources, (3) Collaboration which allows students to work collaboratively by allowing everyone to participate in learning exchange ideas and solve problems together between learners and teachers to expand perspectives for themselves, (4) Scaffolding which help students who are outside of the zone of proximal development to perform the learning tasks and helps encourage learners to make an effort in learning. Assist learners in the learning process including how to use the learning environment, and (5) Coaching which helps guiding and assisting students when needed.
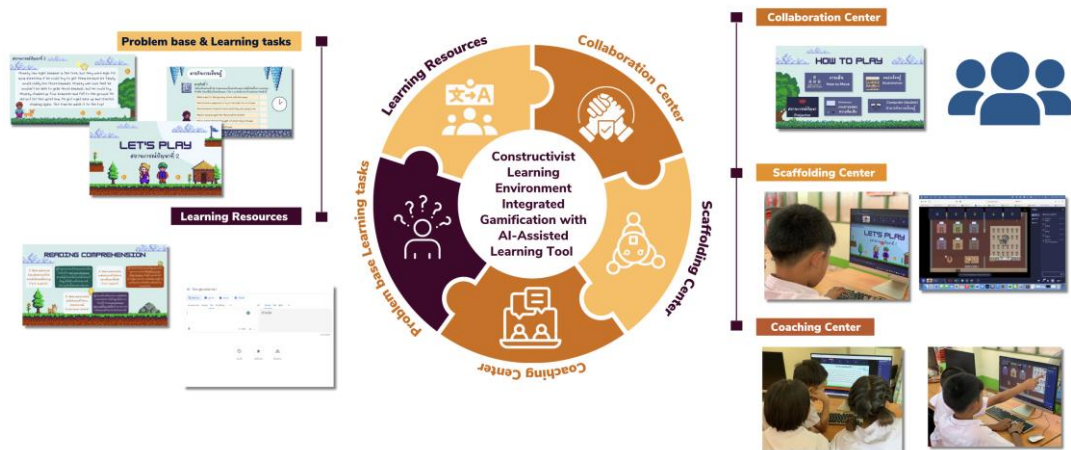

Figure 4: Elements of Constructivist Learning Environment Integrated Gamification with AI-Assisted Learning Tool to Enhance Reading Comprehension for Fourth Grade Students

4.2 Result of Experts' Review

4.2.1 Content Aspect

The content was evaluated by experts as appropriate, comprehensive, and up to date for students to use in their studies. The presentation format, including text, images, and animations, was consistent and conducive to learning. The language used was clear, concise, and easy to understand with links to external resources. The content is applicable to real-life problem-solving, and the Problem Based Learning approach was consistent and relevant. Problem situations help learners become more engaged in learning by reflecting daily life situations.

4.2.2 Media Aspect

The results of the evaluation by media experts concluded that the design elements (compression) were appropriate, stable, eye-catching, and interesting. The presentation format was effective, and the main color structure was comfortable. However, some content had small font sizes, and

some parts needed more images. They also suggested emphasizing some messages. The navigators and icons used in gamification should be clearer and convey the information needed more easily. They recommended using appropriate links and conversations to access information efficiently and making full use of the media.

4.2.3 Design Aspect

The results of the evaluation by constructivist design experts concluded that the problem-based learning design and found it interesting as it closely relates to real-life situations. However, the problem situations and learning tasks needed more clarity and consistency. The content was organized according to the principles of reading comprehension and included an AI chatbot to help learners with word meanings, but there were issues with connecting to external data sources. The Collaboration Center encouraged learners to work in groups and exchange ideas and perspectives to efficiently solve problems. However, the Scaffolding Center needed improvement in terms of clarity and language use. The Coaching Center had teachers acting as coaches to provide guidance and help learners with tasks. Learners had access to coaching anytime through online chat. Based on the feedback, the researcher made improvements to the problem situations, learning tasks, AI chatbot, and support bases to make them clearer and easier to understand.

4.3 Contextual Utilization

4.3.1 The most effective number of students per group

Results from the study of the documents. Study results: Researcher formed a group of 3 learners for effective collaboration. By reasoning that the number of learners 3 people per group is a reasonable number. Because students can express their opinions and share their knowledge with everyone. There are various views and there are judges when there is disagreement. And can classify the level of learners into good, intermediate, weak so that learners can effectively help their friends in the group.

