THE DEVELOPMENT OF DIGITAL SCAFFOLDING ASSESSMENT FOR ENHANCING MATHEMATICS PROFICIENCY AMONG GRADE 7 STUDENTS IN THE ENGLISH PROGRAM AT BUNYAWAT WITTHAYALAI SCHOOL

GARY GUTIERREZ JARDINERO

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Thesis Title	The Development of Digital Scaffolding Assessment for Enhancing Mathematics Proficiency among Secondary 1 (Grade 7) Students in the English Program at Bunyawat Witthayalai School
Name-Surname	Mr. Gary Gutierrez Jardinero
Program	Learning Technology and Innovation
Thesis Advisor	Assistant Professor Thidarat Kulnattarawong, Ph.D.
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..... Dean of Faculty of Technical Education
(Assistant Professor Arnon Niyomphol, M.S.Tech.Ed.)

8 March 2024

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ABSTRACT

The objectives of this study were to: 1) develop a digital scaffolding assessment for enhancing mathematics proficiency among Secondary 1 (Grade 7) students in the English Program at Bunyawat Witthayalai school, 2) compare the learning achievement of students between pre-test and post-test scores using digital scaffolding assessment for enhancing mathematics proficiency and 3) study the satisfaction of students who used digital scaffolding assessment for enhancing their mathematics proficiency.

The samples for this study were 30 students in Secondary 1 (grade 7) in the English Program at Bunyawat Witthayalai school in the academic year 2023. They were selected using purposive sampling. The research tools for the digital scaffolding assessment on improving mathematics proficiency of Secondary 1 (grade 7) students in the English Program included a content and media quality questionnaire, a students' learning achievement questionnaire, and a satisfaction questionnaire.

The research results revealed that: 1) the evaluation of the content of the digital scaffolding assessment for enhancing mathematics proficiency among Secondary 1 (grade 7) students in the English program at Bunyawat Witthayalai school by the experts was appropriate at the highest level ($\bar{x}$ = 5.00, *SD* = 0.00) and the evaluation of media by the experts were appropriate at the highest level ($\bar{x}$ = 4.57, *SD* = 0.52), 2) the post-test scores were higher than the pre-test scores with a statistically significant difference at the .05 level and 3) the student's satisfaction in using digital scaffolding assessment for enhancing mathematics proficiency was at a high level ($\bar{x}$ = 4.34, *SD* = 0.67).

Keywords: booklet, digital scaffolding assessment, mathematics proficiency, learning achievement, satisfaction

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Gary Gutierrez Jardinero

Table of Contents

Table of Contents (Continued)

List of Tables

List of Figures

CHAPTER 1

INTRODUCTION

1.1 Background of Statement

Assessment is a key essential in every learning experience. It measures how learners are assessed shapes their understanding of the subject matter and determines their necessary skills to progress. At the same time, assessment and feedback can be a challenging role for the facilitators that could result in either positive or negative effects on learning development. Effective assessment and feedback can be defined as practice that equips learners to study and perform to their best advantage in the complex disciplinary fields of their choice, and to progress with confidence and skill as lifelong learners. (Rajat Agrawal, 2003)

The practice of assessing and quantifying an individual's knowledge, skills, talents, or performance via the use of digital tools and technology is known as "digital assessment." With the development of technology and the rising usage of computers and the internet, this evaluation approach has grown in popularity. Pen and paper tests and other manual methods were frequently used in traditional evaluations to gauge people's talents. On the other hand, digital assessment uses automated methods, software, digital devices, and internet platforms to conduct and score tests.

Typical instances of digital evaluation techniques are as follows:

Online Exams: These are tests that are administered using websites that allow users to respond to questions and submit responses electronically.

Computer-based testing (CBT): Using specialized software to administer the test and record responses, candidates take assessments on computers.

Simulation-based tests: These types of assessments use interactive software to let applicants show off their abilities in hypothetical real-world situations.

E-portfolios: Digital portfolios that highlight a person's accomplishments, work, and abilities; frequently comprised of multimedia components such as pictures, documents, and videos.

Automated feedback and grading: Digital assessment technologies can instantly deliver feedback, score objective questions automatically, and produce comprehensive performance reports.

Analytics and performance tracking: With the use of digital assessment tools, educators and administrators may follow trends and make informed decisions by gathering and analyzing data on a person's or a group's performance over time.

Digital assessments provide several advantages, such as higher productivity, faster outcomes, less work for administrators, better accessibility for learners who live far away, and the capacity to add multimedia components for more interesting tests. To provide an impartial and trustworthy evaluation, it is important to take into account variables like test security and digital access discrepancies while utilizing digital assessment techniques. It's also possible that certain tests still call for in-person or alternate forms of examination, particularly if they include practical skills or physical tasks. (Wall,J.E., 2000)

Technology is still underused in assessment practices and in giving feedback to learners. However, benefits are accompanied in some cases by challenges. A wider understanding is still needed of how applications of technology can enhance assessment practices, and when there is a business case to support such innovations. For example, if designed appropriately, computer-assisted assessment offers several benefits that can enhance learning and reduce the workload of the facilitators: online assessments can be accessed at a greater range of locations than with paper examinations and enable learners to measure their understanding at times of their own. The result and feedback can be automatically delivered once requested and the time saved in marking can be used in more comprehensive educational improvement, for example in supporting learners experiencing difficulties. The outcomes of assessments can also be more easily collated and evaluated for quality assurance and curriculum review processes. (Haleem et al., 2022).

Assessment and testing vary in many ways. Testing is formal and often in a standardized form. Assessment is based on a collection of data about what students learned and what skills are available to progress in learning. In other words, students are given the exact procedures for administering and scoring in testing. In assessment, on the

other hand, there are multiple types, ways, and methods of collecting information at different times and contexts. Assessment can be done both formal and informal as long as it serves the needs of learning procedures. (Dikli Semire, 2003)

The search for functional technology for modern education is a continuous challenge to innovate and design a comprehensive assessment. However, all computer-based assessment needs commitment on the institutional or departmental level to meet the appropriate technical design and physical estate, and a reasonable approach to facilitate training for academic staff and learners (Davies Sarah, 2010). Quality assurance about test design and delivery also requires close monitoring.

In addition, technology-based assessment can support peer and self-evaluation in any location and at times to suit learners – the value of peer and self-evaluation in developing learners' ability is to regulate their learning. However, this innovation provides only the potential for enhancing assessment and feedback. The transformative effects are more important when there is a rigid educational goal behind the proposed innovation (such as teaching efficiency and administrative support) and when the use of technology is parallel with the curriculum set by the institution. There is considerable.

1.2 Research of Objectives

Research objectives include the following:

1.2.1 To develop a digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English program at Bunyawat Witthayalai School.

1.2.2 To compare the learning achievement of students between pre-test and post-test scores using digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English program at Bunyawat Witthayalai School.

1.2.3 To study the satisfaction of students who use digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English program at Bunyawat Witthayalai School.

1.3 Research Hypothesis

Research hypotheses include the following:

1.3.1 The learning achievement of students towards digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English program was significantly higher at the .05 level.

1.3.2 The student satisfaction level with the digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English program was the highest.

1.4 Conceptual Framework

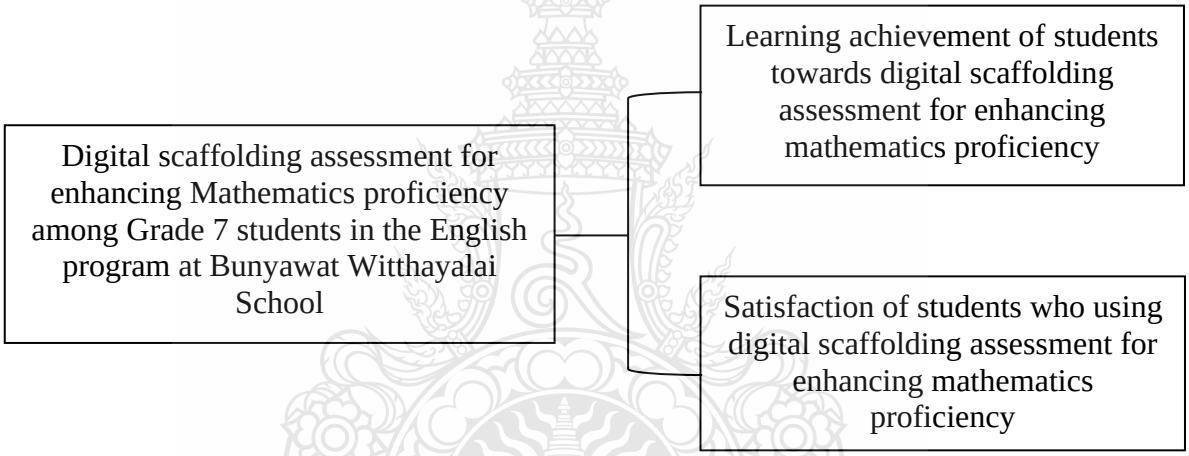

Figure 1.1 Conceptual framework for the development of digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English program at Bunyawat Witthayalai School

1.5 Research of Methodology

The research methods used in this paper include literature analysis, observation, interview, and field research. Mainly based on article analysis and practical teaching experience, this paper explores the value and significance of the digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English program at Bunyawat Witthayalai School.

1.5.1 The population of this study was 30 Grade 7 students in the English program for the academic year 2023 at Bunyawat Witthayalai School. They were selected by using purposive sampling as they were the students of the researcher who was responsible for teaching this course.

1.5.2 The research instruments: (1) digital scaffolding assessment to improve mathematics proficiency in Grade 7 students in the English program (2) content and media quality questionnaire for enhancing mathematics proficiency in Grade 7 students in the English program (3) students' learning achievement questionnaires between pretest and post-test scores using digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English program, and (4) satisfaction questionnaires to assess the student's level for digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English program at Bunyawat Witthayalai School.

1.5.3 The data analysis: The data were analyzed using Mean, Standard Deviation, and t-test.

1.5.4 Variables:

1.5.4.1 Independent Variables are the digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English program at Bunyawat Witthayalai School.

1.5.4.2 Dependent Variable are (1) the learning achievement of students towards digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English program and (2) the student’s satisfaction with the digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English program at Bunyawat Witthayalai School.

1.5.5 Content

Under the Office of the Basic Education Commission (OBEC) of Thailand, the students in grade 7 will explore a variety of topics in the mathematics curriculum. They will practice working with whole numbers, fractions, decimals, and percentages to obtain a basic knowledge of fundamental numerical concepts. They will also study algebraic

expressions and equations, as well as the connections between variables and problem-solving approaches. Geometry will play an important role in their education as they investigate angles, triangles, quadrilaterals, and circles, gaining a grasp of the characteristics and connections between different forms. Measurement will also be emphasized, including concepts such as length, area, volume, and capacity. Finally, students will learn about data handling and statistics, as well as how to acquire, organize, and evaluate data to make educated decisions and develop meaningful conclusions. At the grade 7 level, these courses provide a complete foundation for mathematical competency and critical thinking abilities.

1.5.6 Data collection

The researcher experimented with a one-group pretest and post-test test score design; the population was chosen using purposive selection. The digital scaffolding assessment for boosting mathematics competency among Grade 7 students in the English Program, pretest and post-test scores, mean, standard definition, t-tests the dependent sample Statistics are the measure and statistics and assessment. Amassment statistics data after the experiment and compute (O_1) and (O_2) for the mean ($\bar{X}$) and also compared, organizing for the experimental model by digital scaffolding assessment for improving mathematics competency among Grade 7 students in the English program.

1.5.6.1 A request for cooperation with 30 grade 7 students at Bunyawat Witthayalai School.

1.5.6.2 Plan to use digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English program.

1.5.6.3 Process learning by using digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English program, there are three steps goal of learning, creative thinking, construction knowledge; pretest; post-test; assess students' satisfaction; check pretest and post-test.

1.5.7 Data analysis

The statistics used to analyze data.

1.5.7.1 The researcher plans to implement a criterion experiment that involves content and media analysis, specifically utilizing the Items Objectives Congruence (IOC) analysis. This approach aims to recognize the validity of materials for enhancing the mathematics proficiency of Grade 7 students within the English Program at Bunyawat Witthayalai School.

1.5.7.2 To compare the learning accomplishment of students who utilize digital scaffolding assessment and conventional assessment for enhancing mathematics proficiency among Grade 7 English program students between pretest and posttest using a t-test.

1.5.7.3 To assess the students' satisfaction through the digital scaffolding assessment for enhancing Mathematics proficiency among Grade 7 students in the English program by mean and standard deviation.

1.5.8 Research questions

The following research issues are attempted to be addressed in this study:

1.5.8.1 What particular digital scaffolding methods did the English program at Bunyawat Witthayalai School use in the evaluation to improve the mathematics competency of Grade 7 students?

1.5.8.2 Were there statistically significant gains seen in the mathematics proficiency levels of Grade 7 pupils before and after the use of the digital scaffolding assessment?

1.5.8.3 What were the opinions and comments of both students and instructors about the application of digital scaffolding during the assessment process, and how did these opinions affect the intervention's overall efficacy?

1.6 Definition and Scope of the Study

1.6.1 Students in the English Program in Grade 7: This study focuses on students in Grade 7 who are participating in the English program at Bunyawat Witthayalai School. The study aims to give in-depth insights into the influence of digital scaffolding evaluation on mathematics skills within this specific academic setting by limiting the scope to this specific grade level and curriculum. It enables a focused assessment of the effectiveness of digital tools and resources in supporting 7th-grade students' learning needs and understanding how these interventions can contribute to their overall achievement in mathematics.

1.6.2 Digital Scaffolding Assessment in Mathematics Education: The primary objective of this study is limited to investigating the effectiveness of digital scaffolding assessment in the context of mathematics education. The study aims to examine extensively the possible benefits of utilizing digital tools and resources specifically for Mathematics learning and assessment by concentrating on this subject area. A focus on Mathematics proficiency allows for an intensive look into the use of digital scaffolding techniques, such as interactive exercises, immediate feedback, and personalized support, to improve students' problem-solving abilities, critical thinking abilities, and overall Mathematics competency.

1.7 Definition of Key Terms

1.7.1 Digital Scaffolding Assessment

Refers to the innovative use of digital technology and supportive tools in assessing Grade 7 students' mathematics competency in the English curriculum at Bunyawat Witthayalai School. The method of assessment entails utilizing various digital resources, such as online platforms, educational software, interactive applications, and multimedia content, to provide students with tailored guidance, immediate feedback, and personalized support during their mathematics learning activities and evaluations.

Students receive customized assistance and tools that respond to their specific requirements through the use of digital scaffolding evaluation, allowing them to engage in the learning process with increasing autonomy and confidence. The digital tools

provide real-time feedback, interactive exercises, and adaptive challenges to students, assisting them in navigating complicated mathematical issues and developing problem-solving and critical thinking abilities. The project attempts to investigate the usefulness of these novel technologies in boosting students' mathematics competency and generating a more effective and engaging learning environment by adding digital scaffolding into the assessment process.

1.7.2 Mathematics proficiency

Means the degree of competence, comprehension, and mastery of mathematics ideas and abilities displayed by Grade 7 pupils in Bunyawat Witthayalai School's English program. It requires them to solve mathematical problems, apply mathematical concepts to real-world situations, and reason mathematically. Mathematics competency includes a wide variety of mathematical skills such as numerical operations, algebraic manipulation, geometry, statistics, and problem-solving methodologies. The study looks at how the usage of digital scaffolding assessment affects and improves students' overall mathematical competency, as assessed by various assessments and evaluations of their mathematical talents and achievements.

1.7.3 Learning Achievement

It pertains to the quantifiable results and progress produced by Grade 7 students in the English Program at Bunyawat Witthayalai School in terms of their mathematics competence in the context of this research. It shows the degree of knowledge, skills, and comprehension obtained by students as a consequence of participation in the digital scaffolding assessment intervention in mathematics. The efficiency of the digital scaffolding strategy in boosting students' mathematical abilities and general academic advancement over the study period will be determined using various quantitative metrics, such as test scores and performance assessments.

1.7.4 Student’s Satisfaction

Student satisfaction is an emotional state of students' feelings towards using digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students

in the English program so motivation is the inner power of the individual which is a relationship between expected goals and needs.

1.8 Significance of the Study

The research focuses on the following:

1.8.1 Improving Mathematics Competency: The importance of this study comes from its ability to significantly enhance the mathematics proficiency of Grade 7 students enrolled in the English program at Bunyawat Witthayalai School. The research can uncover particular techniques and tools that best support students' learning requirements and promote their mathematics abilities and knowledge by analyzing the efficiency of digital scaffolding evaluation. This improved competence can have a long-term influence on students' academic achievement, enabling them to flourish in future courses and jobs that demand a solid foundation in Mathematics.

1.8.2 Upgrading Educational Practices: The findings of this study can be used to inform and guide educational practices in the English program at school and elsewhere. Educators may get significant insights into how technology can be effectively integrated into the teaching and assessment process by proving the effectiveness of digital scaffolding assessment. This can stimulate the use of digital tools and resources in other subject areas and grade levels, resulting in a more dynamic and engaging learning environment that accommodates students' different learning styles and skills.

