

BLOOKET APPLICATION AS AN ASSESSMENT TOOL IN SCIENCE AMONG GRADE SIX STUDENTS IN BAGA TENDER INTERNATIONAL SCHOOL

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ABSTRACT

This study examined the effectiveness of the Blooket Application as an assessment tool in science and investigated its impact on the academic performance of Grade Six students in science. Grounded in Constructivist Learning Theory by Jean Piaget and Lev Vygotsky, the study aimed to compare paper-based assessment and Blooket-based assessment in improving students' academic performance. A pretest-posttest research design was employed involving fifty students selected purposively and were divided into two groups: one group was assessed using paper-based assessment, while the other group utilized the Blooket-based assessment. Both groups were exposed to the same teaching strategies, with the assessment tool serving as the only variable that differed in the two groups. The pretest-posttest employed the 30-items multiple choice validated researcher-made questionnaire on Science that focused on topics in Biology, Chemistry and Physics. Results revealed no significant difference between the paper-based and Blooket-based assessment tools, suggesting that they were equivalent in terms of previous knowledge. After instruction, both groups showed significant improvement in their posttest scores, which was confirmed by the Paired t-test results signifying that improvements were statistically significant for both the paper-based and Blooket-based assessment groups. Nevertheless, the posttest scores revealed a significant difference in favor of the Blooket-based assessment group as manifested by the independent t-test conducted on it. The integration of the Blooket-based assessment as supportive tool alongside the paper-based method to improve student motivation, engagement and academic outcomes, is therefore highly recommended. It is also suggested that further studies explore its application across different subjects and year levels.

Keywords: *Paper-based assessment, B/ooket application, pretest, posttest*

INTRODUCTION

Assessment is a vital part of teaching, both in the brick-and-mortar classroom and in online settings. From chalkboard and chalk to interactive whiteboards and digital applications. Similarly, from paper-based assessment to digital-based assessment. This is how the classroom transformed before the emergence of modern technology. Nowadays, the enrichment of student learning is influenced by integrating technology and using digital sources in the classroom. Traditional teaching, such as using mainly the board and chalk, might not be so appealing to 21st-century learners, considering the students' multiple intelligences and how they are exposed to advanced technology.

UNICEF is on the ground in over 190 countries and territories, working across borders and barriers to reach children with the learning opportunities they need to succeed. UNICEF collaborates with governments to ensure that digital learning platforms and solutions can operate effectively in offline or low-connectivity environments, are compatible with low-cost devices, and are designed to be accessible and inclusive for children with disabilities. Furthermore, these platforms are adapted to local languages and aligned with relevant cultural contexts to enhance their effectiveness. It is suggested to use evidence-based results to design and implement digital learning programs that are flexible and personalized, adapting to each learner's level focusing on strengthening literacy and numeracy. Notwithstanding digital skills, so children build a foundation for lifelong learning and empower teachers and administrators to apply digital pedagogies and technologies. Additionally, help caregivers and communities support high-tech and low-tech digital learning ensuring digital learning reaches children in emergencies and humanitarian contexts (UNICEF for every child).

In Mongolia, the government is also challenged in providing education in remote areas, given the country's geographical location. However, the Ministry of Education is prioritizing early childhood care and education and primary education, as they are considered the strong pillars for the country's social development and economic growth. UNICEF is also on a mission to help children enhance educational outcomes of the students in Mongolia. One innovative approach has been the implementation of a play-based and digitally supported learning initiative aimed at improving basic skills. The government of Mongolia has recognized digitalization as a key lever for achieving Sustainable Development Goal 4 (SDG4) by 2030. In partnership with UNICEF, Mongolia is making significant strides in its digital transformation journey. UNICEF believe that by continuing to support innovative programs, bridging education gaps, and embracing digital transformation, Mongolia can set a powerful example for the world. (Kouassi-Komlan, 2024). The establishment of an open education system that supports the integration of e-learning is one of the commitments of the Ministry of Education in Mongolia. Additionally, is committed to developing an ICT policy and guidelines for the effective use of digital tools in the integration of digital technologies in Mongolian schools. (UNESCO, 2021). The Ministry of Education and Science in Mongolia data suggest that 86.5% of the schools are connected to at least 2Mb/s internet service, the student-to-computer ratio was at 1:12.5, and the teacher-to-computer ratio was at 1:1.6. (Unicef, n.d.). In 2020-2021 academic year, there are 839 general education schools in Mongolia, which 67% of the schools are in rural area. (Mongolia, 2021). Most of the classrooms use a traditional chalkboard in teaching and have limited access to digitalization. Teachers

rely on books and green boards. UNICEF believes that digitalization is a key to transforming education for Mongolians, who are sparsely populated across a vast territory, including nomadic communities so they launched a training to help the Mongolian teachers to improve the digital skills among teachers, students and parents, especially in remote communities. (Mongolia U. N., 2025).

However, in many international schools in Mongolia, especially in the capital city, Ulaanbaatar, the use of digital tools is evident in publicly available school information. In many bilingual schools, teachers integrate the use of whiteboards, PowerPoint and the ICT in teaching. In Baga Tenger International school in Ulaanbaatar, Mongolia, is equipped with modern technology such as Smart boards or Interactive boards, providing a favorable environment for the learners to use digital tools. This would make it more beneficial and an advantage to examine the effectiveness of the Blooket App as an Assessment Tool in Teaching Science to Grade Six Students. Through a pre-test and post-test research design, the study will measure whether the students' understanding of science concepts can thereby improve with the Blooket game-based application.

Additionally, the paper-based assessment tool as part of the conventional method of teaching sometimes makes the students less interested in understanding the complex concept. Therefore, the integration of digital tools in the classroom is one of the alternative solutions in engaging the students in an interactive learning experience (Hidayatullah et al., 2023; Indra et al., 2023; Pallud, 2017 as cited in (Astuti, 2024)). According to an article from Drexel University School of Education, by integrating innovative tools in teaching, students become more involved and active in learning. For educators, technology facilitates creating differentiated instruction to address the needs of diverse learners within classroom settings (Education, 2000). In the same way Blooket , a game-based application, is only one of the technologies integrated in classes that improve student engagement by turning student learning into livelier and more interactive. However, the effect of technology integration in the education landscape, including the use of Blooket tools on students' academic achievement, is still in need of further study.

There are previous studies that have shown how gamification can motivate students to participate in class, thus increasing engagement (Hanafiah & Teh, 2019; Mahbubi, 2025 as cited in Astuti, 2025). Educators have introduced various platforms such as Google Classroom, Kahoot, Quizizz, Blooket, and Classpoint to enhance student engagement in learning and improve their academic experience. These platforms promote students' motivation and interactive classes. Moreover, innovative tools integrated into teaching are one way to bridge the gap between the traditional and the contemporary classroom.

Among these tools, Blooket has become one of the popular game-based learning platforms that allows teachers to create learning-based games with students (Che Ku Nuraini Che Ku Mohd et al., 2023). According to Kuzma (2022, as cited in Sulistyanto & Asyhar, 2024), Blooket is an application that can be used by students without the need to install an application, such as avatars, which makes the lesson more engaging for the students. Cited in the same article, Thu and Dan (2023) highlighted that the features presented in the Blooket apps, such as the leaderboard, keep the students' enthusiasm and encourage a healthy competition among students. Apart from this, a variety of game modes promotes participation in the game as it prevents boredom. While most existing studies on Blooket focus on language learning and mastery of English vocabulary, there

are limited articles on its use in Science education. Moreover, despite the integration of ICT into teaching, the assessment tool used is still paper- and- pen tools. The academic performance of grade six students in science needs to be addressed, as the student engagement during assessment remains low. The conventional way of assessing students may not sustain students' interest and motivation, especially among 21st-century learners who tend to respond positively to technology-enhanced assessment tools rather than to paper- and -pen tools. In paper-based assessment, learners tend to leave the questions unanswered immediately when there are words that they do not understand without further reflection, while in using Blooket app, the learners are required to answer before proceeding to the next question. Through using digital tools like Blooket app, the students may be encouraged to think critically, thus promoting engagement and active participation. Furthermore, in the Mongolian education context, there are very limited studies that explore the use of Blooket app as an assessment tool in science among grade 6 pupils, and because of this, further research is needed to address this gap. This study will highlight how Blooket can be useful and effective in integrating it into the Science lessons as an assessment tool to boost student engagement and improve academic achievement.

This study aimed to investigate and analyze the extent to which the use of technology-enhanced learning tools—such as Blooket apps—impacts the academic performance in Science of Grade Six students in a private school in Mongolia. The findings of this study will help researchers and other educators make informed decisions on how best to integrate digital tools like Blooket to improve teaching methodology and assessment procedure to improve students' academic results, and, eventually, the educational experience of middle school learners. This would also contribute to the related literature on game-based learning in science education. The research provides localized evidence for the Mongolian education system on the effectiveness of Blooket in improving the academic performance of grade six students and will serve as a reference for other local or international schools with a similar curriculum in a private school in Mongolia which is the study conducted.

Background of the study

The potential of Technology Enhanced Learning (TEL) tools such as Blooket lies in their ability to create interactive and stimulating learning environments, and research suggests that technology-based activities can increase student motivation and active participation by making lessons and assessment procedure more dynamic and relevant to learners' interests (Deci, 2020). For instance, gamification and interactive simulations have been shown to sustain attention and promote curiosity, which are essential for academic success during adolescence (Juho Hamari, 2016).

The emergence of modern technology has transformed the educational landscape worldwide. Although many schools still use traditional teaching materials and methods, more and more have replaced traditional chalkboards and overhead projectors with technology-enhanced learning tools, namely Kahoot, Quizizz, Google Classroom, Class Point, Blooket. Innovative tools and digital devices not only transform teaching instruction into a modern one but also enhance students' learning by allowing students to experience and sustained engagement.

As stated in the article “Kahoot, Quizizz, and Quizalize in the English Class and their Impact on Motivation by José Antonio España-Delgado”, incorporating games as an educational tool encourages the learners and helps them develop skills such as problem-solving, collaboration and communication. Furthermore, the integration of gamification into learning enhances students’ motivation and engagement, especially by giving a reward or badges such as points, trophies and leaderboards, which also promotes healthy competition and encourages collaboration among students (España-Delgado, 2023). Gamifications promote an enjoyable environment, which shifted from a traditional classroom to a modern learning environment where learning sessions are dynamic and students’ attention is focused (Maraza-Quispe, 2024). While these studies highlight digital platforms such as Kahoot and Quizizz, there is limited research that has been conducted to show the effectiveness of Blooket, which features leaderboards, avatars, and various game modes that increase students’ motivation to learn and improve academic achievement. Some studies suggest that integrating gamification, such as Blooket application tools, improves the students’ learning performance. The article by Eric Ofgang highlights that it might encourage unhealthy competition among learners and that they will rely more on external rewards rather than enhancing intrinsic motivation (Ofgang, 2024). This gap emphasises the need to explore the effectiveness of Blooket application specifically in the context of Science Education.

