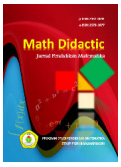

Math Didactic: Jurnal Pendidikan Matematika

Volume 9 Nomor 2, Mei – Agustus 2023, halaman 199 – 212

Tersedia Daring pada https://jurnal.stkipbjm.ac.id/index.php/math

UTILIZING QUIZWHIZZER APPS TO ENHANCE STUDENTS' MATHEMATICAL ABILITY IN GAME-BASED LEARNING MODEL

PEMANFAATAN APLIKASI QUIZWHIZZER UNTUK MENINGKATKAN KEMAMPUAN MATEMATIKA SISWA PADA MODEL PEMBELAJARAN BERBASIS GAME

Wanda Nugroho Yanuarto*[1], Luthfiana Milla Susanti[2]

[1, 2]Universitas Muhammadiyah Purwokerto, Jl. KH. Ahmad Dahlan, PO BOX 202, 53182 Kembaran, Banyumas, Jawa Tengah, Indonesia

[1]wandanugrohoyanuarto@ump.ac.id, [2]luthfianamilla@gmail.com

*Corresponding author

Abstract: In today's technologically advanced classrooms, interaction between students and teachers can be facilitated with the help of QuizWhizzer. In the context of a game-based learning approach, a descriptive study methodology was utilized to investigate students' responses to educational games like QuizWhizzer. Beginning with the preparation of learning tools to direct classroom activities is the first step in the processes for this study. QuizWhizzer preparation, integration, and evaluation. As the teacher's understanding grows, they may realize the shortcomings of the previous gathering and decide to improve it by incorporating the model learning game-based learning they developed with QuizWhizzer. The results of this study are as follows: 1) the learning implementation shows that the teacher is always trying to maximize productivity to improve students' math skills; 2) students' activities during the learning process improved significantly; and 3) the teacher's understanding grows, the students' activities during the learning process improved the students in their education assist others who are further behind them in developing the game and the dialogue.

Keywords: game-based learning, mathematical learning, QuizWhizzer

Abstrak: *Pada era berteknologi maju saat ini, interaksi antara siswa dan guru dapat difasilitasi dengan bantuan QuizWhizzer. Dalam konteks pendekatan pembelajaran berbasis permainan, metodologi penelitian deskriptif digunakan untuk menyelidiki tanggapan siswa terhadap permainan pendidikan seperti QuizWhizzer. Diawali dengan penyiapan perangkat pembelajaran hingga mengarahkan kegiatan kelas merupakan langkah awal dalam proses penelitian ini. Persiapan, integrasi, dan evaluasi QuizWhizzer. Seiring bertambahnya pemahaman guru, mereka mungkin menyadari kekurangan dari pertemuan sebelumnya dan memutuskan untuk memperbaikinya dengan memasukkan model pembelajaran berbasis permainan yang mereka kembangkan dengan QuizWhizzer. Hasil penelitian ini adalah sebagai berikut: 1) pelaksanaan pembelajaran menunjukkan bahwa guru selalu berusaha memaksimalkan produktivitas untuk meningkatkan kemampuan matematika siswa; 2) aktivitas siswa selama proses pembelajaran meningkat secara signifikan; dan 3) pemahaman guru tumbuh, aktivitas siswa selama proses pembelajaran meningkat Siswa dalam pendidikannya membantu orang lain yang jauh di belakang mereka dalam mengembangkan permainan dan dialog.*

Kata Kunci: *pembelajaran berbasis permainan, pembelajaran matematika, QuizWhizzer.*

Cara Sitasi: Yanuarto, W. N., & Susanti, L. M. (2022). Utilizing QuizWhizzer Apps to enhance students' mathematical ability in game-based learning model. *Math Didactic: Jurnal Pendidikan Matematika*, 9(2), 199-212. https://doi.org/10.33654/math.v9i2.1949

Submitted: November 21, 2022
Revised: May 6, 2023
Published: August 30, 2023
Available Online Since: May 18, 2023

Education is one of many aspects of society made possible by its current development (Campilla & Castañaga, 2021). Communication and information technology in education has been shown to improve efficacy and efficiency. As a result, Setyarto, Murtiyasa, and Sumardi (2020) argue that educational institutions must adapt to technological advances to meet modern needs. For One educational technological innovation is technology, avidas, Apostolou, and Papadakis (2022) also note that both formal and informal roles play an important role in learning. Learning media are essential to the educational system (Felszeghy et al., 2019). Learning media that streamlines classroom activities improves teacher-student relationships and student-student relationships (Chen, 2017). However, educational games are one of the few learning mediums that can rapidly improve students' comprehension because they are fun (Wulansari & Dwiyanti, 2021). A brain-developing game that improves concentration and trains players to work quickly and accurately (Novita & Herman, 2021). Educational games teach students and make learning fun (Wijaya, Elmaini, & Doorman, 2021). Games can boost math engagement by 20.57% and learning outcomes by 10.86%, according to Pardimin et al. (2020).