1.8.3 Advancing Technology Integration: The impact of the study extends beyond the context of educational technology integration. The research can contribute to the growing body of knowledge on effective technology integration in the classroom by highlighting the benefits of digital scaffolding assessment in mathematics instruction. This may encourage educational institutions and politicians to invest in digital infrastructure and educator training, encouraging an innovative culture that utilizes technology's promise to improve learning outcomes and prepare students for a technologically advanced society. Finally, innovations in technology can lead to more comprehensive and future-ready instructional methods in schools and educational institutions across the world.

CHAPTER 2
REVIEW OF THE LITERATURE

In this chapter focused on reviewing the previous studies related to the following area relevant to this research. The effectiveness of those who offer in evaluating students' learning outcomes, formative and summative assessments that are digitally based are becoming more and more widespread in school settings. The development of various assessment tools, such as digital-based formative and summative tests that provide immediate feedback and adaptive assessment, has been made easier by the integration of digital technologies into education. A lot of research has been done to determine how well digital formative and summative assessments can enhance student learning results, engagement, and motivation. This literature review seeks to analyze and synthesize the existing research on formative and summative assessments that are conducted digitally, examining their advantages and disadvantages as well as the variables that affect their validity.

2.1 Digital assessment

2.2 Scaffolding

2.3 Mathematics proficiency

2.4 Learning Achievement

2.5 Efficiency of learning

2.6 Literature review of the relevant research

2.1 Digital assessment

Within the framework of existing learning theories, digital assessment may be understood and reviewed. One theory of learning that may be used for digital assessment is "constructivism." Hong, Zishan, (2003) Constructivism is a learning theory that proposes that learners actively create knowledge and understanding based on past experiences, interactions with their surroundings, and social relationships. This approach highlights the learner's responsibility in constructing their knowledge by actively engaging with the learning material and the environment. Constructivism may be useful in the context of digital assessment in numerous ways:

2.1.1 Active Learning and Engagement: Through quizzes with quick feedback, simulations, and multimedia information, digital learning evaluations encourage active learning. Learners participate actively, which promotes deeper learning and problem-solving abilities. Piaget (1973) a Swiss developmental psychologist, is widely regarded as the father of constructivism. He thought that learners actively generate knowledge via their interactions with their surroundings. Piaget's concepts coincide with the concept of active learning and participation in the setting of digital assessment. Learners who use digital assessment tools are actively participating in problem-solving, examining multimedia information, and making decisions, which is consistent with Piaget's focus on the active role of learners in knowledge production.

2.1.2 Social Interaction and Collaboration: Social engagement and cooperation among learners may be facilitated via digital learning platforms, establishing a constructivist learning environment. Learners may communicate ideas, explore concepts, and co-construct knowledge through discussion forums, group projects, and peer evaluations. This social aspect of digital learning assessment helps improve comprehension and problem-solving ability.

Russian scientist Vygotsky (1978) emphasized the importance of social connections in cognitive development. He established the Zone of Proximal Development (ZPD), a notion in which learners can achieve more with the assistance of a skilled colleague or teacher. Collaborative learning elements, such as discussion forums and peer assessments, correspond with Vygotsky's concept of learning through social interactions and scaffolding in the context of digital assessment.

2.1.3 Authentic Assessments: John Dewey (1916) was an American philosopher and educational reformer who emphasized experiential learning and learning by doing. Simulations and project-based assessments, for example, are digital assessment methodologies that align with Dewey's notions since they provide learners with hands-on experiences and real-world applications of knowledge.

The relevance of learning in genuine environments is emphasized by constructivism. Digital assessments may be created to simulate real-world circumstances, allowing students to apply their knowledge and abilities in real-world scenarios. Scenario-

based or project-based assessments, for example, might offer learners with genuine difficulties that compel them to apply what they have learned.

2.2 Scaffolding

Both Lev Vygotsky (1978) and Jerome Bruner (1996) highlighted the notion of scaffolding in their theories of cognitive development and learning. Scaffolding is the assistance offered by a skilled peer or teacher to assist learners in completing activities that they would be unable to perform on their own. This assistance is gradually lessened as learners develop competency, enhancing their learning and problem-solving abilities. Vygotsky and Bruner's concepts can be utilized in the context of digital assessment in the following ways:

2.2.1 Collaborative Learning in Digital Assessment: Vygotsky suggested that social connections were essential to cognitive growth. Collaborative learning components in digital assessment, such as chat rooms and group projects, may boost social connections among learners. Peers can help and challenge one another by sharing diverse viewpoints and ideas, resulting in greater comprehension of the assessment material.

2.2.2 Peer Tutoring and Feedback: Vygotsky's Zone of Proximal Development (ZPD) emphasizes the necessity of giving support in the learners' "zone of proximal development," where they may achieve more with help. Peer tutoring and peer feedback methods can be included in digital assessment platforms, allowing students to help one another and improve their learning experience. Bruner advocated that teachers offer constructive criticism and tips to lead students toward solutions without providing the answers. Feedback mechanisms for digital assessment can be structured to provide tips, ideas, or explanations to learners, helping them to think critically and arrive at the correct answers.

2.2.3 Adaptive Assessments: Bruner pointed out the need to design learning experiences based on the capabilities of the learners. Adaptive assessment systems in digital assessment can give customized learning paths by adjusting assessment material and level of difficulty to individual learners. This personalized technique is similar to scaffolding in that learners receive help that is tailored to their requirements.

2.2.4 Guided Discovery and Problem-Solving: According to Bruner, the concept of "guided discovery," is where learners are led to discover key concepts through active problem-solving. In digital assessment, scenario-based assessments or case studies can be used to encourage learners to apply their knowledge in practical situations and discover solutions through guided exploration.

In summary, both Vygotsky's and Bruner's scaffolding theories may be utilized in digital assessment via collaborative learning, peer interactions, individualized material delivery, guided problem-solving, and supportive feedback systems. Educators may build a more dynamic and learner-centered learning experience by combining these aspects into digital assessment systems, enabling deeper comprehension and skill development.

2.3 Mathematics proficiency

Seymour Papert (1958 – 1963), a well-known mathematician, educator, and one of the forefathers of educational technology was a firm believer in the use of digital technologies, particularly computers, to improve learners' mathematical aptitude. He is connected with the constructionist learning approach, which holds that learners create knowledge best when actively involved in the creation of concrete artifacts. Papert's theories in the context of mathematical proficiency and digital evaluation might be described as follows:

2.3.1 Hands-On Learning: In mathematics, Papert promoted hands-on, experiential learning. He thought that digital technologies, such as computers and programming, allow students to actively investigate mathematical topics through the creation and manipulation of visual models, simulations, and interactive programs. Through hands-on experiences and interactive exercises, digital assessment tools may be built to involve learners in the construction of mathematical knowledge.

2.3.2 Tangible Artifacts: Papert claims that when students develop concrete things like computer programs or visual representations, they have a better knowledge of mathematical topics. Learners can use digital assessment to construct and present their mathematical projects or programs, allowing them to demonstrate their understanding in practical and relevant ways.

2.3.3 Personalized Learning: The learners should have agency and responsibility over their learning. Digital assessment can help to facilitate tailored learning paths in which learners can investigate mathematical ideas at their speed and according to their particular interests and skills. Adaptive digital exams can modify the level of difficulty based on student performance, giving personalized help and challenges.

2.3.4 Learning from Mistakes: The importance of learners having agency and responsibility over their learning. Digital assessment can help in the facilitation of individualized learning paths in which learners can examine mathematical topics in their own time and by their specific interests and talents. Adaptive digital tests can change the level of difficulty based on student performance, providing individualized assistance and challenges.

2.3.5 Collaborative Learning: The need for collaborative learning spaces in which students may share ideas, cooperate on projects, and learn from one another. Collaborative learning activities, such as group projects or online conversations, may be facilitated through digital assessment systems, allowing learners to engage in constructive discourse and peer learning.

In summary, Seymour Papert's ideas about mathematics proficiency and digital assessment revolve around the power of active, hands-on learning, where learners construct knowledge through engagement with digital technologies. By integrating digital assessment tools that foster experiential learning, personalized experiences, and collaborative opportunities, educators can enhance mathematics proficiency and cultivate a deeper understanding of mathematical concepts in learners.

2.4 Learning Achievement

According to Muhibbin Shah (2008: 91), learning achievement is the "degree of student success in learning the subject matter in schools, as indicated in the form of scores received from the results of tests on a certain subject matter." Meanwhile, Tu'u Sincere (2004: 75) states that "learning achievement is the acquisition of knowledge or abilities created by subject matter, commonly shown by test scores or numerical value awarded by teachers." Based on this understanding, it can be concluded that learning achievement is the percentage of pupils who succeed in school and is expressed as a numerical figure.

It refers to how far a student has progressed toward their short- or long-term educational objectives. Individual disparities in academic achievement are significantly linked to personality and IQ differences. Students' levels of self-efficacy, self-control, and drive also impact their academic performance.

Achievement motivation is considered to be a significant factor in academic success since it energizes and focuses behavior toward achievement. Achievement motivation is a broad term that encompasses several concepts such as motivational beliefs, task values, objectives, and achievement motives. However, there are only a few studies that looked at (1) several motivational factors about students' academic accomplishment in a single sample and (2) also considered students' cognitive ability and prior achievement. Because students' cognitive abilities and their prior achievement are among the best single predictors of academic success (e.g., Kuncel et al., 2004; Hailikari et al., 2007), it is necessary to include them in the analyses when evaluating the importance of motivational factors for students' achievement.

2.5 Efficiency of learning

Instructional materials have been observed as a powerful strategy to bring about effective teaching and learning. The importance of quality and adequate instructional materials in teaching and learning can occur through their effective utilization during classroom teaching. Instructional materials here include all the tools that the teachers can use to make the learning more interesting and memorable. According to Farombi, (1998), instructional materials include books, audio-visual, software, and hardware of educational technology. He further opines that the availability, adequacy, and relevance of instructional materials in classrooms can influence quality teaching, which can have a positive effect on students' learning and academic performance. The insight from Farombi on linking instructional resources to students' academic performance is critical in the provision of quality education. According to Oni (1992), instructional resources are teachers' strategic factors in organizing and providing education. This is so because they help to elaborate a concept that the teacher could not, without instructional material. This allows 2 students to learn more comfortably, therefore, influencing positively their academic performance. Writing on the role of instructional materials in teaching and

learning, (Balogun, 1982) commented that science education programs cannot be taught effectively without the existence of equipment for teaching.

2.6 Literature review of the relevant research

This study intends to investigate existing research and academic work on digital scaffolding, mathematics education, and assessment methodologies to acquire insights into how these technologies and tactics have been used to promote students' learning and accomplishment in mathematics. The study aims to identify best practices, obstacles, and possibilities connected with digital scaffolding assessment in the context of Mathematics instruction for Grade 7 students by evaluating relevant literature. The findings of this literature review will inform the design and implementation of a comprehensive research study to investigate the effectiveness and potential benefits of digital scaffolding assessment in promoting Mathematics proficiency among students in the English program at Bunyawat Witthayalai School.

The following studies are being used to investigate the parallel conclusions of this research.

The article Digital Assessment in Technology-Enriched Education: Thematic Review; by Anzela Jurane-Bremane (May 2023) analyzed the contemporary digital assessment literature. The three key topics that digital assessment was developed to address were conditions and proposals for digital assessment, possibilities, and problems. This study's results suggest that digital evaluation may be an effective and full-fledged component of the learning process. It should be noted that this study is an analytical synthesis of previously examined themes and hence does not qualify for astounding results. Thus, the study is useful for academics in the creation of future research, as well as for practitioners and educators. In response to the research topic, the essential digital characterization contains the following aspects: (1)The development of digital skills for both educators and learners;(2) The meaningful selection of appropriate technologies with clear assessment criteria;(3) The guidance of student learning and formative training before summative assessment (using self-assessment); (4) The assessment of knowledge and skills at various levels;•Useful and timely feedback for educators and learners;(5) Availability and individualization;(6) Ensuring academic integrity. More studies are

likely to corroborate these findings. Future studies should concentrate on improving the quality of digital assessment since it is critical to define pedagogical principles for digital assessment implementation.

This work has some limitations. First, a period of only four years was chosen to review the current literature on what are rapidly changing technologies. One has to consider that it is possible that research before 2018 revealed important characteristics of digital assessment. The second limitation relates to the exclusion of COVID-19 topics, which also may have provided valuable information. As explained above, this literature review was designed to identify and avoid the conditions created by temporary situations. This should constitute a separate and extensive systematic review to evaluate the benefits of developed practices in remote learning. This work certainly has significant limitations. First, a four-year timeframe was chosen to study existing research on fast-evolving technology. Research before 2018 likely discovered crucial aspects of digital assessment. The second issue is the omission of COVID-19 themes, which may have also supplied useful information. As previously stated, the purpose of this literature analysis was to identify and avoid the circumstances generated by transitory occurrences. This should be a distinct and lengthy systematic assessment to assess the advantages of developed techniques in remote learning. We can now be certain that the epidemic has ended; so, this research provides a suitable foundation for comparing and assessing what it is worthwhile to maintain from the transitory condition. Future studies should also look into the influence of artificial intelligence in assessment. This necessitates a reconsideration of the sort of assignment for the evaluation to be legitimate.

Siavash Hayati and Najmeh Behnamnia (April 2023) Their qualitative findings from interviews demonstrate that children with high levels of gaming experience vary from those with low levels of gaming experience. These changes were most noticeable in gaming support for improving children's problem-solving abilities on math issues. Children who had greater experience with digital gaming developed stronger social bonds with their peers. Children with minimal gaming experience, on the other hand, engaged themselves in the game's content and attempted to comprehend the game world. As a result, youngsters with greater gaming experience, particularly in Digital Game-Based Learning (DGBL), had a better knowledge of game performance and hence declined more

items to accelerate game advancement. Children with less experience playing in the (DGBL) setting, on the other hand, were more attentive and concentrated on all elements. Furthermore, youngsters who had more experience playing digital games were less likely to seek assistance from their teachers in problem-solving. Children with less game experience, on the other hand, continued to approach their teachers for assistance in solving math issues.

This study investigates the impact of individual differences, particularly the level of experience in digital games among primary-level children (aged 6-8 years old). Each child's gaming preferences may be influenced by their characteristics. The level of gaming experience, along with gaming skills, can lead to significant differences among individuals. The study also aims to examine children's behavior in learning mathematics and its effects on social interaction. Additionally, the research explores the use of teacher scaffolding in Digital Game-based Learning (DGBL) and analyzes the effects of the teacher's presence during mathematics learning. Two types of scaffolding, namely individual and whole-class teacher presence, were studied, both of which had an impact on students' learning outcomes. This study examines the impact of Digital Game-based Learning (DGBL) on mathematics in a virtual school classroom, investigating how students' experimental DGBL ability affects their mathematics learning responses, and how teacher scaffolding strategies influence students' success. The qualitative case study involved 21 primary-level students and explored the help children received from teacher-based digital games. Children with more gaming experience tended to socialize, while those with less experience were more focused on game content. High experience in cooperation and social skills led to better progress and socialization, possibly due to greater attention to learning concepts in the game.

According to the study entitled “Towards a Framework to Support the Implementation of Digital Formative Assessment in Higher Education” by Kaya-Capocci, S., O’Leary, M., & Costello, E. (2022, November 17). The greatest trend of the 21st-century education system is the development of fundamental ideas and techniques that will help in the development of successful formative assessment systems that make the most of technology capabilities. To reshape lecturers’ teaching and learning procedures more effectively for higher education classrooms. The main goal of this

project is to give a structured conceptualization of digital formative evaluation. The core of the framework, as it is described in this article, is a 12-cell grid with 3 technology functionalities (sending and displaying, processing and analyzing, and interactive environments) bounded with 4 essential formative assessment strategies (sharing learning intentions and success criteria, questioning and discussion, feedback, and peer- and self-assessment). These technological capabilities serve as the foundation for incorporating digital tools into formative evaluation for efficient teaching and learning procedures. An illustration of a digital formative evaluation practice is provided for each cell in the grid. The framework's ability to improve the practice of digital formative assessment is highlighted in this paper, along with its importance in light of the ongoing digital transformation. To assess this paper's utility and impact in higher education contexts, it offers a study agenda that could be pursued. The research concludes by providing examples showing the framework's potential for enhancing the practice of digital formative assessment and moving from theory to practice. The digital formative assessment framework presented here was created to give educators a way to:

1. conceptualizing digital formative assessment by providing information on the formative assessment strategies and functionalities of technology,

2. planning lectures on how they could integrate digital tools with formative assessment in a structured, logical way, and

3. incorporating practical digital formative assessment practices into the classroom.

The study also suggested that those who adopt the framework for digital formative assessment must do so with consideration for their specific institutions of higher learning and should be ready to use digital tools that go beyond the examples given. It is anticipated that the framework will eventually be a matter of practical studies that show proof of its usefulness and viability as a tool for implementing digital formative assessment. It will be necessary to perform research to determine which digital formative assessment strategies are most frequently used and which should be promoted. Most importantly, it should be possible to collect evidence of consequential validity using the 12-cell framework to create a measurement scale that can make the application of digital formative assessment more reliable.

