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The Application of Quizizz Software in Assessing Mathematics Learning Outcomes for Secondary School Students

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ABSTRACT: Assessment in secondary school mathematics is not only about testing knowledge but also promoting students' thinking, learning motivation, and overall development. Assessment combined with detailed feedback from teachers helps motivate students to improve their learning efforts. Many scholars have demonstrated that using Quizizz in teaching not only encourages students to be more active and engaged in learning but also provides immediate and accurate feedback. However, to effectively evaluate mathematics learning outcomes for secondary students, teachers need to follow principles such as selecting appropriate content, creating questions with varying difficulty levels, and utilizing Quizizz's features. Additionally, teachers must possess skills in technology use, timely feedback, and learning outcome analysis to enhance the effectiveness of assessment.

KEYWORDS: Quizizz, mathematics assessment, secondary school, learning outcomes.

I. INTRODUCTION

Assessment is an indispensable step in the teaching process, helping teachers accurately measure the knowledge and skills students have acquired. For mathematics, a subject requiring high logical thinking and precision, assessment not only helps check learning outcomes but also adjusts and directs teaching methods to suit students' abilities. Black and Wiliam emphasized the importance of formative assessment in improving students' learning outcomes. They pointed out that continuous and detailed feedback helps students recognize their strengths and weaknesses, allowing them to adjust their learning methods effectively (Black & Wiliam, 1998). Similarly, Harlen and James distinguished between formative and summative assessment, emphasizing that the combination of these methods can help students develop critical thinking and self-assessment skills (Harlen & James, 1997). Hattie and Timperley also stressed the role of feedback in learning, affirming that timely feedback helps students recognize mistakes and adjust their learning strategies to improve their learning outcomes (Hattie & Timperley, 2007).

However, traditional assessment methods, such as written exams or oral questioning, have revealed certain limitations. One major limitation is the time required for grading and analyzing results. Teachers often spend a lot of time processing a large number of tests, leading to delayed feedback for students. This reduces the efficiency of learning, as students cannot promptly recognize and correct their mistakes. Moreover, traditional assessments often lack interactivity and motivation for students, especially in a learning environment increasingly oriented towards technology use. The integration of technology into assessment has been highlighted by researchers as a necessary trend in modern education. Gikandi et al. pointed out that online assessments help teachers effectively manage the testing process while providing quick and accurate feedback to students, making the learning process more active and flexible (Gikandi, 2011). Chaiyo and Nokham demonstrated the effectiveness of using software such as Kahoot, Quizizz, and Google Forms in student assessment, noting significant differences in focus, engagement, interest, motivation, and satisfaction. Kahoot and Quizizz have shown more positive effects than Google Forms when used in the classroom (Chaiyo & Nokham, 2017).

Research on Quizizz has shown that this tool not only makes it easier for teachers to assess students but also increases student engagement. Fadhilawati and Moreira's team found that Quizizz supports students' self-assessment and improves grammar skills through game-based quizzes, helping enhance learning outcomes (Fadhilawati, 2021; Moreira et al., 2024). Mesterjon et al. also confirmed that using Quizizz makes students feel more joyful and proactive in learning (Mesterjon et al., 2024). Zhao and Sitompul's team found that using Quizizz allows students to take classroom tests on their electronic devices. Unlike other educational apps, Quizizz has game-like features such as avatars, allowing students to compete with each other,

thereby encouraging learning. Students take tests simultaneously in class and see their rankings in real time on the leaderboard. Instructors can monitor the process and download reports when the test is completed to evaluate student performance. Using this application in accounting classes helped stimulate student interest and improve participation (Zhao, 2019; Sitompul et al., 2023). Many authors have used Quizizz in assessing subjects like mathematics and science and demonstrated its effectiveness through experimental methods (Armilah, 2023; Yanuarto, 2022; Rahmasari et al., 2022; Setiyani, 2020).

In Vietnam, Nguyen Thi Huong studied the application of Quizizz in online teaching. She stated that Quizizz not only helps students become more engaged with the subject but also allows teachers to easily track the learning process and make timely adjustments to teaching methods. Quizizz provides detailed reports on each student's progress and learning outcomes, helping teachers more accurately assess student abilities (Nguyen, 2022). Le Thi Bach Lien and colleagues proposed using several technological tools such as Quizizz, Kahoot, Blooket, Google Forms, and Azota to assess students' learning outcomes and enhance learner competency development (Le et al., 2022).

II. METHODS

The study used qualitative research methods to synthesize and analyze information related to testing and evaluating math learning outcomes for high school students using Quizizz software. The study was conducted based on data from published research works in the form of survey reports by other authors or in documents related to the research issue published by international and Vietnamese agencies. For online research, initially, keywords about testing, evaluation, Quizizz software, math, middle school students were selected, then searched on the internet. Synthesize research works related to the research objectives to clarify the research problem. The implementation process always ensures that the assessment findings are analyzed with high accuracy.