This study delved into the context of a private school in Mongolia to investigate the potential impact of Blooket, a game-based learning application focusing on the assessment mechanism of the Blooket app that enhance the performance of grade six students in science. It is essential to understand how a platform like Blooket can align with the educational goal and these innovative tools to expand the students’ learning experiences. Moreover, it enables educators to better evaluate the effectiveness of these assessment tools in enhancing academic performance and to determine best practices for their meaningful and sustainable implementation in the classroom.

Review of Related Literature

This chapter offers an in-depth review of literature and previous research studies pertinent to the present investigation. It aims to establish the theoretical and empirical foundations of the study by examining existing studies, identifying research gaps, and highlighting how the current research contributes to the field. It discusses and discover the authentic experiences of science learning under the supervision of technical integrated lessons and its effect on the academic performance of the students in Science. Also, this chapter includes the role of science and gamification tools in the educational field, the impacts of incorporating science lessons with latest technologies, and the learners’ test performance. This review of related literature aimed to support the current study.

Nowadays, technology has emerged as an essential component in educational settings worldwide, recognised for its potential to enhance students’ academic performance. This literature review explores the effectiveness of the Blooket App as an assessment tool in teaching Science to grade six students specifically in a private school in Ulaanbaatar, Mongolia. The findings of the study will determine whether the use of Blooket influences the grade six students’ motivation, engagement and academic performance in science class. This study aims to contribute valuable insights into the

potential benefits of integrating game-based learning as Blooket into grade six students. Reviewing existing related literature on the integration of Blooket in teaching provides a deeper understanding of its effectiveness in enhancing student academic achievement in Science Education.

Academic Performance

Academic achievement among middle school students has been the subject of extensive research, as this stage marks a critical transition between elementary and secondary education, often characterized by changes in learning demands, social environments, and developmental needs. According to Xianfei Gu (Gu, 2024), middle school students' academic performance is influenced by many factors, and it is a result of the influences, including the learning environment, school education, personal factors, and instructional strategies. The teaching quality and educational resources directly impact students' learning outcomes. The author highlights that a good learning environment and advanced teaching equipment enhanced the academic performance of the pupils. Additionally, effective and scientific learning methods help students improve their learning efficiency and outcomes.

In terms of instructional strategies, technology integration has been linked to improved performance when implemented effectively. According to Ellis et.al, (Ellis L.C. Osabutey, 2022) the use of online assessment positively impact the academic performance of the students. Blooket, as a technology-enhanced assessment tool, can be used to evaluate students' knowledge online, and it can influence academic achievement. However, the benefits largely depend on how the technology is embedded within the curriculum and how actively students engage with it.

Moreover, student motivation and self-efficacy have been identified as strong predictors of academic success in middle school. Schunk and DiBenedetto (2020) argued that fostering intrinsic motivation and confidence in one's abilities encourages persistence in learning tasks, thereby improving overall performance.

Collectively, these studies highlight that middle school academic performance is shaped by a complex interplay of individual, family, school, and contextual factors, suggesting that interventions aimed at improving outcomes must address multiple dimensions of the learning environment.

Integration of Digital Tools in Teaching and learning

Technology integration has transformed traditional classrooms into modern ones to meet the demands of modern society, especially in the education sector. Cited from the study of Seyfullah ŞAHİNOĞLU, to raise well-educated and qualified individuals, classrooms, schools and related educational environments are equipped with products and concepts brought by technology to education. Thus, the necessary steps for constructing and protecting an ideal generation have been accelerated. In the development process that started with blackboard and chalk, overhead projectors, simple computers and headphones mostly used only in foreign language classes, videotape and photocopy machines took their place in history as the first educational, technological products of the period. Additionally, the studies highlight that innovative studies on education systems and environments are of vital importance to increase learning effectiveness and productivity in the century we live in. Technology's evolution enhanced

the new generation with the knowledge, skills, and problem-solving abilities to help them address challenges in their daily lives and modern society. Again, scientific studies show that digital or technological tools make lessons more active and engaging, enhance learning, and aid the teacher in checking homework and tasks. The use of technology is acknowledged as a necessity (ŞAHİNOĞLU, 2022).

Pettersson of Umeå University conducted a study to understand a broader perspective of digitalisation and comprehend how teachers, school leaders and educational technologists deal with digital and educational change. Based on the teacher's perspective, using technology and digital tools facilitates various aspects of teaching in terms of organising tasks and course materials and better communication with students. According to the result of the study, many educators have noted that the use of technology tools has helped them reduce paperwork, resulting in ample time for preparing lessons to give the students a great learning experience and provide impactful support to learners, such as leaving on-time comments for assignments and assistance in reorganising their tasks. This supports the idea that integrating a digital learning tool such as Blooket in teaching improves classroom efficiency and enhances students' learning experiences. It reinforces the idea that the use of digital tools is aimed at and comes with an endeavour of more than technical development of the school, as is otherwise characteristic for earlier levels of change and development (Pettersson, 2021).

Global Significance of Game-Based learning in Education

Gamified education uses game elements such as points, leaderboards and achieving learning goals - to motivate and engage students (Swacha, 2021). The gamification option is limited to the teacher's imagination and encourages more efficient and participatory learning. When properly designed by the teacher, it promotes efficient participatory learning. The learning impact often stems from social interaction and students' healthy competition with the desire to see their names at the top of a scoring list or to compare their scores with peers' success (Muhammad Awais Hassan, 2021).

The impact of gamification extends beyond learning outcomes, reaching into self-assessment and self-regulation. The constant and instant feedback offered by these tools fosters a reflective attitude, enabling students to recognise their strengths and areas for improvement without the burden of negative emotions. As gamification continues to evolve, its impact on education dynamics remains a promising area of exploration (Benjamín Maraza-Quispe, 2024). Such tools support engagement, self-directed learning, and skill development aligned with modern educational practices. Furthermore, gamification has been shown to increase motivation, learning retention, and overall achievement compared to traditional classroom approaches (Lampropoulos, 2024).

Educators from all levels – from elementary to university are continuously exploring methodologies to adopt technology to enhance teaching. Even before the COVID-19 pandemic, the need for students and teachers to be technologically savvy and able to conduct teaching and learning virtually was evident. They constantly explore innovative methods to integrate the use of digital tools into traditional classrooms to enhance student learning outcomes and to better equip students to prepare for a technology-driven world. Integrating digital tools such as Blooket is designed to develop a nurturing and interactive learning environment that caters to the diverse needs of all students (University, 2022).

An expert from Stanford GSE, Dean Dan Schwartz, emphasises in the article “How technology is reinventing education” that technology is a game-changer in education, offers the prospect of universal access to high-quality learning experiences, and creates fundamentally new ways of teaching. He stresses that technology can provide universal access to learning and bring forward innovative teaching strategies or methodologies. This issue could also entrench inefficient teaching practices, such as the possible integration of AI. Educators, therefore, should ensure that technological integration—such as the use of digital learning platforms like Blooket—enhances rather than replaces meaningful teaching and learning processes (Spector, 2024).

In recent years, several studies have been conducted to apply gamification in education to explore the effects of gamification on students’ experience and learning and to understand how to tailor gamified educational environments to match students’ characteristics, needs, and behaviours (Wilk Oliveira, 2020). The emphasis on play reflects the theories and pedagogies developed by influential Western authors such as Jean Piaget, Lev Vygotsky, Jerome Bruner, Carl Jung, Friedrich Fröbel and Maria Montessori, who emphasised that play fosters creativity, cognitive development and active engagement among learners through different educational levels (Alfredo Bautista, 2023). These theories form the foundation of modern game-based learning platforms like Blooket, which combine play and learning to create interactive, student-centered environments that encourage participation and motivation.

Paper-based Assessment Tools

The study of Weirich et. al. (2024) compared the trajectories of students’ self-reported test-taking effort during a 120-minute low-stakes large-scale assessment of English comprehension between a paper-and-pencil (PPA) and a computer-based assessment (CBA). Test-taking effort was measured four times during the test. Overall, students’ test-taking effort decreased considerably during the course of the test. On average, effort was lower in CBA than in PPA. While on average, effort was lower in CBA than in PPA, the decline did not vary between both modes during the test. That is, students’ self-reported effort was higher if the items were easier (compared to students’ abilities). The consequences of these results concerning the further development of CBA tests and large-scale assessments in general are discussed.

Young (2024) in her article stated that for students, handwritten assignments and exams can also offer a physical representation of their work, fostering a deeper engagement with the content. However, grading handwritten assignments can be time-consuming for educators, especially when they have large classes to oversee. This may delay the feedback process. Paper-based assignments are also known to offer limited insights into student performance beyond the final grade, making it challenging for educators to identify patterns or trends in student understanding without the aid of digital analytics.

Maria et., al. (2021) conducted a mixed-methods study where they collected evidence of the cognitive validity of CB and PB writing tests and the impact on EFL university students’ cognitive processes (e.g., macro-planning, micro-planning) as part of the validity and fairness of classroom writing assessment. The findings suggest that both CB and PB tests are cognitively valid, as they activated cognitive processes necessary to perform a writing assessment task. However, each test mode impacted EFL students’

cognitive processes differently. The PB mode triggered greater detailed macro-planning of content and text organisation. In contrast, the CB mode triggered micro-planning of text organisation and after-writing revisions at both high and low levels. There were no significant differences in task representation and translating processes. The findings have implications for EFL writing teaching and classroom assessment validity and fairness.

ANOVA of test data showed that the computer-based test group outperformed the paper-based test group. Gender, competitiveness, and computer familiarity were NOT related to this performance difference, though content familiarity was. Higher-attaining students benefited most from computer-based assessment relative to higher-attaining students under paper-based testing. With the current increase in computer-based assessment, instructors and institutions must be aware of and plan for possible test mode effects.

Blooket as a Game-Based Learning/Assessment Tool

According to Astuti (2024), learning in science using traditional teaching methods often struggles to sustain the motivation and engagement of the students, and it is challenging for the students to grasp scientific concepts. The integration of gamified applications such as Blooket provides a more engaging and participatory environment. Blooket application fosters encouragement both motivation, and active learning among students. Astuti (2024) found that integrating the Blooket application in science lessons remarkably improved students' learning motivation and engagement. The study also revealed that the pupils became more confident during lessons due to Blooket's gamified features, and they feel more motivated to understand the material due to the engaging and non-monotonous learning format. The social interaction that occurs during Blooket-based activities also contributes to increased student learning motivation. Observations show that students collaborate more often in groups to solve challenges, which creates a sense of community and support between friends. Intensive group discussions during the game help students understand the material in a more enjoyable way (Astuti, 2024)

In a study integrating the Blooket media to enhance students' learning outcomes in a radiochemical course found that Blooket app created a more relaxed and enjoyable learning environment, promotes student active participation and reduces anxiety. The study highlighted the increase in student learning outcomes up to 14.03% . The result highlights the effectiveness of Blooket app in learning scientific concepts. Blooket is used in the study to help students grasp the topic matter and to measure pupils' recall. According to Christiano et al, Blooket can stimulate interest, enthusiasm, and a sensation of serenity while learning. He further explained that using learning technology may make it easier for teachers and students. (Heru Christiano, 2024).