The study “Enhancement of Performance and Motivation Through Application of Digital Games in an English Language Class” aimed to assess the impact of a digital game, specifically Kahoot, on students' learning performance and motivation. A quasi-experimental design was used with an experimental group taught using Kahoot and a control group taught using conventional methods. Pre-tests, post-tests, and questionnaires were administered to measure motivation and attitudes. Wichadee and Pattanapichet (2018) found that there are statistically significant differences in learning performance and motivation, with the experimental group outperforming the control group. Their survey results indicated positive attitudes toward digital game applications in language learning. The findings suggest that gamification techniques enhance motivation and learning outcomes, making difficult content more engaging and comprehensible. Students had a favorable opinion of using digital games to learn languages, according to the research. This outcome can be explained by three factors. The first (1) thing to note is that students are used to using a range of technology in daily life. Since all students have smartphones, they make the greatest gaming equipment for in-class use. Second (2), through a mobile phone app, Kahoot enables individuals to compete with their peers. Since they had to use their information in the competition, they devoted closer attention during the lessons. Lastly (3) the components of Kahoot games are also appropriate for teaching. In other words, Kahoot's features, such as the screen and music, are well-designed to grab players' attention, and the quizzes are tailored to each player's skill level. Fun learning helps foster a positive environment. Students overwhelmingly concurred that gamified learning made the course more enjoyable for this reason. We may conclude that Kahoot is a useful online game that can be utilized to boost students' interest in language learning and make it more enjoyable.

However, researchers recommended further study is needed to explore the point at which student engagement may decline, compare different digital games, investigate the impact of game quantity, include larger sample sizes, gather more comprehensive feedback through interviews, and ensure clarity of instructional objectives when implementing gamification in the classroom.

Suzanne Young and Helen Nichols (2017) have incorporated various digital learning technologies into their teaching practices to enrich the learning experiences of

their students. Through a reflective analysis of their actions, they realized that the conventional teaching methods were not adequately inclusive for their diverse student groups. Based on feedback from previous modules, they recognized the necessity for increased engagement and interaction to foster active learning among students. Embracing a reflexive approach, the authors discovered that introducing familiar technologies into the learning environment could address some of the challenges they encountered, promoting greater creativity and interactivity for enhanced educational outcomes. Digital learning tools have a special role in increasing engagement, particularly in large classes where students tend to disconnect from traditional forms of delivery. We recognize that individual students may feel "lost in the crowd" in huge lecture halls; yet, digital technology may help empower students to find a voice in circumstances where they may feel isolated. This, in turn, fosters increased engagement and, as seen by the comments we have received, improves the learning experience. Another advantage of using digital tools is the development of communities of practice, in which students use technologies to communicate more effectively with one another both within and outside of the classroom setting. (Khoeler 2012) Incorporating technology-enhanced learning techniques can complement and improve face-to-face interactions in teaching and learning. Web conferencing lectures increased student engagement in the classroom, demonstrating the potential of technology to overcome certain barriers to communication. However, caution is advised not to overuse technology, as digital tools should serve to enhance learning experiences without replacing the value of human interaction. The effectiveness of different technologies depends on class size, with in-class (Beetham, McGill, and Littlejohn 2009) interactive tools being beneficial for larger cohorts and asynchronous learning and social media communities fostering engagement in smaller groups. Purposeful integration of digital tools is essential, supporting the content being taught and offering students opportunities for active learning, contributing to their overall satisfaction with the learning process.

Thus, it could be said that these empirical studies highlighted the strong connection between digital assessment, scaffolding, Mathematics proficiency, learning achievement, and efficiency of learning. These essential components could help the students to achieve their success or accomplish their learning objectives with the forms

of challenges in the learning. The digital scaffolding assessment, therefore, becomes an effective tool to revolutionize the traditional learning process into an educational gimmick that has crossed over between digital assessment, scaffolding, and Mathematics proficiency of Grade 7 students in the English program, which offers students an experiential element that is more effective than traditional learning within the digital transformation trends in education.

CHAPTER 3
RESEARCH METHODOLOGY

The purpose of this research is to investigate the development of digital scaffolding evaluation in enhancing mathematics competency among grade 7 students enrolled in the English Program at Bunyawat Witthayalai School. It involves a thorough examination of data gathering and analysis utilizing quantitative approaches. The researcher describes the approach used in this study, which includes the following components.

3.1 Research Design

3.2 Population and sample

3.3 Research Instrument

3.4 Data Collection

3.5 Data and Statistical Analysis

3.1 Research Design

The study design was carried out by the following structure in the research aim; it proceeded in the following steps:

The researcher used a quantitative approach in experimental design for conducting this study. The data was collected in a quantitative or numerical form derived from the test, and the researcher used a one-group pretest-posttest design. This design included a pretest measure followed by a treatment and a posttest for a single group. An illustration of the design is as follows:

Group: O1 x O2

O1 = Measurement of the pretest score

X = Digital scaffolding assessment for enhancing mathematics proficiency among grade 7 students in English program

O2 = Measurement of the achievement of the posttest score

3.2 Population and sample

3.2.1 The population of this study was 637 grade 7 students whom currently enrolled in Bunyawat Witthayalai School, Lampang City, Thailand during the academic year 2023.

3.2.2 The sample population of this study was 30 students in grade 7 in the English Program at Bunyawat Witthayalai School in the academic year 2023. They were selected by using purposive sampling as they were the students of the researcher who was responsible for teaching this course.

3.3 Research Instruments

3.3.1 The digital scaffolding assessment for enhancing mathematics proficiency among grade 7 students in the English program.

Materials for digital scaffolding assessment:

A) Blooket Application, a game-based platform Blooket offers a special chance to actively engage students and immerse them in engaging educational activities. This study uses a controlled experimental design to examine the effects of Blooket-based examinations on students' understanding of mathematics, motivation, and overall academic success. It also includes quantitative performance measurements and qualitative comments from students and teachers. The study's findings will help educators make wise decisions about integrating Blooket into their instructional practices to create a more stimulating and effective learning environment for grade 7 students. These insights will be particularly helpful in understanding the efficacy of gamified assessments in the particular context of mathematics education. The teacher had to have a premium membership for this study and signed up every participant using their email.

B) Textbook and workbook, the study's textbook was Focus Smart Plus Mathematics 1 by the Pelangi publishing company. The book was updated for the 2017 academic year and is based on Thailand's Basic Education Curriculum from the year 2008. The grade 7 English Program students at Bunyawat Witthayalai School will take both Foundation and Intensive mathematics classes from this book.

C) Teacher’s lesson plans and the textbook’s teacher's aid, For the length of six weeks, the instructor in this study has designed lessons for both Foundation and Intensive Mathematics classes. It is a requirement that all grade 7 students currently enrolled in the English program at Bunyawat Witthayalai School show up to class during the specified hour. Students will continue with their regularly scheduled weekly course load of three hours of Foundation Mathematics 1 and two hours of Intensive Mathematics 1. The following are the guided plan per week:

Week 1: Geometric Constructions (Part 1)

Skills: Use the knowledge of geometry and tools such as compasses and straightedges, including the Geometer's Sketchpad or other dynamic geometry programs, to create geometric shapes, as well as apply the knowledge of geometrical constructions to solve problems in real life. This lesson aims to develop students’ Thinking skills, Problem-solving skills, analyzing skills, and Drawing skills.

Learning Objectives:

1. Construct basic geometric construction.

2. Construct two-dimensional geometric figures using basic geometric construction.

3. Be able to explain the procedure for doing geometric constructions.

Learning Procedures:

Ask students to do Flashback A to help them recall certain Mathematical concepts. Introduce the different construction materials, such as the protractor, compass, and ruler, and then demonstrate the proper way of using them. Teach and guide students on how to construct:

a. line segments

b. triangles on different condition

c. perpendicular lines and transversal.

4. Explain each step to construct the geometrical figures as students carry out the steps accordingly. Make sure they have a set of their tools and draw on a big piece of blank paper.

5. Use Examples 1 to 7. Have them try out the questions in Test Yourself 9.1 as they progress. Explain the notes in the Hot Tips columns to make them understand them better.

6. Ask students to do the exercises for this subtopic on pages 114 to 117 of the Workbook as their homework.

Learning Outcomes:

1. Construction activity about line segments, triangles of given sides, perpendicular lines, and transversal.

2. Workbook

3. Unit Quiz

4. Unit Test on the platform of Blooket.

Week 2: Geometric Constructions (Part 2)

Skills: Students would be able to construct basic geometric figures using different construction materials and apply knowledge of geometrical constructions to solve problems in real life. This lesson aims to develop students' Thinking skills, Problem-solving skills, analyzing skills, and Drawing skills.

Learning Objectives:

1. Construct basic geometric constructions involving parallel lines, transversal lines, and a bisector.

2. Construct various two-dimensional geometric figures using basic geometric construction.

3. Able to determine the relationship of angles formed by intersecting parallel lines and transversals.

Learning Procedures:

1. Ask students to do the Flashback act in the book to help them recall certain Mathematical concepts about bisectors, parallel lines, perpendicular lines, and line segments.

2. Show the instructional videos about constructing parallel lines perpendicular lines and transversal lines. Ask the students to follow the steps and illustrate the figures on a blank sheet of paper.

3. Explain each step to construct the geometrical figures as students carry out the steps accordingly. Make sure they have a set of tools of their own and draw on a big piece of blank paper.

4. Teach and guide the students on how to identify the relationship of angles form by intersecting transversal on two or more parallel lines

5. Use Examples 7 to 14. Have them try out the questions in Test Yourself 9.1 as they progress. Explain the notes in the Hot Tips columns to make them understand better.

6. Ask students to do the exercises of this subtopic on pages 117 to 120 of the Workbook as their homework.

Learning Outcomes:

1. Construction Activity about constructing parallel lines, transversal lines, and bisector

2. Workbook

3. Unit Quiz

4. Unit Test on the platform of Blooket.

Week 3: Introduction to Algebra

Skills: Mastering basic algebra cultivates critical problem-solving skills, nurtures abstract thinking, and establishes a robust foundation for advanced mathematical and scientific pursuits.

Learning Objectives:

1. Translate mathematical phrases into algebraic expressions and vice versa.

2. Identify the different types of polynomials.

3. Recognize similar and dissimilar terms in an algebraic expression.

Learning Procedures:

1. Begin by teaching fundamental algebraic concepts, such as variables, constants, expressions, and equations, to develop a clear understanding of the language and structure of algebra.

2. Introduce the different forms of algebraic terms, degrees of expression, and types of polynomials.

3. Let the students learn how to translate mathematical phrases into algebraic expressions and algebraic equations.

4. Let the students know the similarities and dissimilarities of algebraic terms. Relate the laws of sign and laws of indices in simplifying basic algebraic operations.

Learning Outcomes:

1. Let the students do the Test Yourself Activity in their workbook.
2. Peer Tutoring Activity
3. Unit Quiz
4. Unit Test on the platform of Blooket.

Week 4: Linear Equation in One Variable

Skills: Develop adeptness in translating word - problems into algebraic expressions, boosting problem-solving skills and fostering a clear grasp of the constants-variables relationship for heightened analytical thinking. Additionally, proficiency in isolating variables, applying operations, and interpreting solutions nurtures critical mathematical reasoning, advancing the comprehension of fundamental algebraic concepts.

Learning Objectives:

1. Apply the proper methods to solve basic linear equations with just one variable, demonstrating your proficiency in identifying the variable and coming up with accurate solutions.

2. Convert mathematical word problems into algebraic expressions and equations: Demonstrate the ability to represent and solve practical problems using linear equations.

3. Understand the different algebraic properties of constants and variables in linear equations and demonstrate solving algebraic problems.

Learning Procedures:

1. Recall the different types and degrees of algebraic equations. Relate the previous lesson in learning linear equations in one variable.

2. Let the students know the relationship between variables, constants, and coefficients.

3. Demonstrate how to rewrite and solve linear equations in one variable.

4. Introduce the role of the different properties of equality in learning the lesson. Let them differentiate the symmetry, reflexive, and transitive properties.

5. Give them board work and a “blindfold activity challenge”.

Learning Outcomes:

Let the students do the Test Yourself Activity in their workbook.

1. Workbook
2. Unit Quiz
3. Unit Test on the platform of Blooket.

Week 5: Graphing Linear Equation

Skills: Visually represent mathematical relationships, enabling the interpretation of slope, intercepts, and trends. Additionally, it fosters the ability to analyze and compare various linear equations graphically, facilitating the identification of proportional correlations and pattern recognition.

Learning Objectives:

1. Create and interpret graphs of linear equations on the Cartesian coordinate plane, demonstrating proficiency in visually representing mathematical relationships.

2. Utilize domain and range to plot data points on a linear graph, showcasing the ability to organize and present information effectively through tables of values.

3. Apply linear equations to solve practical problems, showcasing the capacity to analyze and interpret real-life situations mathematically and draw meaningful conclusions.

Learning Procedures:

1. Recall their background knowledge about linear equations. Let them know the degree of the equation. introduce the definition of a linear equation and let them know the use of the Cartesian coordinate plane in graphing. Tell a brief story about how it originated and its importance.

2. Lead the class to know some vocabulary about linear equations and inform them how they relate to the discussion. Show different examples of graphs. Let them know the four behaviors of the linear graph and its properties.

3. Give more real-life examples and let the class know how it works. Inform them of the importance of the table of values in plotting the points and illustrating the line of the equation.

4. Let the class know the relationship between abscissa and ordinate and the four quadrants in a plane.

Learning Outcomes:

1. Graphing Paper activity
2. Workbook
3. Unit Quiz
4. Unit Test on the platform of Blooket.

Week 6: Basic Statistics

Skills: Develops the ability to precisely gather, arrange, and analyze data, enabling critical examination of trends and patterns and informed decision-making. Additionally, it promotes a comprehension of probability principles, making it easier to assess uncertainties and quantify results in a variety of real-world circumstances.

Learning Objectives:

1. Translate Determine an issue and write questions about various problems or situations, as well as set appropriate methods for gathering data.

2. Find the arithmetic mean, median, and mode of non-frequency distribution data and make an appropriate interpretation and valid conclusion to a problem.

3. Represent data in different statistical forms and should be able to read, interpret, and analyze the data obtained from the study.

4. Apply knowledge of statistics to decision-making in various situations.

Learning Procedures:

1. Introduce the different vocabulary words relating to the lesson. Discuss the different components of learning statistics and let them understand its use and importance in the field of mathematics.

2. Present the different data graphs representations, like bar graphs, line graphs, picto-graphs, histograms, and pie charts. Let the students know the difference between each data representation.

3. Students should be able to interpret given statistical data and represent it in different diagrams.

4. Guide the students on how to design a study and let them know the step-by-step procedure for gathering data. Discuss finding the measurement of the central tendency for ungrouped data, including percentiles and quartiles.

5. Let the students work on a simple statistical survey and let them do the data analysis.

Learning Outcomes:

1. Project-based activity, presentation of data analysis
2. Workbook
3. Unit Quiz
4. Unit Test on the platform of Blooket.

3.3.2 Procedure

Step 1: The researcher reviewed theories of mathematics and attitude measurement to develop questions for the pretest, posttest, and questionnaire.

Step 2: The pretest, posttest, and questionnaire were subjected to review by the researcher's advisor and other experts in the field.

Step 3: Pilot testing of the pretest, posttest, and questionnaire was conducted with 30 grade 7 students in the English Program who were not part of the study participants but enrolled in the mathematics subject.

Step 4: A group of 30 grade 7 students from the English Program at Bunyawat Witthayalai School, Lampang, enrolled in the mathematics subject, completed the pretest with a duration of approximately one hour.

Step 5: The researcher devised a six-week lesson plan, implementing a digital scaffolding assessment to enhance mathematics proficiency among grade 7 students in the English program. This plan received approval from the researcher's advisor and field experts.

Step 6: The class was conducted based on the approved lesson plan, teaching mathematics through the use of digital scaffolding assessment for six weeks. Following this period, the students completed both the post-test and questionnaire, with the test-taking approximately 90 minutes.

3.3.3 The quality of digital scaffolding assessment for enhancing mathematics proficiency among grade 7 English Program students.

Three subject matter experts and three media experts evaluated a digital scaffolding evaluation for improving mathematics competency among grade 7 students in the English Program.

3.3.3.1 The assessment of digital scaffolding assessment content quality factors for improving mathematics competency among grade 7 students in the English program for subject matter experts. mathematics content specialists were requested to review the appropriateness of the content applied in the digital scaffolding assessment for developing mathematics proficiency.

3.3.3.2 The evaluation of media quality components of digital scaffolding assessment to improve mathematics proficiency for media experts. Media experts in the domains of information technology, computer, and educational technology, or allied

sectors were requested to review the appropriateness of the media utilized in the digital scaffolding evaluation for enhancing mathematics proficiency.

Step 1: The evaluation in this study was designed to suit the study hypothesis. As a result, it was created based on both ideas used in this study. The study demonstrates the effectiveness of digital scaffolding evaluation in improving mathematics competency. The questionnaire's goal is divided into two sections.