III. RESULTS AND DISCUSSION

A. Introduction to Quizizz

- *Concept:* Quizizz is a game-based educational application that makes classroom environments more interactive and fun. The use of quizzes allows students to practice questions in class using electronic devices (Zhao, 2019).

- *Advantages of Using Quizizz in Assessment*:

+ Increased interaction and engagement: Quizizz transforms traditional tests into fun games, making students feel more relaxed and engaged during assessments, reducing test anxiety and improving learning performance (Rahmasari, 2022).

+ Instant feedback: After each question, the software immediately provides feedback on whether the answer was correct or incorrect, helping students identify and correct their mistakes right away (Fadhilawati, 2021).

+ Easy tracking and analysis: Quizizz provides detailed reports on students' learning outcomes, allowing teachers to track individual and class progress. This helps teachers identify students who need additional support and adjust teaching methods accordingly (Setiyani, 2020).

+ High flexibility: Students can participate in assessments anytime and anywhere, as long as they have an internet connection, making it convenient for distance learning and after-school review (Setiyani, 2020).

B. Principles of Designing Tests on Quizizz

When designing assessment questions on Quizizz for Mathematics at the secondary school level, teachers need to select question formats that align with the evaluation objectives of each specific content in the curriculum. This not only helps accurately assess the knowledge that students have absorbed but also supports the development of skills such as logical thinking, problem-solving, and mathematical practice.

- *Principle 1*: Select the content to be assessed: Teachers need to clearly define the learning objectives and core knowledge they want to test. For middle school Mathematics, the assessment content often focuses on topics such as equations, inequalities, geometry, and algebra.

Example 1:Linear Equation with One Variable. Objective: Assess the ability to solve simple equations and apply equations to solve practical problems.

Question: Solve the equation $2x + 3 = 7$

A. $x = 2$ B. $x = 3$ C. $x = 4$ D. $x = 1$

Correct answer: A

Example 2:Triangle Geometry. Objective: Assess the ability to calculate angles and sides in a triangle using geometric theorems.

Question: In a right triangle with sides AB = 6 cm and BC = 8 cm, calculate the hypotenuse AC.

A. 12 cm B. 10 cm C. 14 cm D. 15 cm

Correct answer: B

Principle 2: Create questions with varying difficulty levels: When designing a test, teachers should classify the questions from easy to difficult to ensure that students of all levels can complete the test. Easy questions help reinforce basic knowledge, while difficult ones challenge higher-level thinking and problem-solving skills.

Example 1: Easy question (Reinforce basic knowledge). Objective: Assess the ability to perform simple calculations with linear equations.

Question: Solve the equation x + 5 = 10

A. x = 4 B. x = 5 C. x = 3 D. x = 6

Correct answer: B

Example 2: Medium question (Develop analytical skills). Objective: Evaluate the ability to handle multi-step equations.

Question: Solve the equation 3x - 5 = 2x + 7

A. x = 12 B. x = 3 C. x = -3 D. x = -12

Correct answer: B

Example 3: Hard question (Challenge problem-solving skills). Objective: Assess the ability to solve real-world problems involving equations.

Question: A person buys 3 books and 5 notebooks for a total of 80,000 VND. If each book costs 15,000 VND, calculate the price of each notebook.

A. 10,000 VND B. 12,000 VND C. 8,000 VND D. 5,000 VND

Correct answer: C

Principle 3: Utilize learning support features:

- Quizizz allows teachers to add images, charts, and mathematical formulas to questions, helping students easily visualize and solve complex problems. This is particularly useful when testing geometric content or problems that require visual illustrations.

Example: Question: Based on the diagram below, calculate the length of side AC of right triangle ABC. (Question is accompanied by an image of a right triangle with sides AB = 6 cm and BC = 8 cm.). Objective: Assess the ability to use the Pythagorean theorem to calculate side lengths.

- Provide instant feedback for each question: When students answer a question in Quizizz, the system provides immediate feedback on whether the answer is correct or incorrect. Teachers can also set up detailed explanations after each question to help students understand the reasoning behind the results and correct errors promptly.

Example: Question: Solve the equation 2x + 4 = 12

+ Immediate feedback if correct: "That's right! Solve the equation by subtracting 4 from both sides, then divide by 2."

+ Immediate feedback if incorrect: "Not quite. Try subtracting 4 from both sides of the equation, then divide the result by 2."

Principle 4: Diversify question types: To keep the test engaging and avoid monotony, teachers can use a variety of question types such as single-choice, multiple-choice, true/false, or fill-in-the-blank. This helps test different aspects of students' knowledge and makes the assessment more diverse and challenging.

- True/False question: Question: An equilateral triangle has three equal sides. Objective: Test knowledge of different types of triangles.