4.3.2 The student's satisfaction towards Constructivist Learning Environment Integrated Gamification with AI-Assisted Learning Tool to Enhance Reading Comprehension for Fourth Grade Students

Student satisfaction survey showed the learners had an average level of content 4.40, a level of very satisfied. An average level of media 4.39, a level of very satisfied. An average level of design 4.47, a level of very satisfied. And an average level of benefit 4.57, a very satisfied.
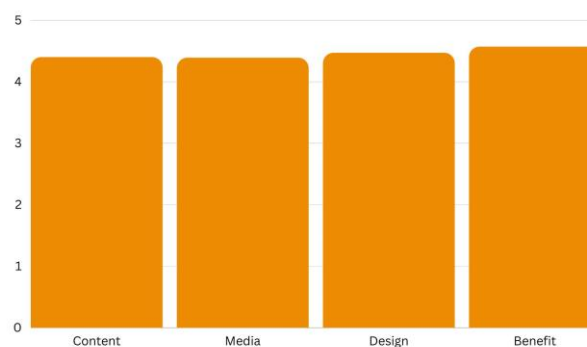

Figure 5: The student's satisfaction
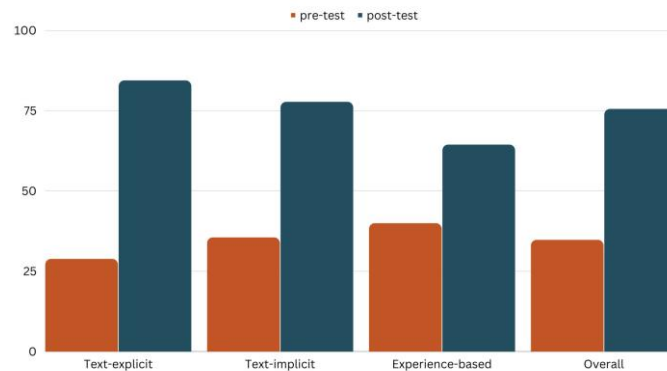
4.3.3 English reading comprehension

Figure 5: Pre-test and Post-test of English reading comprehension

The researcher assessed English reading comprehension ability for the pilot group after studying with a Constructivist Learning Environment Integrated Gamification with AI-Assisted Learning Tool to Enhance Reading Comprehension for Fourth Grade Students. Found that learners had scores after studying at each level as follows: (1) 84.44% for text-explicit (2) 77.78% for text-implicit (3) 64.44% for experience-based and (4) 75.56% for overall.

5   Discussion

Principle Results: Theories and research related to the design and development of a Constructivist Learning Environment Integrated with Gamification and Artificial Intelligence Assisted Learning Tool to Enhance Reading Comprehension for Fourth Grade Students are presented. The study is based on the Constructivism and Social Constructivism theories, with a Pedagogical Base consisting of the principles of the Constructivist Learning Environment (CLEs) [12], called the SOCIALClassnet system, and the principles of learning environment design according to the SOI Model. The Technology Base includes three learning components: Gamification, Multimedia, and AI Tool (Chatbot). The AI-assisted Learning Base, which is the Chatbot, helps support learners in accessing learning resources, and the Reading Comprehension Base has three levels: Text-explicit, Text-implicit, and Experience-based. The Contextual Base consists of content analysis on English reading comprehension and analyzing the basics of the context of the learners. There are four main components of the Constructivist Learning Environment Integrated with Gamification and Artificial Intelligence Assisted Learning Tool to Enhance Reading Comprehension for Fourth Grade Students design concept framework: Stimulating cognitive structure and reading comprehension, Support adaptation, entering intellectual balance, and promoting the creation of knowledge. The researcher developed a Constructivist Learning Environment Integrated with Gamification and Artificial Intelligence Assisted Learning Tool to Enhance Reading Comprehension for Fourth Grade Students, which has five important components: (1) Problem base & Learning tasks, (2) Learning Resources, (3) Collaboration Center, (4) Scaffolding Center, and (5) Coaching Center. Contextual utilization had shown that students should work in groups of 3 learners for effective collaboration. Student satisfaction survey showed high satisfaction levels. English reading comprehension scores have a passing score of 70%., the font size and internet speed could be the issue that should be considered in future study.

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