Part 1: The initial part uses the digital scaffolding evaluation to get experts' opinions on how to improve mathematics proficiency. This section consisted of a closed-ended questionnaire with five (5) point Likert-type scales. Participants were asked to score their level of agreement with each statement on a scale of 1 to 5. The following is a description of each designation:

5 = Very Satisfied
4 = Satisfied
3 = Neither nor Satisfied
2 = Dissatisfied
1 = Very Dissatisfied

Table 3.1 Range of mean and verbal interpretation

Range Value	**Verbal Interpretation**
4.50-5.00	Excellent
3.50-4.49	Good
2.50-3.49	Average
1.50-2.49	Poor
1.00-1.49	Very Poor

Part 2: This section consisted of an open-ended questionnaire. Participants were invited to give their thoughts and ideas for improving mathematics proficiency using digital scaffolding assessment.

Step 2: Before administering the assessment, three measurement and evaluation specialists who work in measurement and evaluation or education were requested to review the wording used in the questionnaire. The information gathered was used to compute the Item Objective Congruence Index (IOC).

The measurement and evaluation experts used the item objective congruence index (IOC) to assess the assessment's content quality and discovered a value of 1.0. Following that, the assessment was sent to content specialists for further review. Similarly, the measurement and evaluation professionals used the item objective congruence index (IOC) to assess the assessment's media quality and discovered a value of 1.0. The assessment was subsequently forwarded to media professionals for additional review.

The evaluation criteria were used for checking the congruence between objectives and items of the test as follows:

Table 3.2 Value of item objective congruence index (IOC) and verbal interpretation

+1	item is considered congruent with the objectives.
0	item is considered neutral in terms of whether it was congruent with the objectives.
-1	item is considered not congruent with the objectives.

For acceptable data, the overall mean score of the Item-Objective Congruence (IOC) Index should be greater than 0.5.

Step 3: Experts will utilize the assessment. For review of digital scaffolding assessment content quality elements for promoting mathematics proficiency for content experts and the assessment of digital scaffolding assessment media quality factors for enhancing Mathematics proficiency for media experts.

3.3.4 The accomplishment evaluation (Pretest and Posttest)

The items on the pretest and posttest were identical, consisting of 40 questions related to the mathematics content covered in class. The pretest was administered through

traditional pen-and-paper testing, allowing students to complete the assessment in 90 minutes. For the posttest, the same set of randomized test questions was uploaded to the Blooket application, with the allotted time for each question totaling 90 minutes. The posttest was conducted using the ClassicQuiz feature of Blooket to enhance students' mathematics proficiency. The following measures were taken by the researcher:

Step 1: The test kinds were chosen by the researcher. In the study, multiple-choice assessments were used.

Step 2: The second component of the questionnaire was designed to examine students' academic success on digital scaffolding assessments to improve their Mathematics competence.

Step 3: Three measurement and evaluation experts who work in the measurement and evaluation or education areas were requested to assess the congruence between the test goals and items. The information gathered was used to compute the Item Objective Congruence Index (IOC).

The following assessment criteria were used to examine for congruence between objectives and test items:

Table 3.3 Item objective congruence index (IOC) and accomplishment evaluation verbal interpretation

+1	a test item is considered congruent with the objectives.
0	a test item is considered neutral in terms of whether it is congruent with the objectives.
-1	a test item is considered not congruent with the objectives.

For acceptable data, the overall mean score of the Item-Objective Congruence (IOC) Index should be greater than 0.5.

Step 4: The pretest and posttest were administered to thirty students in grade 7 who were enrolled at Bunyawat Witthayalai School but were not the study's samples. After the tests have been tested out, the difficulty index, discrimination index,

and reliability index of the accomplishment test are calculated. Using Kuder-Richardson's KR-20 formula, it was discovered that the difficulty index should be between 0.2 and 0.8, the discriminant index should be 0.2 or higher, and the reliability should be 0.8 or higher.

Step 5: The pretest and posttest are utilized with participants to investigate their skills in mathematics before and after studying mathematics using digital scaffolding evaluation for improving mathematics proficiency among grade 7 students in the English Program of Bunyawat Witthayalai School.

3.3.5 The questionnaire on students' satisfaction with digital scaffolding assessment for enhancing mathematics proficiency among grade 7 students in the English Program of Bunyawat Witthayalai School.

The questionnaire was utilized to ask about the students' learning experiences while applying digital scaffolding assessment to improve mathematics proficiency among grade 7 students enrolled in the English Program. The researcher took the following steps:

Step 1: The questionnaire for this study was designed to match the research hypothesis. As a result, it was created using both ideas that were used in this study. The study demonstrates the use of digital scaffolding assessment to improve student learning success. The questionnaire's goal is divided into two parts.

Part 1: The first section is to examine students' satisfaction with the digital scaffolding evaluation for improving mathematics proficiency among grade 7 English students. This section consisted of a closed-ended questionnaire with five (5) point Likert-type scales. Participants were asked to score their level of agreement with each statement on a scale of 1 to 5. The following is the distribution of each rating:

5 = Very Satisfied

4 = Satisfied

3 = Neither

2 = Dissatisfied

1 = Very Dissatisfied

Table 3.4 Range of mean and verbal interpretation

Range Value	Verbal Interpretation
4.50-5.00	Very Satisfied
3.50-4.49	Satisfied
2.50-3.49	Neither
1.50-2.49	Dissatisfied
1.00-1.49	Very Dissatisfied

Part 2: This was an open-ended questionnaire. The participants were asked to offer their ideas and suggestions about learning using digital scaffolding assessment to improve student learning performance in terms of achievements and satisfaction.

Step 2: Before administering the questionnaire, three measurement and evaluation experts who work in measurement and evaluation or education were requested to review the terminology used in the questionnaire. The information gathered was used to compute the Item Objective Congruence Index (IOC).

The following assessment criteria were used to examine for congruence between objectives and test items:

Table 3.5 The significance of the item objective congruence index (IOC) and verbal questionnaire interpretation on student satisfaction

+1	item is considered congruent with the objectives.
0	item is considered neutral in terms of whether it was congruent with the objectives.
-1	item is considered not congruent with the objectives.

For acceptable data, the overall mean score of the Item-Objective Congruence (IOC) Index should be greater than 0.5.

Step 3: Participants will complete the questionnaire to investigate their satisfaction with learning through digital scaffolding evaluation for improving mathematics competency among grade 7 students in the English program. Secondary pupils were given the surveys.

3.4 Data collection

Step 1: Introduce students to digital scaffolding assessment for improving mathematics proficiency among grade 7 English students.

Step 2: Create the student's pre-test to acquire the score.

Step 3: Engage students in learning activities by employing lessons from the digital scaffolding assessment to improve mathematics competency among grade 7 students in the English Program.

Step 4: After studying using the digital scaffolding assessment for boosting mathematics competency among grade 7 students in the English curriculum, administer a post-test, to students' satisfaction and analyze the results using statistical methods.

3.5 Data and Statistical Analysis

3.5.1 The following techniques were used by the researcher to analyze the data:

3.5.1.1 The Item Objectives Congruence Index (I.O.C) was used to measure the consistency in the development of digital scaffolding assessment for enhancing mathematics proficiency among grade 7 students in the English Program at Bunyawat Witthayalai School.

3.5.1.2 Compare the achievement test before and after using digital scaffolding assessment for enhancing mathematics proficiency among grade 7 students in the English Program by applying the t-test dependent.

3.5.1.3 Study the satisfaction of students in digital scaffolding assessments for enhancing mathematics proficiency among grade 7 students in the English Program by mean and standard deviation.

3.5.2 The basic statistics in data analysis are:

3.5.2.1 The formula for calculating the arithmetic mean ($\bar{X}$) is:

$$\overline{X} = \frac{\sum X}{N}$$

Whereas $\bar{x}$ = Average or Arithmetic Mean

$\sum X$ = Sum of all score results

N = Number of students

3.5.2.2 The formula for calculating the standard derivation (S.D.) is:

$$S.D. = \sqrt{\frac{\sum \left(x - \bar{x}\right)^2}{N}}$$

Whereas S.D. = Standard derivation

N = Number of students

$\bar{x}$ = Mean value

X = Student's score

3.5.2.3 The formula used to determine the quality of the instruments was: In finding the content validity of the achievement test, we conducted the IOC formula (Item Objectives Congruence) by following the formula below:

$$IOC = \frac{\sum R}{N}$$

Whereas IOC = Index of correspondence between the test and the objective

$\sum R$ = Sum of individual expert's value

R = Expert's rating

N = Number of experts

3.5.2.4 The formula used in finding the difficulty index of the achievement test were

$$P = \frac{R_{H+}R_L}{N_H + N_L}$$

Whereas P = difficulty level

RH = the number of people who chose the highest option rate

RL = the number of people who chose the lowest option rate

NH = the total number of people in the high group

NL = the total number of people in the low group

Table 3.6 Range of difficulty index and verbal interpretation

Difficulty Index	**Verbal Interpretation**
0.00-0.20	Very Difficult
0.21-0.40	Difficult
0.41-0.60	Average / Moderately Difficult
0.61-0.80	Easy
0.81-1.00	Very Easy

3.5.2.5 The formula for calculating the item discrimination of the achievement test is:

$$r = \frac{R_H - R_L}{N_H or N_L}$$

Whereas r = Discrimination index

R_H = Number of correct responses in the high group

R_L = Number of correct responses in the low group

N_H = Total number of students in the high group

N_L = Total number of students in the low group

Table 3.7 Range of discrimination index and verbal interpretation

Discrimination Index	**Verbal Interpretation**
0.40 and above	Very Discriminating / Very Good Item
0.30 to 0.39	Discriminating / Good Item
0.20 to 0.29	Moderately Discriminating Item
0.10 to 0.19	Not Discriminating / Marginal Item
Below 0.10	Poor / Questionable Item

3.5.2.6 The formula for calculating the reliability of the achievement test K-R#20 by Kuder-Richardson is:

$$\text{rtt} = \frac{k}{k-1}\left[1 - \frac{\sum pq}{S^2}\right]$$

Whereas rtt = Reliability Index

k = Number of test items

p = The proportion of the correct answer

q = The proportion of the incorrect answer

S_2 = The variation of the entire test

3.5.2.7 The formula for calculating the variability of the achievement test is:

$$S_2 = \frac{n\sum fx^2 - \left(\sum fx^2\right)}{n(n-1)}$$

Whereas S_2 = Variance

n = Number of students

x = Achievement test score

f = Data of frequency

3.5.2.8 The formula used to verify the hypothesis was: The formula used in analyzing the differences in achievement scores using the dependent t-test was:

$$t = \frac{\sum D}{\sqrt{\frac{n\sum D^2 - \left(\sum D\right)^2}{n-1}}}$$

Whereas $\sum D$ = Sum of variance score of achievement test

$\sum D^2$ = Sum of different squares of achievement test scores

$\left(\sum D\right)^2$ = Sum of variance score of the square test

n = Number of students

D = Difference between pre-test and post-test scores

CHAPTER 4

RESEARCH RESULT

This chapter introduces the descriptive development of digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English program at Bunyawat Witthayalai School.

The findings are as follows:

4.1 Descriptive data statistics

4.2 Analysis Results

4.1 Descriptive Data Statistic

4.1.1 Study the quality of digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English Program at Bunyawat Witthayalai School by mean and standard deviation.

4.1.2 Compare the learning achievement of students between pretest and posttest scores using digital scaffolding assessment for enhancing mathematics proficiency by T-test.

4.1.3 Study the satisfaction of students who use digital scaffolding assessment for enhancing mathematics proficiency by mean and standard deviation.

4.2 Analysis Results

4.2.1 Study the quality of digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English Program at Bunyawat Witthayalai School.

4.2.1.1 Evaluation of digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English Program at Bunyawat Witthayalai School by three content experts.

The 10 evaluation items are composed of a form prepared by three content experts. This section uses a 5-point rating scale to represent the opinions of content experts. The identification of each standard level is shown in the table below.

Table 4.1 Results of evaluation of evaluation of digital scaffolding assessment for enhancing mathematics proficiency among grade 7 students in the English Program at Bunyawat Witthayalai School by three content experts.

Evaluation Items	$\overline{X}$	*SD*	Remarks
1. The content and learning objectives in developing digital assessment in mathematics are consistent.	5.00	0.00	Excellent
2. The learning objectives are in line with the curriculum of subject matter.	5.00	0.00	Excellent
3. The provided lesson plans are realistic and attainable.	5.00	0.00	Excellent
4. The content provided in digital assessments is appropriate for the subject matter.	5.00	0.00	Excellent
5. The assessment objectives are attainable.	5.00	0.00	Excellent
6. The design of activities is easy for the learners to navigate.	5.00	0.00	Excellent

Table 4.1 Results of evaluation of evaluation of digital scaffolding assessment for enhancing mathematics proficiency among grade 7 students in the English Program at Bunyawat Witthayalai School by three content experts. (Cont)

Evaluation Items	$\bar{x}$	*SD*	Remarks
7. The content provided for digital assessments is engaging.	5.00	0.00	Excellent
8. Each activity has an appropriate amount of content.	5.00	0.00	Excellent
9. The language is appropriate for the learners.	5.00	0.00	Excellent
10. The outline of the research's materials is complete.	5.00	0.00	Excellent
Total	**5.00**	**0.00**	**Excellent**

Table 4.1, the results of the content quality assessment of digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English program at Bunyawat Witthayalai School by three content experts. The overall quality is excellent levels ($\bar{X}$ = 5.00, *SD* =0.00). When considering each item, it is evident that the content is interesting, appropriate for grade 7, aligns with the curriculum provided by the Office of the Basic Education Commission (OBEC), and adheres to the English Program guidelines. Furthermore, the activities are consistent with the content, the lesson plans are well-designed to stimulate learners' interest, and the overview of the content is complete, all achieving excellent levels ($\bar{x}$ =5.00, SD = 0.00), respectively.

4.2.1.2 Evaluation of digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English Program at Bunyawat Witthayalai School by three media experts.

The 10 evaluation items are composed of a form prepared by three media experts. This section uses a 5-point rating scale to represent the opinions of media experts. The identification of each standard level is shown in the table below.

Table 4.2 Results of evaluation of Evaluation of digital scaffolding assessment for enhancing mathematics proficiency among grade 7 students in the English Program at Bunyawat Witthayalai School by three media experts.

Evaluation Items	$\overline{X}$	*SD*	Remarks
1. The digital assessment via Blooket is interactive.	4.33	0.58	Good
2. The selected digital interactive test is appropriate for evaluating students' mathematical proficiency.	4.67	0.58	Excellent
3. The instructions are easy to understand.	4.67	0.58	Good
4. All questions have a provided correct answer.	4.33	0.58	Good
5. Questions are suitable for the students.	4.67	0.58	Excellent
6. The allotted time for each question is sufficient.	4.33	0.58	Good
7. The questions are presented in the right order.	5.00	0.00	Excellent
8. The graphics and layout are clear and easy to see.	4.67	0.58	Excellent
9. The assessment via Blooket motivates the students to learn mathematics.	4.67	0.58	Excellent
10. The result of digital assessment contributes to improving the mathematical skills of students.	4.33	0.58	Good
Total	**4.57**	**0.52**	**Excellent**

Table 4.2, the results of the media quality assessment of digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English Program at Bunyawat Witthayalai School by three media experts. The overall quality was excellent level ($\overline{X}$=4.57, *SD* = 0.52). When considering each item, it is found that the questions presented in the right order were excellent levels ($\overline{X}$=5.00, *SD* = 0.00), respectively.

4.2.2 Compare the learning achievement of students between pretest and posttest scores using digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English Program at Bunyawat Witthayalai School.

Table 4.3 Compare average scores pretest and posttest of students using digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English Program at Bunyawat Witthayalai School.

Items	**n**	$\overline{X}$	***SD***	**df**	**t-test**	**Sig.(2-tailed)**
Pre-test	30	26.70	34.36			
Post-test	30	33.83	32.42	29	9.67	0.000

**p < 0.05

From Table 4.3, presented the efficiency of digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English Program at Bunyawat Witthayalai School. The mean score of pretests was 26.70, and the score of standard deviation (*SD*) was 34.36. The result after administering the digital scaffolding assessment for enhancing Mathematics proficiency among Grade 7 students constituted a substantial improvement in students which translated into a high posttest was 33.83 standard deviation (*SD*) was 32.42 and T-test analysis before and after the treatment 9.67 which demonstrated a considerable difference was statistically significant at the .05 level.

4.2.3 Study the satisfaction of students who use digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English Program at Bunyawat Witthayalai School.

Table 4.4 Evaluation of students' satisfaction questionnaire on learned with digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English Program at Bunyawat Witthayalai School.