Blooket as one of the gamified tools described from the conducted research in the article "The Effects of Blooket on Motivation in Learning English among First-Year Non-English Majors at A University in Ho Chi Minh City", Blooket, a technology-based learning tool, has significantly impacted student motivation during the learning process. It changes students' interest from traditional methods to the modern teaching methodology. It also makes tasks meaningful and relevant to real-life situations, allowing students to recognise vocabulary in specific contexts. Based on the research findings, using Blooket can substantially boost pupils' intrinsic motivation by promoting a conducive learning environment and enhancing students' confidence compared to the conventional method.

Moreover, Blooket strengthens the student's self-awareness and expands the opportunity for the student's autonomy in learning a language. Furthermore, Blooket allows teachers to modify content and create appropriate learning experiences. Therefore, teachers must understand students' interests and abilities and provide some external motivation to monitor learners' growth and improvement (Huynh, 2024).

A qualitative study was conducted by Sarika (2023) to examine the use of educational games-based learning to enhance Students' English vocabulary. Forty (40) students, 7,8 and 9 grades of Public Junior High School students were involved as a subject of research. Engaging students' habits with their gadgets, especially in the game-based-learning strategy "Blooket.com" is a new way to help improve students' mastery of vocabulary. Students were given a questionnaire using Google Forms, and information was gathered in the form of numbers and percentages, which were then interpreted in a qualitative sentence. The result shows that using Blooket can enhance students' motivation in learning vocabulary because it makes them fun, and competitive, and understand the vocabulary easier than the conventional method. Blooket also has weak speed and accuracy because of the Internet connection and the gadget's performance. Therefore, this can be used as an alternative to breaking the old way of learning vocabulary.

Challenges in Implementing Game-Based learning Tools in the Classroom

While Technology-Enhanced Learning (TEL) tools offer significant benefits in facilitating instruction, several studies highlight persistent challenges in their integration into classroom practice. These barriers often involve technological, pedagogical, and contextual factors that affect the effectiveness of TEL implementation.

Many teachers have begun to employ digital apps and tools as a more interactive alternative to traditional activities (Lucas Kohnke, 2021). However, some challenges in technology integration faced by teachers are worth mentioning. Several challenges obstructing the efficient integration of technology, such as slow internet speeds, load shedding, lack of infrastructure, online teaching experience, and training, were reported as the main obstacles that hinder teachers from effectively integrating ICT into their teaching practices. Furthermore, according to Akram, despite the growing use of technology, many teachers find the integration of digital tools into teaching challenging. (Huma Akram, 2022). Therefore, the integration of digital app such as Blooket depends not only on access to technology but also on the teachers' capability and initiative to adopt the Blooket into teaching effectively. This challenge could be addressed with proper training and continuous learning to explore the effectiveness of Blooket in improving the students' academic performance in science class.

Student-related factors can also influence the effectiveness of using Blooket as a game-based learning tool in science education. Liu et al. (2021) note that while digital tools increase engagement, they may also lead to distractions, reduced attention span, and over-reliance on technology. Furthermore, disparities in students' access to devices at home known as the "digital divide" can exacerbate learning inequalities (Van Dijk, 2020). To have the learners experience the full educational benefits of adopting Blooket in science instruction, it is essential that these issues be addressed.

According to AvdiuSchabas (AvdiuSchabas, 2023), another challenge in implementing game-based learning tools in the classroom is how students manage

emotions when confronted with defeat during competitive activities, which can hinder motivation and participation. Additionally, some educators believe that game-based activities are deemed unproductive and occasionally appropriate for both the subject matter and the students. The age and teaching experience of teachers are also to be considered, as the willingness to integrate new instructional strategies might not be present. Individuals often require additional time to develop their innovative and creative ideas effectively. This is due to the need for a comprehensive understanding of the effective integration of innovation, including technology, props, and appropriate game models. Therefore, in the context of teaching science through Blooket the teacher should have a thoughtful consideration of alignment the digital app with curriculum standards for the students' experience a meaningful learning, not just engagement.

Given these opportunities and limitations, the relationship between game-based learning enhanced learning tools and students' academic performance warrants further empirical investigation, particularly in Science education where active learning is essential for understanding the concept. Blooket as a game-based platform, offers a great potential in making Science learning more engaging and fun for students. However, despite potential, the effectiveness in improving the academic performance of the Grade six students in a private school in Mongolia needs to be studied. Understanding both the pedagogical benefits and the implementation challenges of using Blooket can provide a clearer foundation for developing effective technology-based instructional strategies that enhance learning outcomes in Science.

Theoretical Framework

The study was anchored on **Constructivist Learning Theory** by Jean Piaget and Lev Vygotsky. Constructivism is defined as the philosophical position which holds that any so-called reality is the mental construction of those who believe they have discovered and investigated it. The constructivist theory acknowledges that learning is an active and socially influenced process. It highlights the significance of the students' learning experiences, which are meaningful and relevant (Abbas Pourhosein Gilakjani, 2013). The constructivist theory complements this study as integrating technology-enhanced learning tools, such as Blooket, encourages the students to actively participate and engage in learning, improving their understanding and cognitive skills. Through the application of constructivist theory in this study, educators better understand how the use of Blooket as an assessment tool has shifted traditional assessment instruction into a student-centred learning environment, thus improving academic performance. Additionally, the integration of technology-enhanced learning tools like Blooket into assessment methodology promotes collaboration, interaction, and reflective learning among students-key principles emphasised in constructivist learning.

In the article, *Constructivism Theory in Technology-Based learning*, Lazarus (2019), the constructivist theory explains that learners create understanding based on their own interpretation of knowledge and that knowledge should be constructed instead of passively received by the learner. The construction of knowledge is a dynamic process that requires the active engagement of the learners who will be responsible for one's learning while the teacher only creates an effective learning environment. As students and teachers make use of technology in the learning process, these skills become necessary, and the technology becomes a learning tool. When the technology is

integrated into learning, it becomes a great tool that develop a constructivist approach and enhance students' cognitive abilities. The teacher served as facilitator of learning instead of the "sage on the stage". The teacher creates engaging learning experiences for students that complement the constructivist theory principles (Makewa, 2019). In this study, using the Blooket app reflects the constructivist approach by encouraging active participation of the students, collaboration and self-directed learning among the grade six students, thus improving their motivation to learn an engagement in the different activities which leads to better learning process.

Research Questions

The study aimed to determine the effectiveness of the Blooket Application as an assessment tool in Science and examine its impact on the academic performance of Grade Six students in science employing pretest-posttest design at Baga Tender International School in Ulaanbaatar, Mongolia.

Specifically, it sought answers to the following questions:

1. What are the pretest scores of the Grade six students in the
 - 1.1 Paper-based assessment group
 - 1.2 Blooket-based assessment group?
2. What are the posttest scores of the Grade six students in the
 - 2.1 Paper-based assessment group
 - 2.2 Blooket-based assessment group?
3. Is there a significant difference between pretest and posttest scores of the Grade six students in the Paper-based assessment group?
4. Is there a significant difference between the pretest and posttest scores of the Grade six students in the Blooket-based assessment group?
5. Is there a significant difference between the pretest scores of the Grade six students in the Paper-based assessment group and the Blooket-based assessment group?
6. Is there a significant difference between the posttest scores of the Grade six students in the Paper-based assessment group and the Blooket-based assessment group?
7. What program can be proposed based on the findings of the study?

Hypotheses

To answer the statement of the problems the following hypotheses were stated:

1. There is no significant difference between pretest and posttest scores of the Grade six students in the Paper-based assessment group.
2. There is no significant difference between pretest and posttest scores of the Grade six student in the Blooket-based assessment group.
3. There is no significant difference between the pretest scores of the Grade six students in the Paper-based assessment group and the Blooket-based assessment group.
4. There is no significant difference between the posttest scores of the Grade six students in the Paper-based assessment group and the Blooket-based assessment group.

Scope and Delimitation of the Study

The study titled “Blooket Application As an Assessment Tool in Science Among Grade Six Students in Baga Tenger International School, Ulaanbaatar Mongolia” is specifically designed to investigate the influence of the Blooket-based assessment tool on the academic performance of the Grade Six students within the confines of a private school in Mongolia. Furthermore, the study intends to suggest an action plan to improve educators' skills in incorporating Blooket and similar technologies into their teaching approaches alongside its assessment mechanism to increase student performance in the learning process.

However, the dependence on a narrow sample of Grade six students in one of the private schools limits the results' applicability to a larger population, reducing the external validity of the findings. External factors such as socioeconomic origins, family influences, and individual differences among students are not well controlled for in the study, which may contribute to discrepancies in academic achievement. Additionally, some students might not be familiar with the Blooket application, therefore their response to this gamification might vary. The present study provides immediate results as it is a pretest-posttest design, therefore it captures only a short period. It does not measure the long-term learning outcomes or the measure of retention of science concepts.

METHODOLOGY

This chapter includes the research design, research locale, and participants involved in the study. It also presents the research instrument used in this study, data gathering procedure statistical treatment employed and ethical considerations.

Research design

This study employed a quantitative quasi-experimental pretest-posttest research design to determine the effectiveness of the Blooket application as an assessment tool in teaching science to Grade six students in one of the private schools in Ulaanbaatar, Mongolia. The study is a quasi-experimental in nature because it examined the effectiveness of the use of Blooket as an assessment tool on the academic performance of the two intact groups: Paper-based assessment group and Blooket-based assessment group. In this study, the Blooket as an assessment tool served as an intervention. The two grade 6 classes' pretest and posttest results were compared, which made the quasi-experimental design appropriate in determining the effectiveness of the Blooket app as an assessment tool.

Additionally, the study aimed to measure the improvement of the performance of the Grade six students in science after integrating the Blooket apps into science instruction. In this study the participants were not randomly assigned to groups. Instead, the researcher used existing groups such as the two intact classes. The two existing Grade six classes in Baga Tenger International School where class A served as the Blooket-based assessment group (uses Blooket for assessments) and Class B served as the Paper-based group (uses paper-and-pencil assessments). No random assignment took place; the classes already exist and outcomes were compared using numerical data.

According to Creswell, quantitative approaches focus on carefully measuring a parsimonious set of variables to answer theory-guided research questions and hypotheses. It examines relationships between and among variables. It focuses on measurable data and often uses surveys and experiments to answer research questions and hypotheses (Creswell, 2009).

To identify the baseline data of the students' understanding of the Science concept, a pretest was administered. After three weeks comprising of nine sessions of science instruction on both the paper-based assessment and Blooket-based assessment groups where the same strategies and methods were employed in discussing the topics on Biology, Chemistry and Physics, a posttest was administered to assess students' learning progress and determine whether the performance test result has improved. The difference between the pretest and posttest results were evaluated and analysed to determine the effectiveness of Blooket App as an assessment tool in teaching Science to Grade six students.

The data gathered from this study were statistically analysed to determine the impact of Blooket on the Science performance test result of the Grade six students.

Locale of the Study

The study was conducted in Baga Tenger International School, a private school located in Ulaanbaatar, Mongolia. The school offers both a Mongolian national curriculum and an international curriculum from primary to secondary levels. The school maintains high educational standards and integrates ICT across subjects with the use of multimedia in classrooms. Internet connectivity is institution-managed and filtered for educational purposes; Blooket sessions were run during supervised periods. A checkpoint Science subjects, which consists of Biology, Chemistry and Physics, are offered in both curricula, and students take the standardised Science assessment twice a year, aligned to international benchmarks. The school provides support to students who excel in science by facilitating their participation in both local and international Olympiad competitions. It also prepares learners for external examinations that serve as a foundation for their future university studies.