A. True B. False

Correct answer: A

- Fill-in-the-blank question: Question: The solution to the equation 2x + 5 = 15 is x = ___. Objective: Assess the ability to solve equations and input the correct answer directly.

Correct answer: 5

- Multiple correct answers question: Question: Select the prime numbers from the following list: 3, 6, 7, 9, 11. Objective: Test knowledge of prime numbers and the ability to analyze a list of numbers.

A. 3, 6, 11 B. 3, 7, 11 C. 7, 9, 11 D. 6, 7, 9

Correct answer: B

C. Skills teachers need to have when using Quizizz software

To organize the assessment of students' learning outcomes using Quizizz, teachers need to equip themselves with some important skills to make the most of the software's features and bring about the highest assessment efficiency. The author suggests some of the following skills:

- Technology skills: Teachers need to be proficient in using technology devices and software, including computers, tablets or smartphones, to administer online tests using Quizizz. Teachers need to create accounts, manage classes on Quizizz, create, edit and delete tests, games, conduct and manage online tests for students. For example, teachers need to know how to log in, choose test modes (self-test or competitive), as well as manage and organize online classes effectively.

- Test design skills: Teachers need to be able to design tests that are appropriate to the teaching content and students' abilities. This includes creating diverse questions, classifying the level of difficulty and matching the learning objectives. Teachers need to choose the appropriate question type (single-choice, multiple-choice, true/false, fill in the blank), create tests with different levels of difficulty, from basic to advanced, ensuring scientific, clear and concise in each question. For example: For an 8th grade Math test, teachers need to create questions from easy to difficult, such as solving simple first-degree equations to complex problems requiring analytical skills.

- Skills in using support features in Quizizz: Teachers need to understand the features in Quizizz such as adding images, charts, videos and mathematical formulas to questions, helping students easily visualize and solve problems. Teachers need to know how to use these features to make the test more vivid and attractive. For example: When designing a geometry test, teachers can use the image adding feature to include triangles or circles in the test, helping students easily apply the theory.

- Timely feedback and assessment skills: A big advantage of Quizizz is the feature that provides immediate feedback to students after each answer. Teachers need to know how to set up feedback for questions so that students can identify mistakes and learn from them. Teachers set up detailed feedback for each question, including explanations of why the answer is right/wrong, and use feedback to guide students to improve their knowledge and skills. For example: When a student answers a question about a first-degree equation incorrectly, the teacher can set up feedback that explains each step of the equation so that students can understand better.

- Time management and test organization skills: Teachers need to be able to set a reasonable time for each question and the entire test, so that students are not pressured by time but still ensure accuracy and fairness. Teachers set the test time to suit the difficulty of the test, manage the test time and check the progress of students. For example: For basic questions, teachers can set a time of 30 seconds, while more complex questions need 1-2 minutes to give students enough time to think.

- Ability to analyze results and monitor learning progress: Quizizz provides detailed reports on student learning outcomes, including scores, time spent on tests, and correct/incorrect answer rates. Teachers need to be able to analyze this data to assess each student's ability and adjust their teaching methods. Teachers need to exploit the results reports from Quizizz to assess student progress, identify students with learning difficulties, and provide support. For example, if a student consistently answers geometry questions incorrectly, the teacher can analyze the results and spend more time instructing this student.

- Skills to motivate and maintain learning interest: Quizizz is designed to create healthy competition and increase learning interest thanks to the scoring system and leaderboard. Teachers need to use these elements to encourage students to study actively. Teachers need to use the competition and leaderboard features to motivate students, create a positive learning atmosphere by encouraging participation and promoting team spirit in group tests. For example: Teachers can organize competitive tests between groups of students and award prizes to the groups with the highest scores, motivating students to do better.

- Technical troubleshooting and problem-solving skills: Teachers need to be prepared for situations that may arise during online testing, such as network failures or student device problems. Teachers need to have a contingency plan in place in case of technical problems (e.g., switching to a paper test or re-testing later), and provide technical support to students during the test. For example, if a student experiences network problems during a test and is unable to take the test, teachers can plan for a make-up test when the problem is resolved.

IV. CONCLUSION

Assessing the learning outcomes of secondary school students in Mathematics plays an important role in the educational process. Quizizz is a software that not only creates an exciting learning environment but is also an effective tool for assessing learning outcomes because it provides instant feedback from students, helping teachers closely monitor their learning progress. However, to use Quizizz effectively, teachers need to master the basic principles such as selecting appropriate content, designing rich and diverse questions, and proficiently using learning support features. In addition, teachers need to be equipped with analytical skills and exploit reports from Quizizz to help teachers adjust teaching according to each student's ability. Using technology tools like Quizizz is the key to improving the quality of education and improving the effectiveness of assessing students' learning outcomes.

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