Evaluation Items (N = 30)	$\overline{X}$	***SD***	**Remarks**
1. The digital scaffolding assessment positively impacted the overall educational experience of Grade 7 students in mathematics at the English Program of Bunyawat Witthayalai School.	4.23	0.25	Satisfied
2. The Blooket digital scaffolding assessment effectively helps in clarifying mathematical concepts for Grade 7 learners.	4.50	0.57	Very Satisfied
3. The provided digital resources are user-friendly and accessible for the learners during the assessment process.	4.20	0.85	Satisfied
4. Through the use of Blooket digital assessment, pupils in Grade 7 can improve their mathematical skills.	4.23	0.68	Satisfied
5. The digital assessment promotes both autonomous and peer collaboration among learners.	4.40	0.62	Satisfied
6. Are the students able to apply the knowledge acquired through the digital scaffolding assessment to real-life mathematical problems?	4.33	0.66	Satisfied
7. The digital scaffolding assessment provides real-time feedback to both students and teachers, aiding in the identification of areas for improvement	4.50	0.57	Very Satisfied

Table 4.4 Evaluation of students' satisfaction questionnaire on learned with digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English Program at Bunyawat Witthayalai School. (Cont.)

Evaluation Items (N = 30)	$\overline{X}$	*SD*	Remarks
8. The digital scaffolding assessment fosters a positive attitude towards technology integration in the learning process.	4.30	0.75	Satisfied
9. The digital scaffolding assessment accommodates the various learning methodologies in learning mathematics.	4.17	0.65	Satisfied
10. Overall, the learners' excitement for studying mathematics increased as a result of the digital scaffolding evaluation.			
Total	**4.34**	**0.67**	**Satisfied**

From Table 4.4 Based on the comprehensive survey involving 30 Grade 7 students from the English Program at Bunyawat Witthayalai School, the development of the digital scaffolding assessment, particularly through the utilization of Blooket as a digital assessment tool, was examined. The results revealed an overall high level of student satisfaction, with a mean satisfaction score of 4.34 and a standard deviation of 0.67. These findings suggest a notable consensus among the students, indicating a positive perception of the digital scaffolding assessment's impact on enhancing their proficiency in mathematics. The administration of Blooket as a digital assessment appears to have resonated well with the students and, embraces its role in contributing to their overall satisfaction and engagement with the learning process.

Moreover, the favorable reception from students towards the digital scaffolding assessment, in contrast to traditional assessments, underscores its capacity to address a variety of learning preferences. The satisfaction level suggests that the assessment accommodated the various methodologies embraced by Grade 7 students within the English Program, aligning with their expectations and preferences for an effective and

interactive digital learning experience. As such, the digital scaffolding assessment, particularly when implemented through Blooket, not only enhances mathematics proficiency but also fosters a positive learning environment, intrinsically motivating students to learn mathematics and an overall positive educational experience in the English Program at Bunyawat Witthayalai School.

CHAPTER 5
CONCLUSION AND DISCUSSION

In the study on the development of digital scaffolding assessment to enhance the mathematics proficiency of the English Program at Bunyawat Witthayalai School, there are three major objectives: 1) To develop digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English Program at Bunyawat Witthayalai School. 2) To compare the learning achievement of students between pre-test and post-test scores using digital scaffolding assessment for enhancing Mathematics proficiency among Grade 7 students in the English Program at Bunyawat Witthayalai School.3) To study the satisfaction of students using digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English Program at Bunyawat Witthayalai School. The sample for this study comprised 30 Grade 7 students in the English Program at Bunyawat Witthayalai School during the academic year 2023, selected through purposive sampling.

For the research, two instruments were used: 1) The Blooket application, which served as a digital assessment platform for conducting the posttest. It aimed to enhance the mathematical proficiency of grade 7 students. 2) A questionnaire designed to assess the validity of learning materials and media instruments, ensuring consistency and overall educational material quality. The questionnaire focused on content and media quality. 3) A 40-item learning achievement questionnaire was employed for both pretest and posttest assessments. The pretest was printed for conventional assessment, while the same questionnaire was uploaded to Blooket for digital assessment during the posttest 4) The student's degree of satisfaction with the development of digital scaffolding assessment for enhancing their mathematical abilities was measured using a 10-item satisfaction questionnaire.

The conclusion, discussion, and suggestion of the research are as follows:

5.1 Discussion

5.2 Conclusion

5.3 Recommendation

5.4 Suggestion

5.1 Discussion

The discussion regarding the integration of the Blooket application as a digital assessment tool to enhance the mathematical proficiency of Grade 7 students is as follows:

5.1.1 Result of integrating the Blooket platform as a digital assessment for enhancing the mathematical proficiency of Grade 7 students in the English Program at Bunyawat Witthayalai School.

5.1.1.1 The result of developing digital scaffolding by utilizing the Blooket platform as an assessment tool to enhance the mathematical proficiency of Grade 7 students was remarkable, showing a significant increase of 7.13 in their overall average score performance. The average mean score of their pretest was 26.70, equivalent to 72.47%. Out of these, 13 students scored above, while 17 students scored below the institution's passing rate of 75% in the English Program at Bunyawat Witthayalai School. The favorable outcomes of their posttest were an average mean score of 33.83, equivalent to 84.58%. 26 students scored above, and 4 students scored below the school passing rate. The significant increase of 7.13 in the overall mean value between the pretest and posttest of 30 grade 7 students of the English Program at Bunyawat WItthayalai School proves that Blooket digital assessment helps to improve their mathematics proficiency. These findings are similar to the research “Enhancement of Performance and Motivation Through Application of Digital Games in an English Language Class” by Wichadee & Pattanapichet (2018), by utilizing Kahoot to enhance the student's English language ability. The average mean score was in difference of 0.66 by comparing the two experimental classes. This study concluded that Kahoot is appropriate for learning due to its unique features that make the student more intrinsically motivated to learn the English language. Both Blooket and Kahoot are digital learning platforms offering interactive navigation to facilitate positive learning environments, promoting social interaction between peers, and providing reliable feedback. These learning technologies both parallel the study of Siavash Hayati and Najmeh Behnamnia (April 2023) “Exploring Game Behavior, Scaffolding, and Learning Mathematics in Digital Game-based Learning Apps on Children”. The 21 young primary students of Khan Academy in the virtual school classroom, aged 6 - 8 years old with greater gaming experience, particularly in

Digital Game-Based Learning (DGBL), had a better performance on a digital game-based assessment in mathematics than children with less experience playing in the (DGBL) setting, on the other hand, were more attentive and concentrated on all elements. Furthermore, youngsters who had more experience playing digital games were less likely to seek assistance from their teachers in problem-solving. Children with less game experience, on the other hand, continued to approach their teachers for assistance in solving math issues. The study finding is parallel with the idea of developing interactive digital assessment and promoting positive attitudes toward learning and the social development of students. The article "Digital Assessment in Technology-Enriched Education": Thematic Review; by Anzela Jurane-Bremane (May 2023) discusses the challenges for administrators and educators to find an effective digital-based assessment that will develop the students' skills, create a meaningful technical experience, student-centered, timely relevant, provide reliable feedback, navigating both individualization and collaborative setting, and ensuring academic integrity—the article characterization of a good Digital Game-Based Learning Assessment showcased by Blooket.

5.1.1.2 Results of three content and media expert evaluations for the development of digital scaffolding for enhancing mathematics proficiency among grade 7 students in the English Program of Bunyawat Witthayalai School.

The overall quality is excellent levels ($\bar{x}$ = 5.00, SD =0.00). When considering each item, it is evident that the content is interesting, appropriate for grade 7, aligns with the curriculum provided by the Office of the Basic Education Commission (OBEC), and adheres to the English Program guidelines. Furthermore, the activities are consistent with the content, the lesson plans are well-designed to stimulate learners' interest, the content is accurate, the language used is easy to understand and appropriate for the learners, and the overview of the content is complete.

The results of the media quality evaluation for digital scaffolding assessment in enhancing mathematics proficiency among Grade 7 students in the English Program at Bunyawat Witthayalai School by three media experts. The overall quality was excellent level ($\bar{X}$=4.57, SD = 0.52). When considering each item, it was found that the Blooket platform was easy to use, the selected digital interactive test was appropriate, the

questions were presented in the right order, the graphics and layout were clear, the allotted time was enough, and the result was timely relevant and accurate.

5.1.2 Compare the learning achievement of students between pretest and posttest scores evaluations for the development of digital scaffolding for enhancing mathematics proficiency among grade 7 students in the English Program of Bunyawat Witthayalai School.

The efficiency of integrating the Blooket application for developing digital scaffolding assessment was examined through pretest and posttest. The pretest was administered by a conventional pen and paper test, where students answered the 40-item test in 90 minutes. The mean score of pre-tests was 26.70, and the score of standard deviation (S.D.) was 34.36. The result after integrating the Blooket application for developing digital scaffolding assessment constituted a substantial improvement in students' average score of 33.83 with a standard deviation of 32.42. In a significant increase of 7.13 in the average score and a 1.94 decrease in standard deviation. The t-test analysis before and after the treatment was 9.67 which demonstrated a considerable difference was statistically significant at the .05 level. This finding was statistically proven that students with high exposure to the technologies tend to excel in interactive digital assessment (Siavash Hayati and Najmeh Behnamnia, April 2023). Learners are more tuned in to doing the test on their mobile phones, iPads, and computers because of their familiarity with its features and functions. The fast-growing innovative learning technology opens more opportunities for new learners to develop their skills and learners are becoming more competitive. The learner's opportunity challenges 21st-century educators to reshape teaching strategies and learning procedures. Kaya-Capocci, S., O'Leary, M., & Costello, E. (2022, November 17).

5.1.3 Study the satisfaction level of students for the development of digital scaffolding for enhancing mathematics proficiency among grade 7 students in the English Program of Bunyawat Witthayalai School.

The results of an evaluation of student satisfaction with the development of digital scaffolding assessment of 30 grade 7 students of the English Program at Bunyawat Witthayalai School were measured by digital survey using Google Forms. The overall students' satisfaction was excellent level (X= 4.34, S.D. = 0.67). When considering each

item, it was found that mathematics assessment using Blooket helps them to gain more knowledge of the subject matter. It increased their motivation to learn mathematics and improve their social skills and collaboration. It also highlights the interest of students in playing Blooket's competitive games, such as CryptoHack, TowerDefense, GoldQuest, and Classic Quiz. The graphics and layout are user-friendly and the real-time feedback was accurate. Overall, the integration of Blooket in their learning process was satisfactory fostering a positive attitude towards learning with technology.

5.2 Conclusion

The analysis result of the above information answers the research objectives as follows:

5.2.1 To develop a digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English program at Bunyawat Witthayalai School.

The evaluation of the digital scaffolding development for enhancing mathematics proficiency among Grade 7 students received excellent ratings from both content and media experts of ($\bar{x}$=5.00/SD=0.00, $\bar{x}$=4.57/SD=0.52), respectively. Content evaluations emphasized the alignment with the curriculum, appropriateness for Grade 7, accuracy, and overall completeness. Similarly, media quality evaluations highlighted the ease of use of the Blooket platform, appropriateness of the selected digital interactive test, clarity in graphics and layout, sufficient allotted time, and timely and accurate result presentation. These positive assessments reinforce the effectiveness and quality of the digital scaffolding approach in improving mathematical proficiency among students.

5.2.2 To compare the learning achievement of students between pre-test and post-test scores using digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English program at Bunyawat Witthayalai School.

The utilization of the Blooket platform as a digital scaffolding assessment tool for enhancing mathematical proficiency in Grade 7 students at Bunyawat Witthayalai School demonstrated a remarkable improvement, evidenced by a substantial 7.13 increase in the overall average score performance. The pretest results indicated an average mean

score of 26.70 (72.47%), with students falling both above and below the institution's passing rate of 75%. After implementing Blooket for the posttest, the average mean score rose to 33.83 (84.58%), with most students surpassing the passing rate. This positive outcome aligns with similar research on the use of Kahoot for English language improvement. The study suggests that both Blooket and Kahoot, as digital learning platforms, contribute to positive learning environments by offering interactive navigation, promoting social interaction among peers, and providing reliable feedback.

5.2.3 To study the satisfaction of students who use digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English program at Bunyawat Witthayalai School.

The assessment of student satisfaction regarding the implementation of digital scaffolding for 30 Grade 7 students in the English Program at Bunyawat Witthayalai School was conducted through a digital survey using Google Forms. The overall level of student satisfaction was rated as excellent with an average of 86.80% satisfaction or standard deviation of 0.67. On a detailed examination of individual aspects, it was observed that the use of Blooket for mathematics assessment contributed significantly to students' knowledge acquisition in the subject. The platform also proved effective in enhancing their motivation to learn mathematics and improving social skills through collaboration. Notably, students expressed keen interest in engaging with Blooket's competitive games like CryptoHack, TowerDefense, GoldQuest, and Classic Quiz. The user-friendly graphics and layout, coupled with accurate real-time feedback, further contributed to the positive evaluation. In summary, the integration of Blooket into the learning process garnered overall satisfaction, fostering a positive attitude towards learning with technology.

5.3 Recommendation

In this research, the researcher would like to recommend the following for future study.

5.3.1 Examine the consequences of incorporating Blooket as both a formative and summative assessment tool on students' academic performance in understanding the subject matter.

5.3.2 Incorporate Blooket as a digital scaffold within the learning process. This approach will enhance teacher and students' familiarity with navigating the application and cultivate their proficiency in using the tool.

5.3.3 Examine the advantages and disadvantages of the Blooket platform and its application across various subject matters. This exploration may motivate administrators to consider investing in this innovative assessment tool for the development of 21st-century learners.

5.4 Suggestion for Further Study

Based on the findings of this study, the researcher would like to recommend the following for future study.

5.4.1 Apply the strategies and insights uncovered in the research to improve the efficacy of digital scaffolding within educational contexts. The integration of platforms such as Blooket into mathematics assessments has demonstrated a positive influence on students' acquisition of knowledge, motivation levels, and collaborative skills.

5.4.2 Educators are strongly encouraged to explore the adoption of digital tools, such as Blooket, to cultivate interactive and captivating learning environments across diverse domains, including language acquisition, science, technology, cultural studies, art, and more.

5.4.3 Comparative studies between Blooket and other digital learning platforms may also offer insights into the unique advantages and limitations of each tool. Exploring the perspectives and experiences of educators who integrate Blooket into their teaching methodologies can provide valuable qualitative data for successful learning innovation.

BIBLIOGRAPHY

Agrawal, R. (2023, August 19). Assessment OF Learning & Assessment FOR Learning & need for Assessment Framework. LinkedIn. https://www.linkedin.com/pulse/assessment-learning-need-framework-rajat-agrawal/

Dikli, S. (Year not provided). Assessment at a distance: Traditional vs. Alternative Assessments. Florida State University. Retrieved from https://files.eric.ed.gov/fulltext/EJ1101956.pdf

Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. Journal. Volume 3. Retrieved from https://www.sciencedirect.com/science/article/pii/S2666412722000137

Longe, B. (n.d.). Formal vs. Informal Assessment: 15 Key Differences & Similarities. Retrieved from https://www.formpl.us/blog/formal-vs-informal-assessment

Wall, J. E. (2000). Technology-Delivered Assessment: Diamonds or Rocks? ERIC Clearinghouse on Counseling and Student Services. Retrieved from https://www.counseling.org/resources/library/Selected%20Topics/Cybercounseling/Wall-Digest-2000-02.htm

Bezzina, S., Pfeiffer, A., Dingli, A., & Wernbacher, T. (2022, July). Enhancing Digital Assessment Through Artificial Intelligence. In Proceedings of the 14th International Conference on Education and New Learning Technologies. DOI:10.21125/edulearn.2022.2250

Cook, D. A., & Dupras, D. M. (2004). A Practical Guide To Developing Effective Web-based Learning. J Gen Intern Med, 19(6), 698–707. doi: 10.1111/j.1525-1497.2004.30029.x

(2023). Digital Assessment in Technology-Enriched Education: Thematic Review. Education Sciences, 13(5), 522. https://doi.org/10.3390/educsci13050522

Hong, Zishan, (2003) "Constructivism in online learning: a literature review" (2003). Graduate Research Papers. 853. https://scholarworks.uni.edu/grp/853

BIBLIOGRAPHY (Cont)

McLeod, S. (2024, January 24). Vygotsky's Zone Of Proximal Development And Scaffolding Theory. Semenov, A. (2017). Seymour Papert and Us. Constructionism As the Educational Philosophy of the 21st Century. Voprosy Obrazovaniya / Educational Studies Moscow, (1), 269-294. https://doi.org/10.17323/1814-9545-2017-1-269-294.

Anfas, Sudarwo, R., Umasugi, M., Zainuddin, & Widokarti, J. R. (2018). The Influence of Learning Motivation with Technology-Based Distance Learning System. International Journal of Engineering Research and Technology, 11(3), 427-437. http://www.irphouse.com

Jurane-Bremane, A. (2023, May). Digital Assessment in Technology-Enriched Education: Thematic Review. Education Sciences, 13(5), 522. https://doi.org/10.3390/educsci13050522

Costello, E. (2022). Towards a Framework to Support the Implementation of Digital Formative Assessment in Higher Education. Education Sciences, 12(11), 823. https://doi.org/10.3390/educsci12110823

Wichadee, S., & Pattanapichet, F. (2018). Enhancement of Performance and Motivation through Application of Digital Games in an English Language Class. Teaching English with Technology, 18, 77-92.