The study focused on 50 Grade Six students from two classes. Grade six students were chosen for this study because, at this stage, they have sufficient digital literacy and show a strong interest in learning through technology and gamification integration into their lessons. Thus, they are ideal participants for assessing the effectiveness of the Blooket application in science assessment.

Participants of the Study

The participants for this study were the 50 Grade six students enrolled in Baga Tenger International School one of the private schools in Mongolia. They were selected through purposive sampling, as this group of students has already been exposed to digital literacy skills and familiar to some game-based learning activities through their Information and Communication Technology classes. This makes them ideal as the participants to determine the effectiveness of Blooket app as assessment tool in enhancing the academic performance of the Grade six students in science education. The fifty participants were divided into 2 groups the Paper-based assessment group and the Blooket-based assessment group each comprising twenty-five students. The sample

size of fifty is considered adequate for analysing pretest and posttest results to determine the effectiveness of Blooket in enhancing students' academic performance in science by using game-based assessment tool.

Instruments of the Study

The primary instrument used in this study was a researcher-made science achievement test. The science test consists of two parts: a pretest administered before instruction and the posttest administered after the two groups, the Paper-based assessment group and the Blooket-based assessment group were taught using the same strategies and methods in Biology, Chemistry and Physics. The posttest in the paper-based assessment group used paper and pen as assessment tool while the Blooket-based assessment group employed the Blooket app, a game-based assessment tool. Thirty (30) item multiple-choice questions were given in both the pretest and posttest. The multiple-choice questions were content validated by the Science subject expert or specialist to ensure alignment with the curriculum and learning objectives. Revisions were made based on the experts' suggestions and feedback before the instruments were administered. The following descriptors were used to describe the performance level of the Grade 6 students in both the pretest and posttest:

Score interval	Description
25-30	Outstanding
19-24	Very Satisfactory
13-18	Satisfactory
7-12	Needs Improvement
0-6	Poor

One topic was taken from each Science strands: Biology, Chemistry, and Physics. Both the pretest and posttest were designed to measure the effectiveness of using Blooket app game-based assessment tool on the achievement of the students. To maintain consistency, the pretest and posttest questionnaire have the same content revolving on the topics in Biology, Chemistry and Physics in evaluating the student's learning progress.

To test the reliability of the items, a pilot test was administered to a group of 25 grade seven students selected from one of the three classes. The pilot test was administered using paper-based science achievement test questions. The measure of the internal consistency using Cronbach α is 0.82 indicating good internal consistency reliability which implies that the test items consistently measured the same construct.

Data Gathering Procedure

This includes the steps underwent before the data was collected. There were three phases in the gathering of the data:

Phase 1 Assigning of group and securing permits

The study employed a quasi-experimental pretest-posttest design with two groups: the Paper-based assessment group and the Blooket-based assessment group. Before conducting the study, permission was obtained from the administration of the participating international school. After approval for the conduct of the study, the official list of 50 sixth-grade students was finalized and assigned to their respective groups, the Paper-based assessment group and the Blooket-based assessment group. Next, consent forms were distributed to parents of the participating grade six students, informing them about the purpose of the study and the confidentiality measures of the research. A Google Form was created for the parents who preferred an online form. A permission letter was also obtained to collect the necessary data from the participants, the pretest and posttest results, for analysis.

Phase 2 Test Construction and Administration

A 30-item multiple choice type of test was constructed by the researcher covering topics in Biology, Chemistry and Physics. The questionnaire underwent validation by 3 Science experts all with MAED course. to ensure the validity of the items. The suggestions and recommendations of the experts were incorporated into the items before the administration of the assessment to ensure the appropriateness of the items. The researcher-made multiple-choice questions were adapted from the Cambridge International Education examination standard. The questionnaire also was pilot tested to a group of 25 grade 7 students who have already taken the course in Science. Based on the Cronbach α result of 0.82 it indicates good internal consistency reliability which implies that the test items are consistently measuring the same construct. The pretest was administered to the two groups, the Paper-based assessment group and the Blooket-based assessment group under the supervision of the researcher and the Science teacher to establish baseline knowledge before the instruction.

Phase 3 Instruction and Posttest administration

After the administration of the pretest, three-week lessons were conducted, consisting of nine sessions totalling 360 minutes of science instruction. All sessions in the two groups of Grade six students, the Paper-based assessment group and the Blooket-based assessment group, followed the same lesson plans, learning objectives, time allocation, strategies and methods. During the instruction phase the researcher employed the usual methods used in science teaching, such as PowerPoint presentation, inquiry approach, discovery approach, cooperative method, experimentation and the like, to Paper-based assessment group and the Blooket-based assessment group. This phase ensured that the two groups received similar treatment on content and instruction, but only differed in the mode in which the assessment was conducted. The Blooket app was solely used for the administration of the posttest assessment for the Blooket-based assessment group and was not used as a teaching-learning tool or to deliver lesson content among grade six students.

After completing the nine sessions, the researcher administered the Science Achievement Test as the posttest, consisting of the 30-item multiple-choice questions. The Paper-based assessment group took the posttest using paper and pen, while the Blooket-based assessment group took the posttest through Blooket application platform.

Procedure for Conducting the Posttest Using the Blooket App

Assessment in Blooket is done by hosting quizzes as games, collecting student responses, and analysing performance reports to measure learning. The following illustrates how the student assessment was done using the Blooket app.:

1. The teacher created an account in the Blooket application. Then, a 30-item multiple-choice question was created in the platform.
2. The teacher clicked the host button and chose the classic game mode, after which the game code was shown to the students.
3. The student then visited the play.blooket.com using Google and entered the game code.
4. The students entered their names and selected a Blook while they waited for the game to begin. Once all students had registered, the teacher clicked start.
5. After 30 minutes, all the students had completed answering the 30-item multiple-choice questions.
6. After every question, the leaderboard was displayed, showing the student ranking from first to last.

This feature increased learner's interaction and encouraged healthy competition. The feedback or result of the Blooket-based assessment was obtained after the allotted 30-minute assessment time.

All Science Achievement test papers were collected from the Paper-based assessment group and the results from Blooket apps were tabulated and analysed. For analysis, Quasi-experimental pretest-posttest design was employed to determine the difference in the use of assessment tool between the two groups, the Paper-based assessment group and the Blooket-based assessment group.

During the whole duration of the data gathering process, confidentiality and anonymity were strictly observed, and the findings of the results were used for academic purposes only. All the data gathered were obtained with permission from the school administrator, parents and the participants of the study.

Statistical Treatment of Data

To address the research questions quantitatively, appropriate statistical treatment was employed.

To answer research questions 1 and 2, What are the pretest and posttest scores of the Grade six students in the Paper-based assessment group and the Blooket-based assessment group, the Mean, Standard deviation, Frequency distribution and Percentage were employed.

To evaluate research questions 3 and 4, Is there a significant difference between the pretest and posttest scores of the Grade six students in the Paper-based assessment group and in the Blooket-based assessment group, the data were subjected to Paired t-test, and the result was compared to 0.05 significance level.

To analyze research question 5, Is there a significant difference between the pretest scores of the Grade six students in the Paper-based assessment group and the Blooket-based assessment group-Independent t-test was used, and the result was compared to 0.05 significance level.

To resolve research question 6, Is there a significant difference between the posttest scores of the Grade six students in the Paper-based assessment group and the Blooket-based assessment group, Independent t-test was employed, and the result was compared to 0.05 significance level.

Ethical considerations

The researcher ensured the participant's privacy and confidentiality. The researcher was aware that whether or not the study volunteers would be divulged and how the survey would be administered must be thoroughly agreed upon with them. Consent were obtained from the school administrators. The research also complied with the policies of the school and respect cultural sensitivities, ensuring that the study was conducted with integrity and transparency. Informed consents from both the students and their parents were acquired before the study. To ensure anonymity, the names of the grade 6 students were not written in the science achievement paper or any part of the research report, instead a number was assigned for each respondent.

The participants were given adequate information about the study to make an informed decision about their participation. All data gathered from each respondent was treated with confidentiality and used only for academic purposes. Moreover, the researcher interpreted the study findings with no exaggeration to convey the findings accurately and reliably. The researcher also observed anti-plagiarism by citing all sources and the related literature used in the study. The researcher ensured that there was no potential harm or stress to the students and that Blooket, as the assessment tool, did not negatively impact their learning experience. About AI use, the researcher ensured that AI was only used for language support and grammar correction. AI were not used to generate false information, interpretation of data or judgment.

To ensure the validity and reliability of the data-gathering instrument, the Science Achievement Test was reviewed and validated by science subject experts. The validation process ensured that the test items were aligned with the curriculum, age-appropriate, and measured the intended learning competencies.

RESULTS

The tables of the results of the study:

Table 1.1
Pretest Scores of the Grade Six Students in the Paper-based Assessment Group

Score Interval	Description	Frequency	Percentage
25-30	Outstanding		
19-24	Very Satisfactory	3	12
13-18	Satisfactory	10	40
7-12	Needs Improvement	10	40
0-6	Poor	2	8
Total		25	100
Mean		13.20	
SD		4.53	

Table 1.2
Pretest Scores of the Grade Six Students in the Blooket-based Assessment Group

Score Interval	Description	Frequency	Percentage
25-30	Outstanding	1	4
19-24	Very Satisfactory	6	24
13-18	Satisfactory	9	36
7-12	Needs Improvement	6	24
0-6	Poor	3	12
Total		25	100
Mean		14.80	
SD		6.04	

Table 2.1
Posttest Scores of Grade Six Students in the Paper-based Assessment Group

Score Interval	Description	Frequency	Percentage
25-30	Outstanding	7	28.0
19-24	Very Satisfactory	7	28.0
13-18	Satisfactory	10	40.0
7-12	Needs Improvement	1	4.0
0-6	Poor		
Total		25	100
Mean		19.28	
SD		5.23	

Table 2.2
Posttest Scores of the Grade Six Students in the Blooket-based assessment group

Score Interval	Description	Frequency	Percentage
25-30	Outstanding	7	28.0
19-24	Very Satisfactory	15	60.0
13-18	Satisfactory	2	8.0
7-12	Needs Improvement	1	4.0
0-6	Poor		
Total		25	100
Mean		22.16	
SD		3.83	

Table 3
Difference Between the Pretest and Posttest Scores of the Grade Six Students in the Paper-based Assessment Group

Test	Mean	Increase/Percent	Computed Paired T-Test Value	p-value	Decision	Interpretation
Pretest	13.20	6.08(46%)	-6.966	0.001	Reject the Hypothesis	Significant
Posttest	19.28					

Note: p-value ≤ 0.05 – significant, p-value > 0.05 – not significant

Table 4
Difference Between the Pretest and Posttest Scores of the Grade Six Students in the Blooket-based Assessment Group

Test	Mean	Increase/Percent	Computed Paired T-Test Value	p-value	Decision	Interpretation
Pretest	14.80	7.36 (50%)	-8.079	0.001	Reject the Hypothesis	Significant
Posttest	22.16					