Young, S., & Nichols, H. A Reflexive Evaluation of Technology-Enhanced Learning. Journal Title, https://doi.org/10.25304/rlt.v25.1998

McKenney, S., Boschman, F., Pieters, J. et al. Collaborative Design of Technology-Enhanced Learning: What Can We Learn from Teacher Talk? TechTrends 60, 385–391 (2016). https://doi.org/10.1007/s11528-016-0078-8

Littlejohn, A., Beetham, H., & McGill, L. (2012, December). Learning at the digital frontier: A review of digital literacies in theory and practice. Journal of Computer Assisted Learning, 28(6), 547-556. https://doi.org/10.1111/j.1365-2729.2011.00474.x

BIBLIOGRAPHY (Cont)

University of Derby. (n.d.). Assessment and feedback. Retrieved from https://www.derby.ac.uk/services/learning-and-teaching/learning-teaching-and-assessment/assessment-and-feedback/

Pelangi Teacher Resources – Pelangi Teacher Resources collects digital Instructional materials that can be applied as teachers' teaching aids for optimal efficiency in teaching. (n.d.). Pelangi Teacher Resources – Pelangi Teacher Resources Collecting Digital Instructional Materials That Can Be Applied as Teachers' Teaching Aids for Optimal Efficiency in Teaching. https://www.e-pelangithai.com/

(Pelangi Teacher Resources – Pelangi Teacher Resources Collecting Digital Instructional Materials That Can Be Applied as Teachers' Teaching Aids for Optimal Efficiency in Teaching., n.d.)

APPENDICES

APPENDIX A

- **List of experts who reviewed research instruments**
- **Invitation Letter to experts to examine research instruments**

List of experts who reviewed research instruments

A. Content Specialists

1. Ms. Nutsiree Leetrakul Ma. Ed, Gifted Mathematics Teacher at Bunyawat Witthayalai School
2. Mr. Wutthichai Misong Ma. Ed, Grade 12 Mathematics Coordinator at Teacher at Bunyawat Witthayalai School
3. Mr. Natthapong Pakiratha English Program Mathematics Teacher at Bunyawat Witthayalai School

B. Media Specialists

1. Dr. Kawit Srisamrit, Office of Educational Technology, Sukhothai Thammathirat Open University
2. Dr. Montira Boonyawinit, Faculty of Education, Nakhon Pathom Rajabhat University
3. Dr. Kittisak Paen-Ngam, Nakhonnayok Primary Educational Service Area Office

   University Vice Chancellor

C. Measurement and Evaluation Experts

1. Asst.Prof.Dr. Danucha Saleewong, Faculty of Education, Valaya Alongkorn Rajabhat University
2. Dr. Jomsurang Limprasertkul, College of Teacher Education, Phranakhon Rajabhat University
3. Dr. Bhornsawan Chantakhad, Faculty of Technical Education, King Mongkut's University of Technology North Bangkok

Invitation Letter to experts to examine research instruments

MHESI 1351.18/2023

Office of the Dean, Faculty of Technical Education
Rajamangala University of Technology Thanyaburi
Klong Luang, Pathum Thani 12110 Thailand
Tel:+66-2-549-4710 Fax:+66-2-577-5049

25 October, 2023

Dear Mrs.Nutsiree Leetrakul
Teacher at Bunyawat Witthayalai School

Subject: Respectfully Requesting for letter of Invitation of Experts for M.Ed.Thesis

I am writing to request your assistance as an honorary external research reviewer in evaluating the research instruments of Mr.Gary Gutierrez Jardinero, Master of Education Program in Technology and Learning Innovation Rajamangala University of Technology Thanyaburi, who has been working on the thesis titled "The effectiveness of digital scaffolding assessment for enhancing mathematics proficiency among grade 7 students in the english program at bunyawat witthayalai school". under the supervision of Assistant Professor Dr.Thidarat Kulnatarawong. In this regard, I would like to request your valuable time to evaluate the research instruments as I strongly believe that your expertise will be of great value in improving the research instruments.

If you have any questions or need further information, please feel free to contact Mr.Gary Gutierrez Jardinero, on the e-mail: gary_j@mail.rmutt.ac.th

Yours sincerely,

(Assistant Professor Arnon Niyomphol)
Dean of Faculty of Technical Education

MHESI 1351.19/2023

Office of the Dean, Faculty of Technical Education
Rajamangala University of Technology Thanyaburi
Klong Luang, Pathum Thani 12110 Thailand
Tel:+66-2-549-4710 Fax:+66-2-577-5049

25 October, 2023

Dear Mr.Wutthichai Misong
Teacher at Bunyawat Witthayalai School
Subject: Respectfully Requesting for letter of Invitation of Experts for M.Ed.Thesis

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25 October, 2023

Dear Mr. Nattaphong Pakiratha

Subject: Respectfully Requesting for letter of Invitation of Experts for M.Ed.Thesis

I am writing to request your assistance as an honorary external research reviewer in evaluating the research instruments of Mr.Gary Gutierrez Jardinero, Master of Education Program in Technology and Learning Innovation Rajamangala University of Technology Thanyaburi, who has been working on the thesis titled "The effectiveness of digital scaffolding assessment for enhancing mathematics proficiency among grade 7 students in the english program at bunyawat witthayalai school". under the supervision of Assistant Professor Dr.Thidarat Kulnatarawong. In this regard, I would like to request your valuable time to evaluate the research instruments as I strongly believe that your expertise will be of great value in improving the research instruments.

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MHESI 1351.21/2023

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Rajamangala University of Technology Thanyaburi
Klong Luang, Pathum Thani 12110 Thailand
Tel:+66-2-549-4710 Fax:+66-2-577-5049

25 October, 2023

Dear Dr. Kawit Srisamrit
Office of Educational Technology, Sukhothai Thammathirat Open University

Subject: Respectfully Requesting for letter of Invitation of Experts for M.Ed.Thesis

I am writing to request your assistance as an honorary external research reviewer in evaluating the research instruments of Mr.Gary Gutierrez Jardinero, Master of Education Program in Technology and Learning Innovation Rajamangala University of Technology Thanyaburi, who has been working on the thesis titled "The effectiveness of digital scaffolding assessment for enhancing mathematics proficiency among grade 7 students in the english program at bunyawat witthayalai school". under the supervision of Assistant Professor Dr.Thidarat Kulnatarawong. In this regard, I would like to request your valuable time to evaluate the research instruments as I strongly believe that your expertise will be of great value in improving the research instruments.

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MHESI 1351.22/2023

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Rajamangala University of Technology Thanyaburi
Klong Luang, Pathum Thani 12110 Thailand
Tel:+66-2-549-4710 Fax:+66-2-577-5049

25 October, 2023

Dear Dr. Montira Boonyawinit
Faculty of Education, Nakhon Pathom Rajabhat University

Subject: Respectfully Requesting for letter of Invitation of Experts for M.Ed.Thesis

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25 October, 2023

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Nakhonnayok Primary Educational Service Area Office
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MHESI 1351.27/2023

Office of the Dean, Faculty of Technical Education
Rajamangala University of Technology Thanyaburi
Klong Luang, Pathum Thani 12110 Thailand
Tel:+66-2-549-4710 Fax:+66-2-577-5049

25 October, 2023

Dear Dean of College of Teacher Education

Subject: Respectfully Requesting for letter of Invitation of Experts for M.Ed.Thesis

I am writing to request Dr.Jomsurang Limprasertkul College of Teacher Education Phranakhon Rajabhat University assistance as an honorary external research reviewer in evaluating the research instruments of Mr.Gary Gutierrez Jardinero, Master of Education Program in Technology and Learning Innovation Rajamangala University of Technology Thanyaburi, who has been working on the thesis titled "The effectiveness of digital scaffolding assessment for enhancing mathematics proficiency among grade 7 students in the english program at bunyawat witthayalai school". under the supervision of Assistant Professor Dr.Thidarat Kulnatarawong. In this regard, I would like to request your valuable time to evaluate the research instruments as I strongly believe that your expertise will be of great value in improving the research instruments.

If you have any questions or need further information, please feel free to contact Mr.Gary Gutierrez Jardinero, on the e-mail: gary_j@mail.rmutt.ac.th

Yours sincerely,

(Assistant Professor Arnon Niyomphol)
Dean of Faculty of Technical Education

MHESI 1351.26/2023

Office of the Dean, Faculty of Technical Education
Rajamangala University of Technology Thanyaburi
Klong Luang, Pathum Thani 12110 Thailand
Tel:+66-2-549-4710 Fax:+66-2-577-5049

25 October, 2023

Dear Dr.Bhornsawan Chantakhad
Faculty of Technical Education, King Mongkut's University of Technology North Bangkok

Subject: Respectfully Requesting for letter of Invitation of Experts for M.Ed.Thesis

I am writing to request your assistance as an honorary external research reviewer in evaluating the research instruments of Mr.Gary Gutierrez Jardinero, Master of Education Program in Technology and Learning Innovation Rajamangala University of Technology Thanyaburi, who has been working on the thesis titled "The effectiveness of digital scaffolding assessment for enhancing mathematics proficiency among grade 7 students in the english program at bunyawat witthayalai school". under the supervision of Assistant Professor Dr.Thidarat Kulnatarawong. In this regard, I would like to request your valuable time to evaluate the research instruments as I strongly believe that your expertise will be of great value in improving the research instruments.

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Yours sincerely,

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Dean of Faculty of Technical Education

APPENDIX B

- Content assessment questionnaire
- Media assessment questionnaire
- Students' Satisfaction Survey
- Achievement test

Assessment of content quality aspects on the development of digital scaffolding assessment for enhancing mathematics proficiency

(For Measurement and Evaluation Experts)

Thesis Title: The Development of Digital Scaffolding Assessment for Enhancing Mathematics Proficiency among Grade 7 Students in the English Program at Bunyawat Witthayalai School

Researcher: Mr. Gary Gutierrez Jardinero

Program: M.Ed. - Technology and Learning Innovation

Thesis Adviser: Assistant Professor Thidarat Kulnatarawong, Ph.D.

This assessment is part of the thesis for a Master's degree in Education in Technology and Learning Innovation, at Ragamangala University of Technology Thanyaburi.

Research Objectives:

1. To develop an effective digital scaffolding assessment for enhancing Mathematics proficiency among Grade 7 students in the English program at Bunyawat Witthayalai School.

2. To compare the learning achievement of students between pre-test and post-test scores using digital scaffolding assessment for enhancing Mathematics proficiency among Grade 7 students in the English program at Bunyawat Witthayalai School.

3. To study the satisfaction of students who use digital scaffolding assessment for enhancing Mathematics proficiency among Grade 7 students in the English Program at Bunyawat Witthayalai School.

Directions: This survey investigates the thoughts of experts on the development of digital assessment in mathematics education. Please check the appropriate box next to each item's consistency level. This questionnaire consists of 2 parts as follow:

Part 1: Check the box of each item describing the degree of your analysis.

Items		Level of Consistency		
		+1	0	-1
1.	The content and learning objectives in developing digital assessment in Mathematics are consistent.			
2.	The learning objectives are in line with the curriculum of subject matter.			
3.	The provided lesson plans are realistic and attainable.			
4.	The content provided in digital assessments is appropriate for the subject matter.			
5.	The assessment objectives are attainable.			
6.	The design of activities is easy for the learners to navigate.			
7.	The content provided for digital assessments is engaging.			
8.	Each activity has an appropriate amount of content.			
9.	The language is appropriate for the learners.			
10.	The outline of the research's materials is complete.			

Part 2: Comments and suggestions

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Assessment of content quality aspects on the development of digital scaffolding assessment for enhancing mathematics proficiency

(For Measurement and Evaluation Experts)

Thesis Title The Development of Digital Scaffolding Assessment for Enhancing Mathematics Proficiency among Grade 7 Students in the English Program at Bunyawat Witthayalai School

Researcher Mr. Gary Gutierrez Jardinero

Program M.Ed. - Technology and Learning Innovation

Thesis Adviser Assistant Professor Thidarat Kulnatarawong, Ph.D.

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Part 1: Check the box of each item describing the degree of your analysis.

Items		Level of Consistency		
		+1	0	-1
1.	The digital assessment via Blooket is interactive.			
2.	The selected digital interactive test is appropriate for evaluating students' mathematical proficiency.			
3.	The instructions are easy to understand.			
4.	All questions have a provided correct answer.			
5.	Questions are suitable for the students.			
6.	The allotted time for each question is sufficient.			
7.	The questions are presented in the right order.			
8.	The graphics and layout are clear and easy to see.			
9.	The assessment via Blooket motivates the students to learn mathematics.			
10.	The result of digital assessment contributes to improving the mathematical skills of students.			

Part 2: Comments and suggestions

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Assessment of content quality aspects on the development of digital scaffolding assessment for enhancing mathematics proficiency

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Part 1: Check the box of each item describing the degree of your analysis.

Items		Level of Consistency		
		+1	0	-1
1.	The digital scaffolding assessment positively impacted the overall educational experience of Grade 7 students in mathematics at the English Program of Bunyawat Witthayalai School.			
2.	The Blooket digital scaffolding assessment effectively helps in clarifying mathematical concepts for Grade 7 learners.			
3.	The provided digital resources are user-friendly and accessible for the learners during the assessment process.			
4.	Through the use of Blooket digital assessment, pupils in Grade 7 can improve their mathematical skills.			
5.	The digital assessment promotes both autonomous and peer collaboration among learners.			
6.	Are the students able to apply the knowledge acquired through the digital scaffolding assessment to real-life mathematical problems?			
7.	The digital scaffolding assessment provides real-time feedback to both students and teachers, aiding in the identification of areas for improvement.			
8.	The digital scaffolding assessment fosters a positive attitude towards technology integration in the learning process.			
9.	The digital scaffolding assessment accommodates the various learning methodologies in learning mathematics.			
10.	Overall, the learners' excitement for studying mathematics increased as a result of the digital scaffolding evaluation.			

Part 2: Comments and suggestions

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Assessment of Content Quality Aspects on the Development of Digital Scaffolding Assessment for Enhancing Mathematics Proficiency

(For Measurement and Evaluation Experts)

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Part 1: Check the box of each item describing the degree of your analysis.

Items	**Level of Consistency**		
Time: Easy (60 sec) Average (90 sec) Difficult (120 sec)	**+1**	**0**	**-1**
1. What is the relation between the set of x and y? x = { 1 2 3 4. . . } y = { 1 4 9 16 . . .} a) natural numbers b) positive counting numbers c) prime and real numbers **d) roots and squared numbers** Time: 60 sec			
2. Point X is located 10 units left and 8 units above the origin. Find the coordinates of point X. a) (10, 8) b) (- 10 , - 8) **c) (-10, 8)** d) (10, - 8) Time: 60 sec			
3. Twice the sum of a number and 5. a) x = 5 b) x + 5 **c) 2(x + 5)** d) 2x + 5 Time: 60 sec			
4. Solve for x, 2x + 4 = 8 **a) 2** b) -2 c) 6 d) -6 Time: 90 sec			
5. Twice the difference of x and y is nine. **a) 2(x - y) = 9** b) 2(y - x) = 9 c) 2x – y = 9 d) 2y - x = 9 Time: 90 sec			

Items	Level of Consistency		
Time: Easy (60 sec) Average (90 sec) Difficult (120 sec)	**+1**	**0**	**-1**
6. Simplify, 4 − 3x = 8 + x a) 1 b) 4 **c) -1** d) -4 Time: 90 sec			
7. Solve for x, $\frac{x}{4} = \frac{-3}{2}$. a) 6 **b) -6** c) -4 d) -3 Time: 120 sec			
8. If 28 is less than five times a certain number is 232. What is the number? a) 40 b) 35 **c) 52** d) 63 Time: 120 sec			
9. The sum of three consecutive even numbers is 246. What are the numbers? a) 78, 80, 82 b) 74, 80, 92 **c) 80, 82, 84** d) 81, 82, 83 Time: 120 sec			
10. Find the product, - 2(5x+3) **a) -10x – 6** b) 10x + 6 c) 7x + 5 d) 3x – 6 Time: 90 sec			

Items	Level of Consistency		
Time: Easy (60 sec) Average (90 sec) Difficult (120 sec)	**+1**	**0**	**-1**
11. Which of the following is quadratic trinomials? a) $x^2 + 3x$ **b) $x^2 - 5x + 1$** c) x^2 d) $x^2 - 2x$ Time: 90 sec			
12. Find the LCD. $\frac{1}{4} - \frac{x}{3} = \frac{5}{-3}$ **a) -12** b) 6 c) - 8 d) 4 Time: 60 sec			
13. Which of the following is binomial? a) 3x **b) 4 + x** c) $-2x + x^2 + 1$ d) 0 Time: 60 sec			
14. When 18 is subtracted from six times a certain number, the result is – 42. What is the number? a) 3 b) 4 **c) -4** d) -3 Time: 120 sec			
15. Find the LCD. $\frac{2}{3} - \frac{x}{2} = \frac{x}{6}$ a) -12 **b)** 6 c) – 8 d) 4 Time: 60 sec			

Items	Level of Consistency		
Time: Easy (60 sec) Average (90 sec) Difficult (120 sec)	**+1**	**0**	**-1**
16. Solve for x. $\frac{2}{3} - \frac{x}{2} = \frac{x}{6}$ a) -12 b) 6 c) 8 **d) 1** Time: 120 sec			
17. Solve for x, $\frac{x+3}{6} = 41$. **a) 243** b) -148 c) 16 d) – 28 Time: 120 sec			
18. Which of the following has a constant of 4? a) 4x + 1 b) x + ¼ c) $x^4 - 1$ **d) x + 4** Time: 90 sec			
19. Find thequotient, $\frac{4x-8}{2}$. a) x + 4 b) x – 4 **c) 2x – 4** d) 2x + 4 Time: 60 sec			
20. Simplify, 5m + 10 = 10m – 5 a) -3 b) -1 c) 1 **d) 3** Time: 60 sec			

Items	Level of Consistency		
Time: Easy (60 sec) Average (90 sec) Difficult (120 sec)	**+1**	**0**	**-1**
21. Simplify, 4x – (7 – x) = 18. a) 2 **b) 5** c) 8 d) 9 Time:120 sec			
22. Solve for x, $5 - \frac{2x+7}{9} = 0$. **a) 19** b) 14 c) 0 d) 1 Time: 120 sec			
23. Solve for x, - 4(-3x+4) = - (x + 5). a) 21/13 **b) 11/13** c) -21/11 d) -13/11 Time: 120 sec			
24. If (n) is added to – 5, the result is 7. What is 3n? a) 12 b) 16 c) 18 **d) 36** Time: 90 sec			
25. Which of the following is the linear expression? a) x^2 b) $2x^2+ 1$ **c) x** d) $x^3 – 3$ Time: 60 sec			
26. Which of the following is a quadratic expression? a) x^4 **b) $2x^2+ 1$** c) x d) $x^3 – 3$ Time: 60 sec			

Items	Level of Consistency		
Time: Easy (60 sec) Average (90 sec) Difficult (120 sec)	**+1**	**0**	**-1**
27. A square has a perimeter of 60 cm. Its length is 2n. What is the value of n? **a) 7.5 cm** b) 15 cm c) 10.5 cm d) 30 cm Time: 90 sec			
28. Find the sum. $\frac{7}{3} + \frac{1}{x}$. a) $\frac{7x-3}{3}$ **b)** $\frac{\mathbf{7x+3}}{\mathbf{3x}}$ c) $\frac{7x+3}{-3x}$ d) $\frac{7x-3x}{3x}$ Time: 90 sec			
29. Find the next two numbers in the sequence. 19, 26, 33, 40, 47,_?__, __?__, a) 48, 50 b) 49, 54 **c) 54, 61** d) 64, 76 Time: 90 sec			
30. Write the algebraic expression for "Three times the difference between a number and one" a) 3x b) 3(1-x) **c) 3(x-1)** d) 3x – 1 Time: 60 sec			
31. Write the algebraic expression for "Jackson has 5-baht coins and 2-baht coins with a total value of 33 coins is 111 baht" **a) 5x + 2(33 - x) = 111** b) 5 + 2(33 - x) = 111 c) 2+ 5(33 - x) = 111 d) 111 + 2(33 - x) = 55 Time: 90 sec			

Items	Level of Consistency		
Time: Easy (60 sec) Average (90 sec) Difficult (120 sec)	**+1**	**0**	**-1**
32. One number is 3 less than another number and their sum is 49. What are the two numbers? a) 20 and 39 b) 24 and 25 **c) 23 and 26** d) 17 and 32 Time: 120 sec			
33. Simplify, $5 + 3(x - 1) = 5x - 6$ a) 1 b) 2 c) 3 **d) 4** Time: 90 sec			
34. Solve, $x + 21 = 10$. **a) -11** b) 11 c) 31 d) 0 Time: 60 sec			
35. Solve for x, $4x + 1 = 7x - 5$ a) 3 **b) 2** c) 1 d) -1 Time: 90 sec			
36. Solve for x, $3(x - 1) = 2(4x - 4)$ **a) 1** b) 2 c) 3 d) 4 Time: 90 sec			

Items	Level of Consistency		
Time: Easy (60 sec) Average (90 sec) Difficult (120 sec)	**+1**	**0**	**-1**
37. John is 3 years older than Jim. Jim is 4 years less than twice David's age. How old are the three boys if their ages add up to 35? a) 12 years old b) 15 years old c) 10 years old **d) 8 years old** Time: 120 sec			
38. If the perimeter of a rectangle is 18 inches, and one side is one inch longer than the other, how long are the sides? **a) 4 in and 5 in** b) 3 in and 4 in c) 5 in and 6 in d) 2 in and 8 in Time: 120 sec			
39. Find a number such that 5 more than one-half the number is three times the number. a) 1 b) 3 **c) 2** d) 4 Time: 120 sec			
40. The sum of three consecutive integers is 108. What are the integers? a) 30 b) 34 **c) 35** d) 38 Time: 120 sec			

Summary:

Easy (60 sec)– 12 items Average (90 sec)– 14 items Advanced (120 sec) – 14 items

Part 2: Comments and suggestions

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APPENDIX C

- Result of content assessment validity using Items Objective Congruence (IOC).
- Result of media assessment validity using Items Objective Congruence (IOC).
- Result of difficulty index (p) and discriminant index (r).
- Result of comparison of pretest and posttest using statistical mean ($\bar{x}$) and standard deviation (SD).
- Result of students' satisfaction survey.

Result of content validity by the index of Item objective Congruence (IOC)

The quality analysis of the 40-item achievement test was determined by three (3) different content experts who are currently in the field of teaching mathematics by using the Index of Item Objective Congruence (IOC) formula. The consistency of the questionnaire for the pretest and posttest was found higher than 0.5 level in which is interpreted as the lesson plans are well-designed to stimulate learners' interest, the content is accurate, the language used is easy to understand and appropriate for the learners, and the overview of the content is complete.

Table C.1: Result of content validity assessment by index Item Objective Congruence (IOC) of achievement test

Content Validity Assessment					
Items	Raw scores			Total Score	IOC
	Ms. Leetrakul	**Mr. Misong**	**Mr. Pakiratha**		
1	+1	+1	+1	3	1.00
2	+1	+1	+1	3	1.00
3	+1	+1	+1	3	1.00
4	+1	+1	+1	3	1.00
5	+1	+1	+1	3	1.00
6	+1	+1	+1	3	1.00
7	+1	+1	+1	3	1.00
8	+1	+1	+1	3	1.00
9	+1	+1	+1	3	1.00
10	+1	+1	+1	3	1.00
11	+1	+1	+1	3	1.00
12	0	+1	+1	2	0.67
13	+1	+1	+1	3	1.00
14	+1	+1	+1	3	1.00
15	+1	+1	+1	3	1.00
16	+1	+1	+1	3	1.00
17	+1	+1	+1	3	1.00
18	+1	+1	+1	3	1.00
19	+1	+1	+1	3	1.00
20	0	+1	+1	2	0.67
21	+1	+1	+1	3	1.00

Table C.1: Result of content validity assessment by index Item Objective Congruence (IOC) of achievement test (cont.)

Content Validity Assessment					
Items	Raw scores			Total Score	IOC
	Ms. Leetrakul	**Mr. Misong**	**Mr. Pakiratha**		
22	+1	+1	+1	3	1.00
23	+1	+1	+1	3	1.00
24	+1	+1	+1	3	1.00
25	+1	+1	+1	3	1.00
26	+1	+1	+1	3	1.00
27	+1	+1	+1	3	1.00
28	0	+1	+1	2	0.67
29	+1	+1	+1	3	1.00
30	+1	+1	+1	3	1.00
31	+1	+1	+1	3	1.00
32	+1	+1	+1	3	1.00
33	0	+1	+1	2	0.67
34	+1	+1	+1	3	1.00
35	+1	+1	+1	3	1.00
36	+1	+1	+1	3	1.00
37	+1	+1	+1	3	1.00
38	+1	+1	+1	3	1.00
39	+1	+1	+1	3	1.00
40	+1	+1	+1	3	1.00

Result of difficulty index and discriminant index

Table C.2: Result of difficulty index (p) and discriminant (r)

Difficulty and Discriminant Index					
Items	Difficulty Index (p)	Discriminant Index (r)	Analysis		Remarks
			(p)	(r)	
1	0.73	0.00	Easy	Poor	Available
2	0.73	0.27	Easy	Moderate	Available
3	0.50	0.07	Average	Poor	Available
4	0.73	0.13	Easy	Not discriminating	Available
5	0.70	0.47	Easy	Discriminating	Available
6	0.73	0.13	Easy	Not discriminating	Available
7	0.43	0.20	Average	Moderate	Available
8*	0.90	0.20	Very Easy	Moderate	Remove
9	0.57	0.20	Average	Moderate	Available
10*	0.80	0.00	Easy	Poor	Remove
11	0.57	0.33	Average	Discriminating	Available
12*	0.83	0.07	Very Easy	Poor	Remove
13	0.50	0.47	Average	Very discriminating	Available
14	0.67	0.40	Easy	Very discriminating	Available
15	0.43	0.33	Average	Discriminating	Available
16	0.63	0.07	Easy	Poor	Available
17*	0.83	0.07	Very Easy	Poor	Remove
18	0.67	0.13	Easy	Not discriminating	Available
19	0.50	0.33	Average	Discriminating	Available
20*	0.87	0.13	Very Easy	Not discriminating	Remove
21	0.53	0.27	Average	Moderate	Available
22*	0.80	0.00	Easy	Poor	Remove
23	0.73	0.13	Easy	Not discriminating	Available
24	0.77	0.20	Easy	Moderate	Available
25	0.60	0.00	Average	Poor	Available
26	0.53	0.13	Average	Not discriminating	Available
27*	0.90	0.20	Very Easy	Moderate	Remove
28	0.50	0.47	Average	Very discriminating	Available
29	0.63	0.20	Easy	Moderate	Available
30	0.70	0.33	Easy	Discriminating	Available
31	0.60	0.40	Average	Very discriminating	Available
32	0.70	0.20	Easy	Moderate	Available
33	0.63	0.33	Easy	Discriminating	Available

Table C.2: Result of difficulty index (p) and discriminant (r) (Cont.)

Difficulty and Discriminant Index					
Items	Difficulty Index (p)	Discriminant Index (r)	Analysis		Remarks
			(p)	(r)	
34	0.73	0.53	Easy	Very discriminating	Available
35	0.60	0.13	Average	Not discriminating	Available
36	0.73	0.27	Easy	Moderate	Available
37	0.57	0.20	Average	Moderate	Available
38	0.67	0.00	Easy	Poor	Available
39	0.60	0.00	Average	Poor	Available
40*	0.83	0.20	Very Easy	Moderate	Remove

*Remove questions

Based on Table C.2, it was found that the difficulty index should be between 0.2 – 0.78, and the discriminant index should be 0.20 or higher. This analysis was calculated using Kuder-Richardson's K-R#20 formula at 0.77, as shown below in Table C.3.

Table C.3: Result of variance and reliability index of achievement test

Reliability of Achievement Test			
Students	Total Score (x)	Total Score (x^2)	$\sum PQ$
N = 30	$\sum X = 801$	$\sum X^2 = 22{,}383$	8.26
	$\left[\sum X\right]^2 = 641{,}601$	$N\sum X^2 = 671{,}490$	
Variance (S^2)		Reliability Index (r_{tt})	
$S^2 = \frac{(N\sum X^2) - (\sum X)^2}{N^2}$ $S^2 = \frac{[30(22{,}383)] - (801)^2}{30^2}$ $S^2 = \frac{671{,}490 - 641{,}601}{900}$ $S^2 = \frac{671{,}490 - 641{,}601}{900}$ $\boldsymbol{S^2 = 33.21}$		$r_{tt} = \frac{k}{k-1}(1 - \frac{\sum PQ}{S^2})$ $r_{tt} = \frac{30}{29}(1 - \frac{8.26}{33.21})$ $r_{tt} = 1.03\ (1 - 0.2487)$ $r_{tt} = 1.03 * 0.7513$ $\boldsymbol{r_{tt} = 0.7738}$	

Table C.4: Result and comparison of students' score

Result of Achievement Tests				
No.	Name	Pretest	Posttest	Difference
1	Proud	17	24	7
2	Ten 1	35	38	3
3	Paper	24	30	6
4	Titan 1	22	30	8
5	Junior	30	36	6
6	Ten 2	31	35	4
7	Titan 2	37	40	3
8	Jowkhun	33	35	2
9	Otwo	35	40	5
10	Biene	31	40	9
11	Poon	30	36	6
12	Num-Oon	31	35	4
13	Zenith	34	40	6
14	Ava	25	32	7
15	Kk	20	33	13
16	Ploy	26	34	8
17	Maprang	18	32	14
18	Jenny	31	36	5
19	Jamsai	27	30	3
20	Meilie	20	35	15
21	Pinmook	26	36	10
22	Mootung	15	13	-2
23	Tonfang	27	35	8
24	Pin	22	36	14
25	Pimpit	26	34	8
26	Jomjai	24	27	3
27	Tienhom	21	28	7
28	Ceancean	21	35	14
29	Lookmee	32	40	8
30	Bright	30	40	10

Table C.5: Result of attained arithmetic mean of students' achievement test for the development of digital scaffolding assessments for enhancing mathematics proficiency of grade 7 students in the English Program at Bunyawat Witthayalai School.

Test Analysis					
Test	N	Total Score	Average	S.D.	T-test
Pretest	30	801	26.70	34.36	9.67
Posttest	30	1015	33.83	32.42	

**p < 0.05

Table C.5 presented the efficiency of digital scaffolding assessment for enhancing mathematics proficiency among Grade 7 students in the English Program at Bunyawat Witthayalai School. The mean score of pretests was 26.70, and the score of standard deviation (*SD*) was 34.36. The result after administering the digital scaffolding assessment for enhancing Mathematics proficiency among Grade 7 students constituted a substantial improvement in students which translated into a high posttest was 33.83 standard deviation (*SD*) was 32.42 and T-test analysis before and after the treatment 9.67 which demonstrated a considerable difference was statistically significant at the .05 level.

APPENDIX D

Interface of Blooket application

- Home page and facts about Blooket
- Blooket general instructions
- Teacher’s profile windows
- Hosting and conducting assessments windows
- History of student’s achievements score and ranking