Note: p-value ≤ 0.05 – significant, p-value > 0.05 – not significant

Table 5
Difference Between the Pretest Scores of the Grade Six Students in the Paper-based assessment and Blooket-based Assessment Groups

Pretest	Mean	Computed T-Test Value	p-value	Decision	Interpretation
Paper-based Group	13.20	1.059	0.295	Do not Reject the Hypothesis	Not Significant
Blooket-based Group	14.80				

Note: p-value ≤ 0.05 – significant, p-value > 0.05 – not significant

Table 6
Difference Between the Posttest Scores of the Grade Six Students in the Paper-based Assessment and Blooket-based Assessment Groups

Posttest	Mean	Computed T-Test Value	p-value	Decision	Interpretation
Paper-based Group	19.28	2.222	0.031	Reject the Hypothesis	Significant

Blooket-based Group	22.16				
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Note: $p\text{-value} \leq 0.05$ – significant, $p\text{-value} > 0.05$ – not significant

Table 7: Proposed training program based on the findings of the study

BLAST Program (Blooket-Led Assessment Strategy for Teaching Grade Six Students)						
COMPONENT	OBJECTIVES	ACTIVITY	PERSONS INVOLVED	RESOURCES	TIME FRAME	SUCCESS INDICATOR
PRE-IMPLEMENTATION PHASE : Preparation and Development						
Orientation on the use of Blooket in science assessment to teachers	To orient science teachers to the educational value of Blooket and its useful features to be used as an assessment tool in science.	Conduct an orientation on the use of Blooket App for assessment in middle school science lessons.	Secondary curriculum coordinator, Science teachers, IT in charge	Laptops, Blooket account, smart tv, internet connection	Third week of August	Teachers demonstrate understanding of the Blooket app, its features and its use in formative and summative assessments.
Orientation on the use of Blooket in science assessment to students	To familiarize middle school students with the use of Blooket app as an assessment tool in science instruction.	Conduct an orientation on the utilization of the Blooket App in formative and summative assessment for the middle school students' science lessons.	Secondary curriculum coordinator, Science teachers, IT in charge	Smart tv, internet connection. ICT lab	Fourth week of August	Students demonstrate understanding of the Blooket apps, their features and their use in formative and summative assessments.
Curriculum Alignment and Content review	To align the Blooket app-based assessment with the middle school science syllabus	Review the science syllabus and the topics for each term to identify in which lessons	Head of center, Curriculum coordinator, middle school	Science syllabus, assessment schedule, lesson plan	Third week of August	Blooket app-based assessments are aligned with the middle school

		Blooket app based assessment will be used.	science teachers			science syllabus.
Workshop on Quiz development through Blooket App	To conduct a workshop on creating assessment effectively using Blooket App	Conduct a workshop on creating quizzes, selecting game modes, setting questions, and interpreting learners' results.	Head of Centre, Curriculum coordinator, middle school science teachers,	Laptops, internet access, Blooket platform, training handouts	First week of September	Teachers create at least one Blooket assessment for science lesson.
Development of Blooket-app Based Assessment Questionnaire	To develop an assessment questionnaire appropriate for middle school science lessons	Develop question sets, and interactive assessment tasks for science lesson.	Middle school science teachers	Science syllabus, lesson plan, textbooks, progression test and past papers.	First week of September	Ready-to-use Blooket assessment sets are prepared for implementation.
Validation of assessment content	To validate the appropriateness and the relevance of the Blooket based question sets	Review and validate the Blooket based questions set through peer checking and expert feedback.	Master teacher, Science coordinator, school head	Validation checklist, rating forms, Blooket question sets	Second week of September	Assessment sets are validated and approved
Baseline Assessment set	To determine the student's prior knowledge in science before conducting the Blooket app-based assessment	Administer pre-test to middle school students	Science teachers, middle school students	Printed test papers for baseline assessment	Second week of September	Baseline data of middle school students are obtained
IMPLEMENTATION PHASE: Blooket Utilization						
Classroom Use of Blooket as an Assessment Tool	To utilize Blooket for formative and summative assessment	Use Blooket for formative quizzes, summative assessments, gathering baseline data and revision	Science teachers, students	Gadgets, internet connection, Blooket app/platform, prepared quiz sets	Every term period (3 terms)	Middle school students actively participate in Blooket based

		quizzes in middle school science lessons				assessments
Monitoring of Students' Participation and Performance	To monitor students' performance in Blooket-based assessment	Observe students' participation, completion of quizzes and performance reports generated through Blooket app	Head of center, Curriculum coordinator, science teachers	Class record, Blooket app reports	Every end of formative and summative assessment	Increased students' scores and improved assessment performance are observed.
Review and Feedback session	To evaluate the implementation and provide feedback on areas of improvement	Conduct a monthly meeting with the science teachers to gather feedback regarding the administration of formative and summative assessments and students' participation in the program.	Curriculum coordinator, science teachers	Monitoring and feedback template	Monthly	Teachers identify implementation strengths, challenges, and possible improvements.
POST-IMPLEMENTATION PHASE : Evaluation and Follow-Up						
Collection of Feedback from both teachers and Students	To determine the learning gains of middle school students after the utilization of Blooket as an assessment tool	Conduct a survey s and short interviews with science teachers and middle school students	Curriculum coordinator, science teachers, students	Survey form, interview guide, questions	End of the program implementation	Positive responses on engagement, motivation, and assessment experience are collected.
Analysis of the information gathered	To determine the effectiveness of the Blooket app as an assessment tool	Compare pre-test and post-test results and analyze learner performance data. Analyze the responses	Head of Centre, Curriculum coordinator	Statistical tools, assessment results, summary tables	End of May	Data show significant improvement in student performance.

		from the interviews and survey.				
Program Evaluation and Development	To provide evidence of improvement and recommendation for the utilization of the Blooket app-based assessment in middle school and high school science classes.	Prepare a comprehensive report and recommend school-level adoption of Blooket in middle school and high school science classes.	Head of Centre, curriculum coordinator, teachers	Summary of findings, report with action plan	End of academic year	Program is recommended for continuous use and expansion to high school.

DISCUSSION

This chapter consists of information about the results of the study and the analysis and interpretation of data gathered with the use of appropriate statistical tools. The presentation includes a narrative discussion of the results and implications of the data gathered.

Research Question 1. Pretest scores of the Grade Six students in the 1.1 Paper-based assessment group

Table 1.1 presents the pretest scores in the assessment phase of the Grade 6 students in the Paper-based assessment group before they were exposed to the same instruction as the Blooket-based assessment group. The same number of students which is 10 or 40% of the total 30-item multiple choice test obtained scores in the score range of 13-18 described as “Satisfactory” and in the score range of 7-12 with the description of “Needs Improvement.” Three students out of the total 25 test takers got scores in the interval of 19-24 categorized as “Very Satisfactory” while 2 students had a “Poor” performance in the pretest as revealed by their scores that fell on the lowest score range of 0-6. The pretest mean score of the students in the Paper-based assessment group during the assessment phase is 13.20 and a standard deviation of 4.53.

The results indicate that before instruction took place, most Grade six students had limited knowledge of the competencies on the subject matter being assessed, with a significant number of Grade six students still requiring improvement. The pretest result mirrored the students baseline performance using the conventional paper-based assessment typically described by fixed format, limited interactivity, easy access and delayed feedback.

These results establish an important baseline. The relatively low mean and the high number of students in the Needs Improvement category suggest considerable room for improvement. This makes it a good ground for considering the use of the Blooket app-

based assessment which is characterized as more interactive and game-based, that can spark improved engagement and higher posttest performance compared to the conventional paper-based approach.

Research Question 1. Pretest scores of the Grade Six students in the 1.2 Blooket-based assessment group

The pretest results of the Blooket-based assessment group in Table 1.2 indicate a generally moderate level of prior knowledge among the 25 students before instruction as evidently shown in the table above wherein 1 or 4% achieved an Outstanding rating score between 25-30. Six (6) students or 24% were in the Very satisfactory category obtaining scores in the range of 19-24 whereas a large proportion of 9 students or 36% gained scores in the Satisfactory level with scores in the range of 13-18. Meanwhile, 6 students or 24% were classified as Needs improvement with scores in the range of 7-12 while 3 students or 12% were in the Poor category for having scores in the range of 0-6. The computed mean score of 14.80 bring the overall performance within the Satisfactory level, indicating that, on average, students possessed a fair level of understanding of the competencies being assessed prior to instruction. Nonetheless, the relatively high standard deviation of 6.04 implies a wide spread of scores, demonstrating notable differences in students' prior knowledge and skill levels.

When linked to the use of the Blooket-based assessment as a pretest tool, the results suggest that even in a game-based and interactive format, students' baseline performance still varied considerably. Though there are some students who were able to perform at higher proficiency levels which can probably be attributed from the engaging and motivating features of Blooket there were other students who remained in the lower performance level, indicating that engagement alone does not fully take care of the gaps in prior knowledge.

Technology integration has transformed traditional classrooms into modern ones to meet the demands of modern society, especially in the education sector. Cited from the study of Seyfullah ŞAHİNOĞLU, to raise well-educated and qualified individuals, classrooms, schools and related educational environments are equipped with products and concepts brought by technology to education. Thus, the necessary steps for constructing and protecting an ideal generation have been accelerated. ŞAHİNOĞLU, 2022.

Research Question 2. Posttest scores of the Grade 6 students in the 2.1 Paper-based assessment group

To describe how the Grade 6 students in the Paper-based assessment and Blooket-based assessment groups scored in the posttest after they were taught in Science (Biology, Chemistry and Physics) using the same methods and strategies the posttest scores were subjected to Mean, Standard Deviation, Frequency distribution and Percentage. The results are reflected in Table 2.1 and Table 2.2.

As shown in Table 2.1 the posttest results of the paper-based assessment group demonstrate a marked improvement in student performance after the instructional phase. Results show that majority of the Grade 6 students in the Paper-based assessment group, which is 10 or 40%, obtained scores in the 13-18 range described as "Satisfactory." The

same number of 7 students or 28% were classified as Outstanding and Very Satisfactory whose scores fell in the 25-30 and 19-24 score range respectively, while 1 or 4% student Needs improvement obtaining score in the 7-12 category. Notably, there were no students in the Poor category, indicating a significant reduction in low performance levels. The mean score of 19.28 falls within the Very Satisfactory range and is considerably higher than the pretest mean, reflecting an ample gain in students' mastery of the competencies. The standard deviation of 5.23 suggests a moderate spread of scores, indicating that while performance improved overall, some variability among learners still exists, though less pronounced than in earlier assessments.

With the common teaching strategies across both the paper-based and the Blooket-based assessment groups, the observed improvement in the paper-based group can be analyzed in relation to the Blooket-based assessment used during the assessment phase. These results suggest that the conventional paper-based assessment effectively obtained students' learning gains following instruction. The structured and familiar format of paper-based testing may have permitted students to demonstrate their understanding more consistently, particularly for those who are more adapted to conventional assessment methods. Comparing paper-based and Blooket-based assessments, the remarkable posttest performance of the paper-based group indicates that the paper-based assessment remains a reliable tool for measuring academic achievement. The bulk of students in the Outstanding and Very Satisfactory categories, along with the increased mean score, reveals that students were able to assimilate and apply the learned concepts effectively under the conventional paper-based testing conditions.

The findings suggest that though digital tools like Blooket app may enhance engagement, the paper-based assessment continues to provide stable and effective assessment of learning outcomes, specifically when matched with consistent instructional strategies. These results served as the springboard for comparing whether similar or greater gains can be observed in the group assessed through Blooket app in the posttest phase.

The present study's findings is supported by the study of Maria et., al. (2021) using their findings suggest that both CB and PB tests are cognitively valid, as they activated cognitive processes necessary to perform a writing assessment task. However, each test mode impacted EFL students' cognitive processes differently. Similarly, the present study enhance the learning process of the students but on a different rate. The PB mode triggered greater detailed macro-planning of content and text organization. In contrast, the CB mode triggered micro-planning of text organization and after-writing revisions at both high and low levels. There were no significant differences in task representation and translating processes. The findings have implications for EFL writing teaching and classroom assessment validity and fairness.

Research Question 2. Posttest scores of the Grade 6 students in the 2.2 Blooket-based assessment group

As manifested in Table 2.2 the posttest results of the Blooket-based assessment group reveal a high level of student performance and mastery following the common instructional phase in both the paper-based assessment and Blooket-based assessment groups. Out of 25 students, 7 or 28% achieved an Outstanding rating with scores in the

range of 25-30, while a majority of 15 students or 60% reached the Very Satisfactory level with scores in the interval of 19–24. Only 2 students or 8% were classified under the Satisfactory category having obtained scores in the 13–18 range, and 1 student or 4% remained in the Needs Improvement level with scores in the range of 7-12. Markedly, there were no students in the Poor category, indicating that nearly all students obtained a high level of performance. The mean score of 22.16, which lies within the Very Satisfactory to Outstanding range, signifies a considerable improvement from the pretest results and indicates a strong overall proficiency of the competencies. Moreover, the standard deviation of 3.83 is lower compared to earlier results, suggesting less scattered scores and a more constant performance among students.

With the two groups having been exposed to the same teaching strategies, the difference in outcomes can be attributed with the Blooket-based assessment used during the posttest phase. The results suggest that the interactive and game-based features of Blooket may have contributed to enhanced students' engagement, motivation, and focus during the assessment. These factors more likely contributed to better performance, as students were able to actively participate and respond in a more stimulating environment compared to conventional paper-based formats.

The impressive posttest performance of this group indicates that Blooket-based assessment can be an effective tool not only for student engagement but also for improving measurable learning outcomes. The bulk of students in the Very Satisfactory and Outstanding categories, together with the higher mean score and lower variability, suggests that this assessment tool may support more homogeneous achievement across learners. The findings demonstrate that the Blooket-based assessment was highly effective in gaining and possibly improving student learning, leading to both better performance levels and greater consistency among students. This provides strong evidence for its potential advantage over the conventional paper-based assessment in the assessment phase of instruction.

The study was grounded on Constructivist Learning Theory by Jean Piaget and Lev Vygotsky. Constructivism posits that learners actively construct their own understanding and knowledge of the world through experiences, reflection, and social interaction, rather than passively absorbing information. The constructivist theory complements this study as integrating technology-enhanced learning tools, such as Blooket, encourages the students to actively participate and engage in learning, improving their understanding and cognitive skills. Through the application of constructivist theory in this study, educators better understand how the use of Blooket as an assessment tool has shifted from paper-based assessment instruction into a student-centered learning environment, thus improving academic performance. Additionally, the integration of technology-enhanced learning tools like Blooket into assessment methodology promotes collaboration, interaction, and reflective learning among students—key principles emphasized in constructivist learning.

Likewise, the findings of the present study align with the study conducted by Astuti (2024). According to him the integration of gamified applications such as **Blooket** provides a more engaging and participatory environment. Blooket application fosters encouragement both motivation, and active learning among students. found that integrating the Blooket application in science lessons remarkably improved students' learning motivation and engagement. The study also revealed that the pupils became

more confident during lessons due to Blooket's gamified features, and they feel more motivated to understand the material due to the engaging and non-monotonous learning format. The social interaction that occurs during Blooket-based activities also contributes to increased student learning motivation. Observations show that students collaborate more often in groups to solve challenges, which creates a sense of community and support between friends. Intensive group discussions during the game help students understand the material in a more enjoyable way (Astuti, 2024)

Similarly, according to Ellis et.al., (Ellis L.C. Osabutey, 2022), the use of online assessment positively impact the academic performance of the students. **Blooket**, as a technology-enhanced assessment tool, can be used to evaluate students' knowledge online, and it can influence academic achievement. However, the benefits largely depend on how the technology is embedded within the curriculum and how actively students engage with it .In terms of instructional strategies, technology integration has been linked to improved performance when implemented effectively.

Moreover, Wilk Oliveira, (2020) stated that in recent years, several studies have been conducted to apply gamification in education to explore the effects of gamification on students' experience and learning and to understand how to tailor gamified educational environments to match students' characteristics, needs, and behaviors. The emphasis on play reflects the theories and pedagogies developed by influential Western authors such as Jean Piaget, Lev Vygotsky, Jerome Bruner, Carl Jung, Friedrich Fröbel and Maria Montessori, who emphasized that play fosters creativity, cognitive development and active engagement among learners through different educational levels (Alfredo Bautista, 2023). These theories form the foundation of modern game-based learning platforms like **Blooket**, which combine play and learning to create interactive, student-centered environments that encourage participation and motivation

Furthermore, student motivation and self-efficacy have been identified as strong predictors of academic success in middle school. Schunk and DiBenedetto (2020) argued that fostering intrinsic motivation and confidence in one's abilities encourages persistence in learning tasks, thereby improving overall performance. These are the attributes developed by the students when using digital tools such as the **Blooket app**.

Additionally, according to the result of the study, many educators have noted that the use of technology tools has helped them reduce paperwork, resulting in ample time for preparing lessons to give the students a great learning experience and provide impactful support to learners, such as leaving on-time comments for assignments and assistance in reorganizing their tasks. This supports the idea that integrating a digital learning tool such as Blooket in teaching improves classroom efficiency and enhances students' learning experiences. It reinforces the idea that the use of digital tools is aimed at and comes with an endeavor of more than technical development of the school, as is otherwise characteristic for earlier levels of change and development (Pettersson, 2021).

Research Question 3. Difference between the pretest and posttest scores of the Grade 6 students in the Paper-based assessment group.

Table 3 shows the difference between the pretest and posttest scores of the Grade 6 students in the Paper-based Assessment Group. The **paired t-test** results reveal a statistically significant difference in students' performance from pretest to posttest. A

mean gain of 6.08 points, which corresponds to a 46% increase resulted from 13.20 to 19.28 mean score increased. This sizeable improvement indicates that students were able to achieve a higher level of mastery of the competencies after the instructional period. The computed t-value of -6.966 yielded a p-value of 0.001 which is less than the 0.05 level of significance, leading to the rejection of the null hypothesis. This verifies that the difference between pretest and posttest scores is statistically significant and not due to chance.

Knowing that both groups were exposed to the same teaching strategies, the significant improvement observed in this group can be attributed to the paper-based assessment used during both the testing phase. The results illustrate that the paper-based assessment can be considered as a consistent and dependable tool for measuring student learning achievement. The structured format of the paper-based assessment tool likely enabled students to organize their responses effectively and demonstrate their acquired knowledge in a clear and systematic manner.

Furthermore, the significant increase in scores indicates that the paper-based assessment was drawn changes in students' learning over time, making it a valid instrument for evaluating academic progress in a pretest-posttest design. The familiarity and accessibility of this assessment format may have also contributed to students' ability to perform well, as it aligns with conventional classroom testing experiences.

These findings demonstrate that the paper-based assessment is effective in providing meaningful improvements in student performance, even when instructional conditions are the same. The paired t-test results confirm that the paper-based assessment does not only impress significant learning but can also be used as a reliable measure of student achievement, supporting its continued use in evaluating educational outcomes.

Constructivism argues that learners don't just absorb information passively—they actively build (or "construct") their own understanding through experience, interaction, and reflection. Assessment, in this view, isn't just about measuring what students know; it's part of the learning process itself. Blooket turns assessment into an interactive activity. Students answer questions in a game-like environment, which requires continuous participation. This aligns with constructivism because learners are actively involved in thinking through problems rather than passively recalling answers. Constructivism emphasizes learning through experience. Blooket's game modes create a simulated environment where students "learn by doing." Even though it's digital, the experience of making decisions, seeing consequences, and trying again mirrors experiential learning.

In the study conducted by Clariana (2025) where he compared paper-based versus computer-based assessment, ANOVA of test data showed that the computer-based test group outperformed the paper-based test group. Gender, competitiveness, and computer familiarity were NOT related to this performance difference, though content familiarity was. Higher-attaining students benefited most from computer-based assessment relative to higher-attaining students under paper-based testing. With the current increase in computer-based assessment, instructors and institutions must be aware of and plan for possible test mode effects.

Research Question 4. Difference between the pretest and posttest scores of the Grade Six students in the Blooket-based Assessment group.

As presented in Table 4 the paired t-test results for the Blooket-based assessment group indicate a highly significant improvement in students' performance from pretest to posttest. The mean score increased from 14.80 to 22.16, resulting in a mean gain of 7.36 points, which corresponds to a 50% increase. This evident increase suggests that students achieved a markedly higher level of mastery of the competencies after instruction. The computed t-test value of -8.079 yields a p-value of 0.001 which is lower than the 0.05 level of significance, resulting to the decision of rejecting the null hypothesis. The result further signifies that the observed difference between pretest and posttest scores of the Blooket-based assessment group is statistically significant and not due to chance.

Considering that both groups were exposed to the same teaching strategies, the significant improvement in this group can be attributed in part to the Blooket-based assessment used during the testing phases. The findings suggest that Blooket, as an interactive and game-based assessment tool, may have enhanced students' engagement, motivation, and active participation during the assessment process. These features can encourage sustained attention and immediate cognitive involvement, which may contribute to better performance outcomes.

Furthermore, the larger mean gain of 7.36 indicates that the Blooket-based assessment was not only effective in measuring learning but may have also facilitated improved demonstration of knowledge. This can be attributed to its dynamic format, that often includes real-time feedback and gamified elements. The use of the gamified Blooket tool may have reduced the test anxiety for some students and create a more engaging environment, allowing a broader range of students to perform at higher levels. This could have helped students process questions more actively and respond with greater confidence.

These findings highlight that the Blooket-based assessment does not only result to significant learning gains but may also enhance the assessment experience, leading to greater improvements in student performance. This suggests that Blooket can be used as a powerful alternative or supplement to paper-based assessment, particularly when the goal is to promote both engagement and measurable academic achievement.

A qualitative study was conducted by Sartika (2023) to examine the use of educational games-based learning to enhance Students' English vocabulary. Engaging students' habits with their gadgets, especially in the game-based-learning strategy "Blooket.com" is a new way to help improve students' mastery of vocabulary. Students were given a questionnaire using Google Forms, and information was gathered in the form of numbers and percentages, which were then interpreted in a qualitative sentence. The result shows that using **Blooket** can enhance students' motivation in learning vocabulary because it makes them fun, and competitive, and understand the vocabulary easier than the conventional method. Therefore, this can be used as an alternative to breaking the old way of learning vocabular.