Figure D.1: Blooket home page for student and teacher

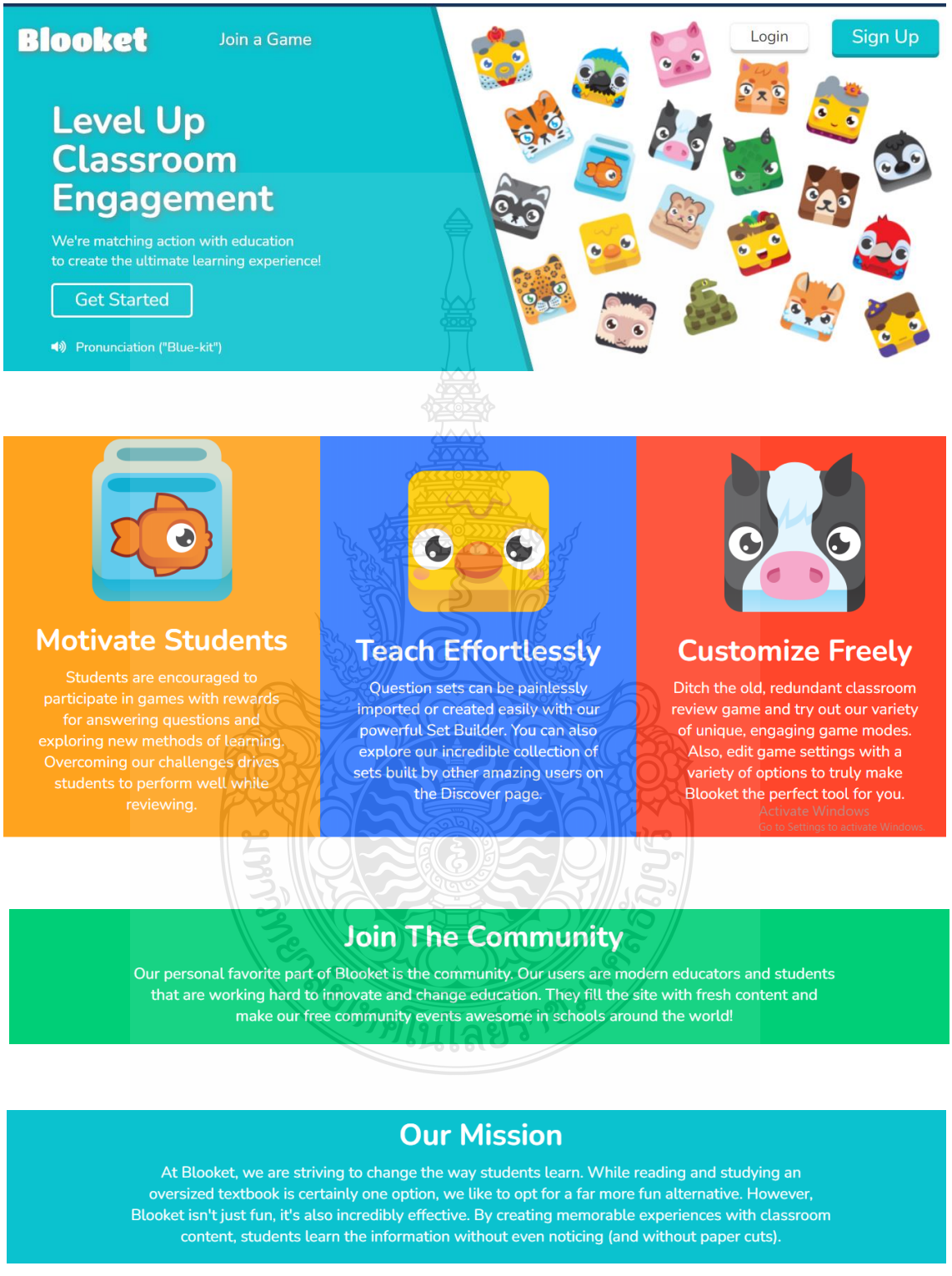
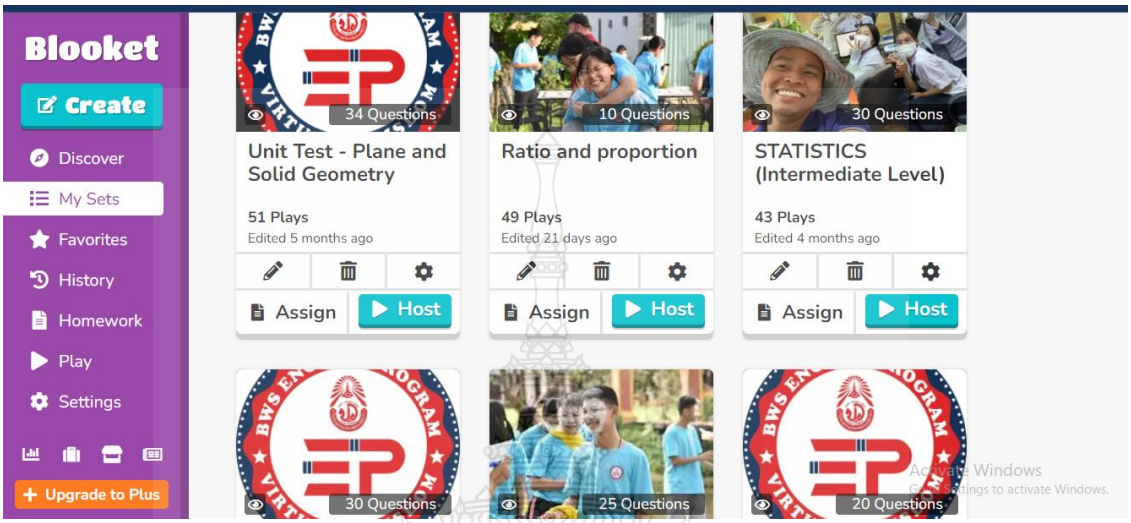


Figure D.2: General instructions of playing and hosting Blooket

Figure D.3: Teacher's profile and navigation windows. Indicating either teacher's personal assessment window, community shared assessment, list of favorite assessment, scheduled of homework, assessment history and settings window.



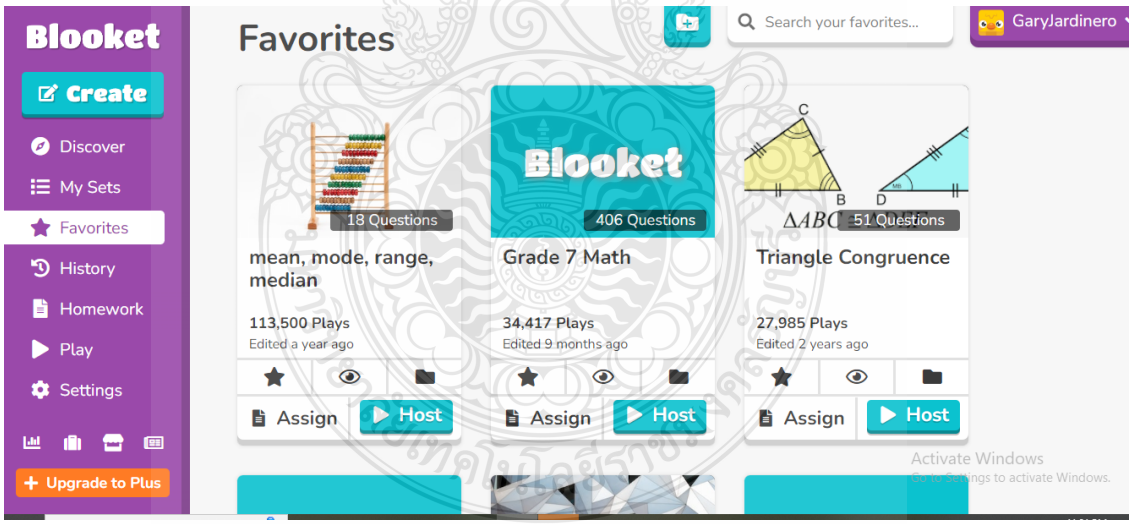
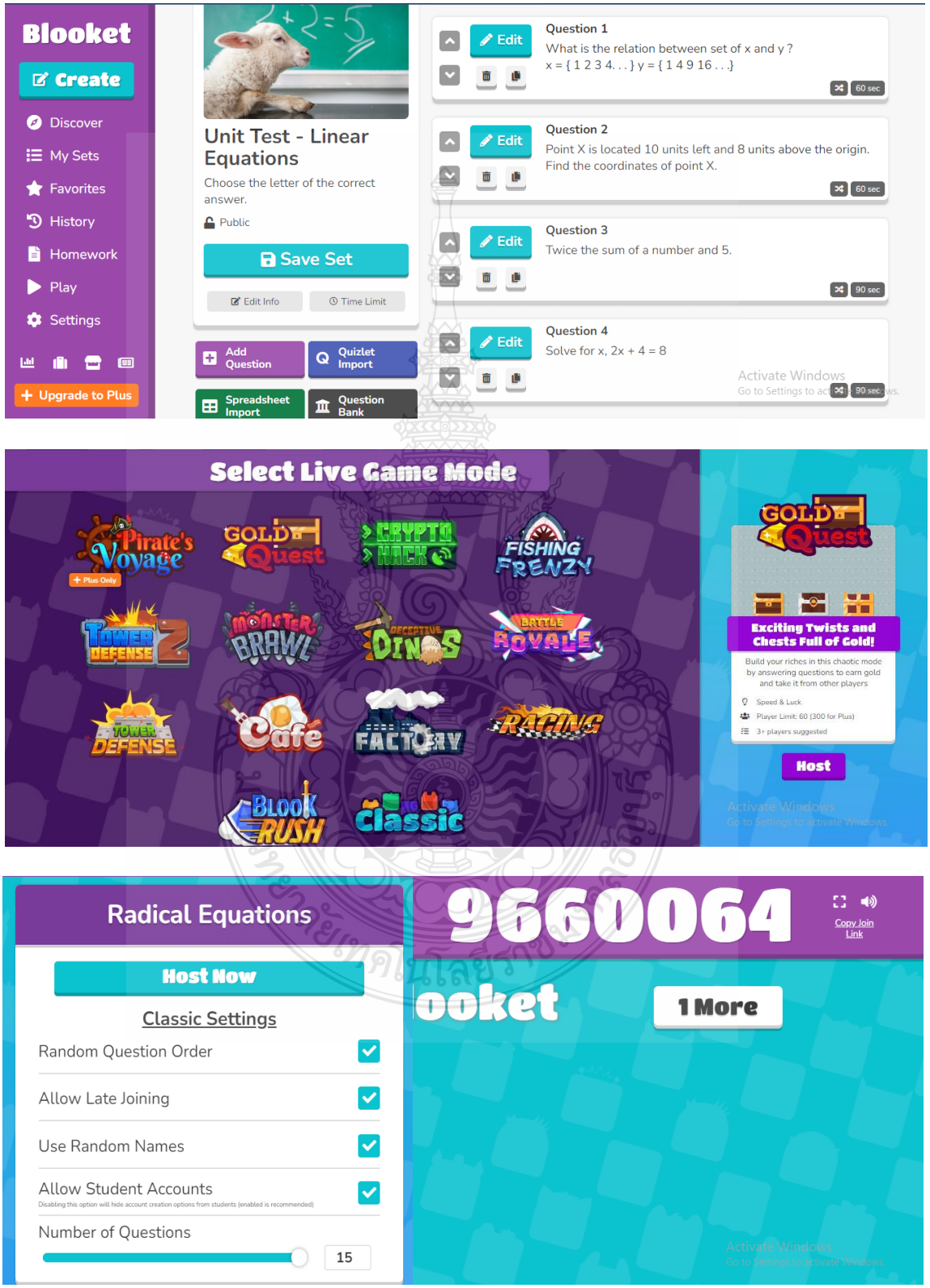
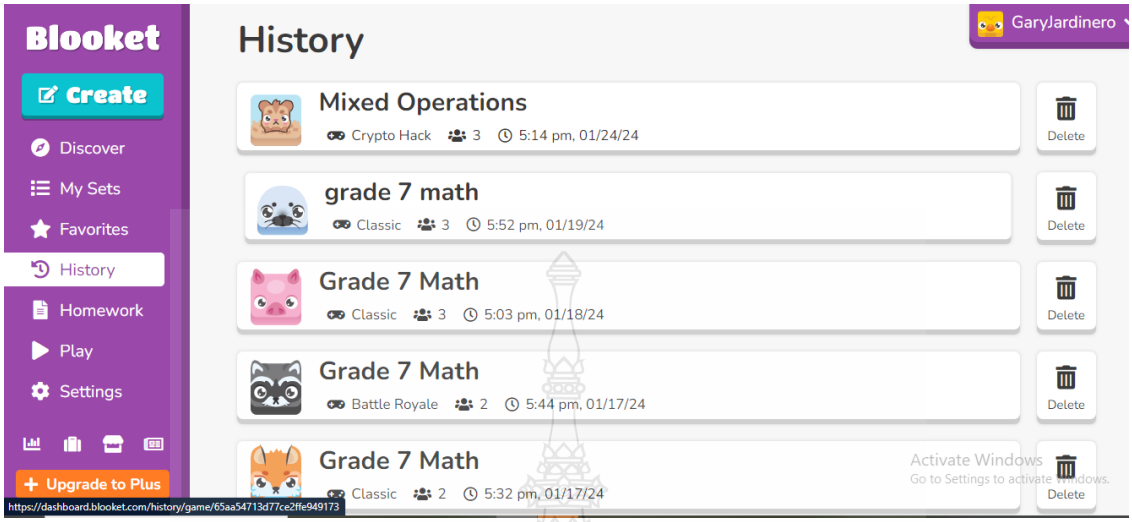
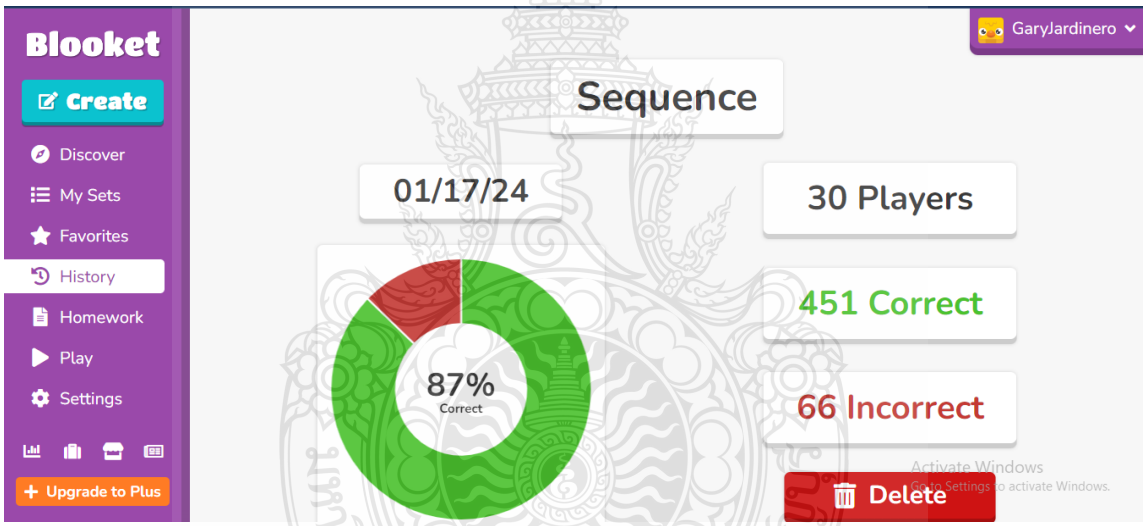


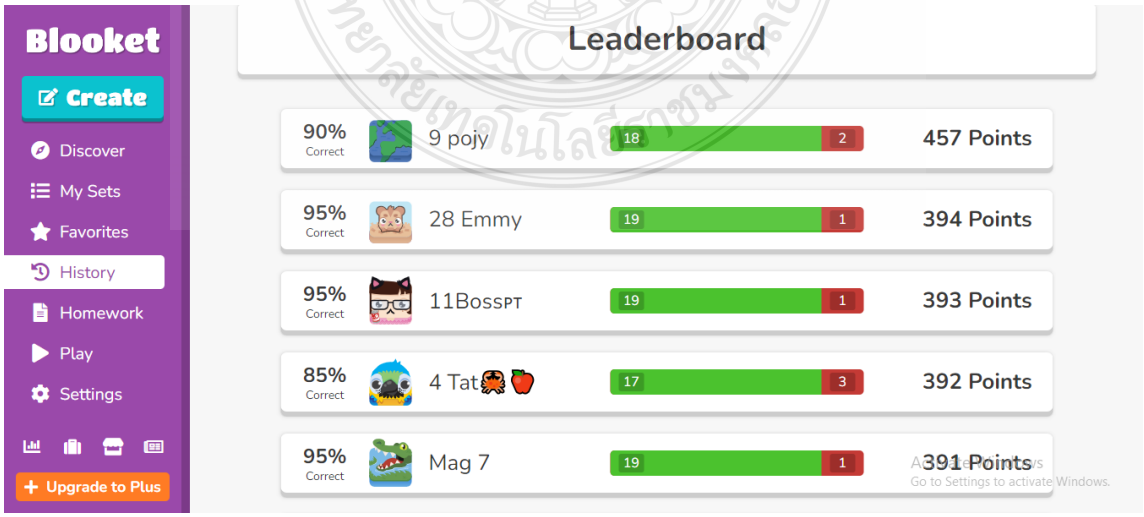
Figure D.4: Hosting windows prior to conducting digital assessment. Showing the selected materials, selections of interactive games, and password to join the game.



Figures D.5: History of students' assessments, showing students average score, individual score, and students ranking.







BIOGRAPHY

Mr. Gary Gutierrez Jardinero, a proud Filipino citizen from Basud, Camarines Norte, Philippines, was born on the 1st of May 1989, the youngest among his seven siblings. He graduated with his Bachelor of Secondary Education degree majoring in Mathematics from Mabini Colleges in Daet, Camarines Norte. Gary's passion for education has driven his career as an experienced teacher since 2009, encompassing both private and public-school institutions.

In 2014, Gary seized an exciting opportunity that took him to Thailand, where he became an overseas teacher specializing in teaching mathematics to secondary-level students. Currently, he is in his eighth year of teaching in the English Program at Bunyawat Witthayalai School in Lampang. Outside the traditional classroom setting, Gary has actively participated in numerous extracurricular activities, assuming roles as a trainer and facilitator for various school events. Notably, his significant contributions extend to research and development within the realm of mathematics. Gary takes pride in his engagement with students from diverse backgrounds, with a particular affinity for working with children. His meticulous approach involves carefully crafting engaging lessons. Gary possesses a skill for rendering complex lessons both enjoyable and easily comprehensible, deriving satisfaction from adeptly handling varying levels of students' abilities. His dedication to education motivates him to undertake this research, marking a significant achievement on his journey toward earning a Master's Degree in Education with a focus on Technology and Learning Innovation from Rajamangala University of Thanyaburi.

Exploring various destinations fueled by his passion for travel has enabled Gary to immerse himself in diverse cultures, bringing him joy and fostering a profound connection with people.

วิทยานิพนธ์ฉบับนี้เป็นงานวิจัยที่เกิดจากการค้นคว้าและวิจัย ขณะที่ข้าพเจ้าศึกษาอยู่ในคณะครุศาสตร์อุตสาหกรรม มหาวิทยาลัยเทคโนโลยีราชมงคลธัญบุรี ดังนั้น งานวิจัยในวิทยานิพนธ์ฉบับนี้ถือเป็นลิขสิทธิ์ของมหาวิทยาลัยเทคโนโลยีราชมงคลธัญบุรี และข้อความต่าง ๆ ในวิทยานิพนธ์ฉบับนี้ ข้าพเจ้าขอรับรองว่าไม่มีการคัดลอกหรือนำงานวิจัยของผู้อื่นมานำเสนอในชื่อของข้าพเจ้า

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Gary .....

(Mr. Gary Gutierrez Jardinero)