Similarly, an expert from Stanford GSE, Dean Dan Schwartz, emphasizes in the article "How technology is reinventing education" that technology is a game-changer in education, offers the prospect of universal access to high-quality learning experiences,

and creates fundamentally new ways of teaching. He stresses that technology can provide universal access to learning and bring forward innovative teaching strategies or methodologies. This issue could also entrench inefficient teaching practices, such as the possible integration of AI. Educators, therefore, should ensure that technological integration—such as the use of digital learning platforms like **Blooket**—enhances rather than replaces meaningful teaching and learning processes (Spector, 2024).

Blooket, a technology-based learning tool, according to Huynh, (2024). has significantly impacted student motivation during the learning process. It changes students' interest from traditional methods to the modern teaching methodology. It also makes tasks meaningful and relevant to real-life situations, allowing students to recognize vocabulary in specific contexts. Based on the research findings, using Blooket can substantially boost pupils' intrinsic motivation by promoting a conducive learning environment and enhancing students' confidence compared to the conventional method. Moreover, Blooket strengthens the student's self-awareness and expands the opportunity for the student's autonomy in learning a language. Furthermore, Blooket allows teachers to modify content and create appropriate learning experiences.

Research Question 5. Difference between the pretest scores of the Grade Six Students in the Paper-based Assessment and Blooket-based Assessment Groups.

To determine the difference in the pretest scores between the Paper-based assessment and Blooket-based assessment groups the means of the pretest scores in both groups were subjected to **Independent t-test** and the resulting p-value was compared to significance level of 0.05. The result is reflected in Table 5.

No statistically significant difference existed between the two groups, the Paper-based and the Blooket-based assessment groups at the baseline level as revealed by the **independent t-test** results when the pretest of the two groups were compared. The paper-based group obtained a mean score of 13.20, while the Blooket-based group recorded a slightly higher mean of 14.80. However, the computed t-value of 1.059 yields a p-value of 0.295, which exceeded the 0.05 level of significance, that led to the decision not to reject the null hypothesis. This result indicates that the difference in the mean scores between the two groups is not significant and can be attributed to chance rather than any true disparity in students' prior knowledge or ability. Therefore, both the Paper-based and the Blooket-based assessment groups can be considered statistically equivalent at the start of the study.

This finding shows that both the paper-based and Blooket-based assessments can effectively serve as pretest instruments. Each tool was able to measure students' initial level of understanding in a way that produced equivalent and unbiased results. The paper-based assessment, characterized with structured and conventional format, and the Blooket-based assessment, equipped with interactive and game-based features, both presented validity in getting the students' baseline academic performance.

Since both groups received the same treatment in terms of instruction and only the assessment tools differed, yielding no significant difference in pretest scores confirms that the two groups started from a common baseline. This support and heightened the internal validity of the study, as it ensures that any differences that occurred in the posttest can be more positively attributed to the type of assessment used, the paper-based and the

Blooket-app, rather than the pre-existing differences or difference in their prior knowledge between the groups. The findings indicate that both assessment tools are reliable for producing baseline compatibility in a pretest-posttest research design, furnishing a fair foundation for comparing their effectiveness in measuring and potentially influencing student learning outcomes.

Research Question 6. Difference between the posttest scores of the Grade Six Students in the Paper-based Assessment and Blooket-based Assessment Groups.

To asserts the difference in the posttest scores between the Paper-based assessment and Blooket-based assessment groups the means of the pretest scores in both groups were subjected to **Independent t-test** and the resulting p-value was compared to significance level of 0.05. The result is manifested in Table 6.

As shown in Table 6 the **independent t-test** results for the posttest scores show a statistically significant difference between the paper-based and Blooket-based assessment groups. The paper-based group obtained a mean score of 19.28, while the Blooket-based group achieved a higher mean of 22.16. The computed t-value of 2.222 yields a p-value of 0.031, which is less than the 0.05 level of significance, that led to the rejection of the null hypothesis. This result indicates that the difference in the posttest performance between the two groups is significant and not due to chance, suggesting that the type of assessment tool used had a measurable effect on student outcomes.

Inasmuch as both groups were exposed to the same teaching strategies, the significant difference in the performance in the posttest can be attributed to the assessment tools used during the posttest phase. The paper-based assessment, which yielded a mean of 19.28, demonstrates that it remains an effective and reliable tool for measuring student learning, as the students in this group were able to achieve a Very Satisfactory level of performance. Its characteristic features of structured and familiar format likely supported students in organizing their responses and demonstrating their understanding clearly. However, the higher mean score of 22.16 in the Blooket-based assessment group suggests that the Blooket-based assessment may provide additional advantages beyond measurement. Its interactive and game-based features may have enhanced student engagement, motivation, and focus during the assessment, allowing learners to perform at a higher level. These factors can create a more stimulating testing environment, which may help students better process questions and respond more confidently. The significant difference between the two groups implies that while both assessment tools are effective in producing learning, the Blooket-based assessment appears to be more forceful in promoting higher student performance during the assessment phase. This may be due to its ability to combine evaluation with engagement, potentially leading to improved demonstration of knowledge. These findings suggest that the choice of assessment tool plays a crucial role not only in measuring learning outcomes but also in enhancing student performance. While the paper-based assessment provides stability and reliability, the Blooket-based assessment offers an innovative approach that may enhance both engagement and achievement. The results indicate that although both tools are well grounded for assessment, the Blooket-based assessment shows a statistically significant advantage over the paper-based assessment in terms of posttest

performance, making it a promising substitute or supplement to conventional paper-based method.

According to the result of the study, many educators have noted that the use of technology tools has helped them reduce paperwork, resulting in ample time for preparing lessons to give the students a great learning experience and provide impactful support to learners, such as leaving on-time comments for assignments and assistance in reorganizing their tasks. This supports the idea that integrating a digital learning tool such as **Blooket** in teaching improves classroom efficiency and enhances students' learning experiences. It reinforces the idea that the use of digital tools is aimed at and comes with an endeavor of more than technical development of the school, as is otherwise characteristic for earlier levels of change and development (Pettersson, 2021).

Similarly, in a study of Christianto, (2024), integrating the Blooket media to enhance students' learning outcomes in a radiochemical course found that **Blooket app** created a more relaxed and enjoyable learning environment, promotes student active participation and reduces anxiety. The study highlighted the increase in student learning outcomes up to 14.03% . The result highlights the effectiveness of Blooket app in learning scientific concepts. Blooket is used in the study to help students grasp the topic matter and to measure pupils' recall. According to Christianto et al, Blooket can stimulate interest, enthusiasm, and a sensation of serenity while learning. He further explained that using learning technology may make it easier for teachers and students.

Moreover, Technology's evolution enhanced the new generation with the knowledge, skills, and problem-solving abilities to help them address challenges in their daily lives and modern society. Again, scientific studies show that digital or technological tools make lessons more active and engaging, enhance learning, and aid the teacher in checking homework and tasks. The use of technology is acknowledged as a necessity (ŞAHİNOĞLU, 2022).

Research Question 7. Proposed training program based on the findings of the study.

Below is the detailed Blooket-Led Assessment Strategy for Teaching Grade Six Students (BLAST Program) proposed by the researcher based on the results of the study. Based on the findings of the study, a program is proposed to empower the teachers specifically Grade six Science teachers in using the Blooket app to enhance students engagement and motivation during assessment to improve their academic performance. The program aims to equip the Science teachers with knowledge, skills and expertise in the use of the Blooket app that they can use in their class during the assessment phase.

Rationale

The proposed Blooket-Led Assessment Strategy for teaching Grade Six Students (BLAST Program) was designed based on the findings of the research study, which shows that Blooket-based assessment encourages motivation and increases student engagement during science assessment. The purpose of the BLAST program is to help middle school Science teachers enhance their knowledge of how the Blooket application can help assess students' understanding, thereby increasing their interest in

assessment. Additionally, an orientation will be conducted for the middle school students who have not used the Blooket app before as an assessment in any lesson.

Assessment plays an important role in determining the student's understanding and academic achievement; therefore, teachers should be provided with interactive strategies and digital tools, such as Blooket, to make formative and summative assessments more relevant and learner-centered. Through orientation, workshops, proper implementation and evaluation, the Blooket-Led Assessment Strategy for teaching Grade Six Students (BLAST Program) aims to boost teachers' confidence and expertise to integrate technology-enhanced digital tools like Blooket in science assessments.

Summary of Findings

Among the important findings of this research were:

1. The pretest scores in the assessment phase of the Grade 6 students in the Paper-based assessment group shows the same number of students which is 10 or 40% obtained scores in the score range of 13-18 and 7-12 described as "Satisfactory" and "Needs Improvement" .respectively. Three students got scores in the interval of 19-24 categorized as "Very Satisfactory" while 2 students had a "Poor" performance as revealed by their scores that fell on the lowest score range of 0-6. The pretest mean score is 13.20 and a standard deviation of 4.53.
2. The pretest results of the Blooket-based assessment group indicate a generally moderate level of prior knowledge among the 25 students before instruction wherein 1 or 4% achieved an Outstanding rating score between 25-30, six (6) students or 24% were in the Very satisfactory category obtaining scores in the range of 19-24 whereas a large proportion of 9 students or 36% gained scores in the Satisfactory level with scores in the range of 13-18, 6 students or 24% were classified as Needs improvement with scores in the range of 7-12 while 3 students or 12% were in the Poor category for having scores in the range of 0-6. The computed mean score of 14.80 bring the overall performance within the Satisfactory level and a relatively high standard deviation of 6.04.
3. The paired t-test results reveal a statistically significant difference in students' performance from pretest to posttest scores of the Grade 6 students in the Paper-based Assessment Group. A mean gain of 6.08 points corresponds to a 46% increase resulted from 13.20 to 19.28 mean score increased. This sizeable improvement indicates that students were able to achieve a higher level of mastery of the competencies after the instructional period. The computed t-value of -6.966 yielded a p-value of 0.001 which is less than the 0.05 level of significance, leading to the rejection of the null hypothesis. This verifies that the difference between pretest and posttest scores is statistically significant and not due to chance.
4. The paired t-test results for the Blooket-based assessment group indicate a highly significant improvement in students' performance from pretest to posttest. The mean score increased from 14.80 to 22.16, resulting in a mean gain of 7.36 points, corresponds to a 50% increase. This increase suggests that students achieved a

markedly higher level of mastery of the competencies after instruction. The computed t-test value of -8.079 yields a p-value of 0.001 lower than the 0.05 level of significance, resulting to the decision of rejecting the null hypothesis. The result further signifies that the observed difference between pretest and posttest scores of the Blooket-based assessment group is statistically significant and not due to chance.

5. No statistically significant difference existed between the Paper-based and the Blooket-based assessment groups at the baseline level as revealed by the independent t-test results when the pretest of the two groups were compared. The paper-based group obtained a mean score of 13.20, while the Blooket-based group recorded a slightly higher mean of 14.80. The computed t-value of 1.059 yields a p-value of 0.295, which exceeded the 0.05 level of significance, that led to the decision not to reject the null hypothesis. This result indicates that the difference in the mean scores between the two groups is not significant.
6. The independent t-test results for the posttest scores show a statistically significant difference between the paper-based and Blooket-based assessment groups. The paper-based group obtained a mean score of 19.28, while the Blooket-based group achieved a higher mean of 22.16. The computed t-value of 2.222 with yields a p-value of 0.031, which is less than the 0.05 level of significance, that led to the rejection of the null hypothesis. This result indicates that the difference in the posttest performance between the two groups is significant.
7. Based on the findings of the study, the Blooket-based assessment group posttest results obtained a higher posttest mean This indicates that assessment through Blooket app has a positive impact on student engagement and motivation. These findings lead to the development of the proposed program, BLAST (Blooket-Lead Assessment Strategy for Teaching grade six Students). The purpose of the BLAST program is to help middle school Science teachers enhance their knowledge of how the Blooket application can help assess students' understanding, thereby increasing their interest in assessment. Additionally, an orientation will be conducted for the middle school students who have not used the Blooket app before as an assessment in any lesson.

Conclusions

Based on the foregoing findings, the following conclusions were drawn:

1. The results indicate that before instruction took place, most Grade six students had limited knowledge of the competencies on the subject matter being assessed, with a significant number of Grade six students still requiring improvement. The pretest result mirrored the students baseline performance using the conventional paper-based assessment typically described by fixed format, limited interactivity, easy access and delayed feedback. These results establish an important baseline. The relatively low mean and the high number of students in the Needs Improvement

category suggest considerable room for improvement. When linked to the use of the Blooket-based assessment as a pretest tool, the results suggest that even in a game-based and interactive format, students' baseline performance still varied considerably as there are some students who were able to perform at higher proficiency levels which can probably be attributed from the engaging and motivating features of Blooket there were other students who remained in the lower performance level, indicating that engagement alone does not fully take care of the gaps in prior knowledge. When the Blooket-based and paper-based assessments were compared, these findings serve as an important baseline for the Blooket-based assessment group. The mean score of the Blooket group is slightly higher than that of the paper-based pretest group, which may indicate that the interactive nature of Blooket can facilitate better initial performance or increased motivation during assessment but with the greater variability in scores means that the effect of Blooket at the baseline stage is not uniform across all students. The pretest results indicate that students in the Blooket-based assessment group started with a satisfactory but different level of proficiency, which provided a basis for exploring whether the succeeding instruction and the continuous use of Blooket will lead to more constant and significant improvements in posttest performance compared to the conventional paper-based group.

2. With the common teaching strategies across both the paper-based and the Blooket-based assessment groups, the observed improvement in the paper-based group can be due to structured and familiar format of paper-based testing that may have permitted students to demonstrate their understanding more consistently, particularly for those who are more adapted to conventional assessment methods. The remarkable posttest performance of the paper-based group indicates that the paper-based assessment remains a reliable tool for measuring academic achievement. The bulk of students in the Outstanding and Very Satisfactory categories, along with the increased mean score, reveals that students were able to assimilate and apply the learned concepts effectively under the conventional paper-based testing conditions. The findings suggest that though digital tools like Blooket app may enhance engagement, the paper-based assessment continues to provide stable and effective assessment of learning outcomes, specifically when matched with consistent instructional strategies. The remarkable results in the posttest of the Blooket-based group suggest that the interactive and game-based features of Blooket may have contributed to enhanced students' engagement, motivation, and focus during the assessment. These factors more likely contributed to better performance, as students were able to actively participate and respond in a more stimulating environment compared to conventional paper-based formats. The impressive posttest performance of this group indicates that Blooket-based assessment can be an effective tool not only for student engagement but also for improving measurable learning outcomes. The bulk of students in the Very Satisfactory and Outstanding categories, together with the higher mean score and lower variability, suggests that this assessment tool may support more homogeneous achievement across learners. The findings demonstrate that the Blooket-based assessment was highly effective in gaining

and possibly improving student learning, leading to both better performance levels and greater consistency among students. This provides strong evidence for its potential advantage over the conventional paper-based assessment in the assessment phase of instruction.

3. Knowing that both groups were exposed to the same teaching strategies, the significant improvement observed in this group can be attributed to the paper-based assessment used during the testing phase. The results illustrate that the paper-based assessment can be considered as a consistent and dependable tool for measuring student learning achievement. The structured format of the paper-based assessment tool likely enabled students to organize their responses effectively and demonstrate their acquired knowledge in a clear and systematic manner. Furthermore, the significant increase in scores indicates that the paper-based assessment was able to draw changes in students' learning over time, making it a valid instrument for evaluating academic progress in a pretest-posttest design. The familiarity and accessibility of this assessment format may have also contributed to students' ability to perform well, as it aligns with conventional classroom testing experiences. These findings demonstrate that the paper-based assessment is effective in providing meaningful improvements in student performance, even when instructional conditions are the same. The paired t-test results confirm that the paper-based assessment does not only impress significant learning but can also be used as a reliable measure of student achievement, supporting its continued use in evaluating educational outcomes.
4. Considering that both groups were exposed to the same teaching strategies, the significant improvement in this group can be attributed in part to the Blooket-based assessment used during the testing phases. The findings suggest that Blooket, as an interactive and game-based assessment tool, may have enhanced students' engagement, motivation, and active participation during the assessment process. These features can encourage sustained attention and immediate cognitive involvement, which may contribute to better performance outcomes. Furthermore, the larger mean gain indicates that the Blooket-based assessment was not only effective in measuring learning but may have also facilitated improved demonstration of knowledge. This can be attributed to its dynamic format, that often includes real-time feedback and gamified elements. The use of the gamified Blooket tool may have reduced the test anxiety for some students and create a more engaging environment, allowing a broader range of students to perform at higher levels. This could have helped students process questions more actively and respond with greater confidence. These findings highlight that the Blooket-based assessment does not only result to significant learning gains but may also enhance the assessment experience, leading to greater improvements in student performance. This suggests that Blooket can be used as a powerful alternative or supplement to paper-based assessment, particularly when the goal is to promote both engagement and measurable academic achievement.

5. This finding shows that both the paper-based and Blooket-based assessments can effectively serve as pretest instruments. Each tool was able to measure students' initial level of understanding in a way that produced equivalent and unbiased results. The paper-based assessment, characterized with structured and conventional format, and the Blooket-based assessment, equipped with interactive and game-based features, both presented validity in getting the students' baseline academic performance. Since both groups received the same treatment in terms of instruction and only the assessment tools differed, yielding no significant difference in pretest scores confirms that the two groups started from a common baseline. This support and heightened the internal validity of the study, as it ensures that any differences that occurred in the posttest can be more positively attributed to the type of assessment used, rather than the pre-existing differences. The findings indicate that both assessment tools are reliable for producing baseline compatibility in a pretest-posttest research design, furnishing a fair foundation for comparing their effectiveness in measuring and potentially influencing student learning outcomes.
6. Inasmuch as both groups were exposed to the same teaching strategies, the significant difference in the performance in the posttest can be attributed to the assessment tools used during the posttest phase. The paper-based assessment demonstrates that it remains an effective and reliable tool for measuring student learning, as the students in this group were able to achieve a Very Satisfactory level of performance. Its characteristic features of structured and familiar format likely supported students in organizing their responses and demonstrating their understanding clearly. The higher mean score of the Blooket-based assessment group suggests that the Blooket-based assessment may provide additional advantages beyond measurement. Its interactive and game-based features may have enhanced student engagement, motivation, and focus during the assessment, allowing learners to perform at a higher level. These factors can create a more stimulating testing environment, which may help students better process questions and respond more confidently. The significant difference between the two groups implies that while both assessment tools are effective in producing learning, the Blooket-based assessment appears to be more forceful in promoting higher student performance during the assessment phase. This may be due to its ability to combine evaluation with engagement, potentially leading to improved demonstration of knowledge. These findings suggest that the choice of assessment tool plays a crucial role not only in measuring learning outcomes but also in enhancing student performance. While the paper-based assessment provides stability and reliability, the Blooket-based assessment offers an innovative approach that may enhance both engagement and achievement. The results indicate that although both tools are well grounded for assessment, the Blooket-based assessment shows a statistically significant advantage over the paper-based assessment in terms of posttest performance, making it a promising substitute or supplement to conventional paper-based method.

7. The proposed program, Blooket-Led Assessment Strategy for Teaching Grade Six Students (BLAST) aimed to equip the Grade 6 Science teachers with knowledge, skills and expertise in the use of the Blooket app in the classroom during the assessment phase. The program also aimed to familiarize middle school students with the Blooket application, specifically for those who have not previously used the platform as an assessment in any subject.

Recommendations

Based on the findings of the study, particularly the significant improvements observed in both groups and the statistically higher posttest performance of the Blooket-based assessment group, the following recommendations are proposed:

1. Integrate Blooket-based assessment in classroom practice

Based on the findings of the study the Blooket-based assessment group demonstrated significantly higher posttest scores and greater mean gain, teachers in Science are encouraged to incorporate Blooket as an alternative or supplementary assessment tool. Its interactive and game-based features can enhance student engagement and motivation that may lead to improved academic performance.

2. Use paper-based assessment alongside digital tools

While Blooket showed advantages as reflected in the study, the paper-based assessment also resulted in significant learning gains. Therefore, educators should continue using paper-based assessments in combination with digital platforms to provide a balanced approach that caters to different learning preferences and testing conditions.

3. Match assessment tools with learning objectives

Teachers should carefully select assessment methods based on the intended learning outcomes. Paper-based assessments may be more suitable for tasks requiring structured and extended responses, while Blooket can be effective for quick checks of understanding, formative assessments, and review activities. Aligning both the assessment tools with the expected learning outcomes may result to an impressive and improved academic performance.

4. Provide training on the use of game-based assessment tools

To maximize the benefits of Blooket, schools and institutions should provide training and support for teachers on how to effectively design and implement game-based assessments. Knowledge on the proper use of the tool can ensure that it measures learning accurately while maintaining student engagement.

5. Implement the proposed program

Based on the result of the study, the researcher proposed and designed program for the teachers to undertake training and seminar workshop to become familiar with the feature, use, and operation of the Blooket app so that they will be able to

apply the Blooket app in their classes complementing the paper-based assessment tools.

6.Address the needs of lower-performing students

The result of the study yields that despite improvements in both the paper-based and Blooket-based assessment groups, some students remained in lower performance categories. Teachers should implement targeted interventions and differentiated instruction to support these learners, regardless of the assessment method used.

7. Ensure accessibility and technological readiness

Before fully implementing Blooket-based assessments, schools should ensure that students have adequate access to devices and stable internet connectivity. This will help prevent inequities and ensure fair assessment conditions for all learners.

8. Conduct further research

Future researchers are encouraged to replicate the study with a larger sample size, different subject areas, or longer intervention periods to validate and expand the findings. Additional variables such as student motivation, engagement, and attitudes toward assessment may also be explored.

9. Explore hybrid assessment models

Educators may consider developing a hybrid assessment approach that combines the strengths of both paper-based and Blooket-based tools. This can provide a more comprehensive evaluation of student learning while maintaining both reliability and engagement.

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