Learning media helps students learn various subjects. Learning can also be made more interesting and pleasurable via the use of media. One of them is creating and using ICT-based learning materials (Serrano, 2019). This digital or ICT-based learning medium aims to improve education in this globalized age (Nejem & Muhanna, 2018). ICT-based instructional materials will allow students to collaborate in digital activities. ICT learning aids comprehension. It will use many digital educational media. Learning-related education and technology. Thus, Ezeugwu et al. (2016), in the context of ICT learning resources will make learning fun and engaging for students. Educational media are so well-designed to excite and engage learners that they achieve both goals. QuizWhizzer, Padlet, Quizizz, and Kahoot are evolving and being used to help students understand the subject being taught by the teacher. During the pandemic, when learning is done online, it's crucial to use digital advances (Bringula, Reguyal, Tan, & Ulfa, 2021). Given that educational activities must continue with a variety of instructional formats and learning innovations that use developing digital media during the COVID-19 pandemic, it is impossible to disagree. Etcuban and Pantinople (2018) stated that all teachers used their own devices to access digital educational resources.

In the meantime, Malik (2022) noted that QuizWhizzer can help students and teachers interact in the classroom in the digital age. Quiz whizzer, Quizizz, Padlet, and Kahoot help students understand the teacher's role as a transmitter of materials and quizzes (Calder & Murphy, 2018). This helps teachers teach. Media quiz whizzer and hands-on learning may help students adapt to the growing use of science and technology in the classroom. Brigham (2019), found that game-based learning can motivate students. Game-based learning outperforms traditional methods and media. White and McCoy (2019) found that QuizWhizzer, Kahoot, Quizizz, and Educandy can make learning more fun and challenging. History, a dull subject, is especially true. QuizWhizzer is a classroom-friendly educational game. This dynamic and entertaining medium emphasizes teamwork and communication and can encourage constructive student interactions, particularly through games, as part of the educational process (Faijah, Nuryadi, & Marhaeni, 2022). QuizWhizzer is a great math tool because it makes learning fun and offers a variety of activities. This allows extensive game

research. Online students can use QuizWhizzer anytime. QuizWhizzer, an interactive learning media tool, can also help educators make their classes more engaging and less monotonous. This game may also inspire students to answer questions (Faijah & Hetty Marhaeni, 2021). QuizWhizzer users can compete with students by following pre-planned paths, like the snake and ladder game. Users can also customize debate type, question score, player movement constraints, and game board location. The quiz builder can run multiple games simultaneously (Al-mashaqbeh & Dweri, 2014).

Thus, in this digital age, where technology and information advance rapidly, teachers must be more creative and innovative in developing learning models and applying them to classroom learning (Dahlan, Darhim, & Juandi, 2022). The rapid advancement of technology and information matches education. Game-based learning fits the digital age. According to Harikrishnan et al. (2019), the game-based learning model attracts and engages users to build knowledge and skills. Exercises will help students win. Students can earn credit for game-based learning events in person and online. "Game-based learning" is a method that can improve learning, according to Ramli, Maat, and Khalid (2020). Many recent studies have shown that game-based learning is effective if properly implemented. This learning boosts critical thinking and problem-solving skills, motivates students, makes them happier with learning, more eager and challenged, and able to cooperate with friends (Rondina & Roble, 2019).

According to previous studies, using gaming media like QuizWhizzer in the learning process has several drawbacks (Russo, Bragg, & Russo, 2020). Because of this, researchers focus on using QuizWhizzer as a digital learning media to teach math in class VIII at SMP N 2 Purwanegara in Central Java. This study uses QuizWhizzer in a game-based learning model in class VIII at SMP N 2 Purwanegara. QuizWhizzer was investigated for game-based learning.

Methodology

A descriptive study design was used to examine student reactions to educational games like QuizWhizzer in a game-based learning model (Creswell, 2014). SMP N 2 Purwanegara in Central Java conducted this research in eighth grade. Participants were seventh-graders. Despite samples collected at 32 7th–12th graders participated in this study. A student response questionnaire was used to evaluate QuizWhizzer-based educational games. Table 1 shows students' response grid responses.

Table 1. Students Response Assessment Questionnaire Grid

No.	Assessment Components	Item
1	The ease of access to educational gaming applications	1, 7
2	User interest in gameplay application maintenance education for self-study	2, 8
3	Data display in educational game applications	3, 9
4	The effectiveness of instructional game apps on students' motivation	4, 10
5	The efficacy of instructive game applications on comprehension skills	5, 11
6	Satisfaction through educational game apps	6, 12

QuizWhizzer will be used in mathematics learning endurance competitions from January to April 2022. Application uses medium. QuizWhizzer requires internet access. The team-teaching Assistant designs QuizWhizzer educational materials with mathematics teachers (Malik, 2022). Start

early with learning equipment preparation to guide classroom activities. QuizWhizzer preparation, integration, and evaluation should precede this. QuizWhizzer's creation is outlined in this timeline (Tolentino, 2020):

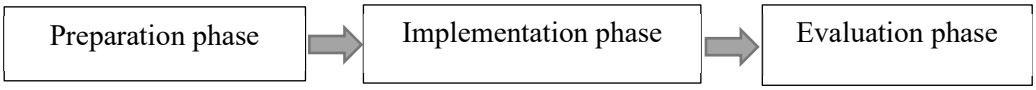

Figure 1. QuizWhizzer Implementation Flow

The researchers utilized the median as a measure of central tendency to describe the usability of the instructional material in terms of efficiency, effectiveness, and satisfaction because the quantitative data that they obtained were in ordinal scale. The qualitative data were evaluated using thematic descriptions for the purpose of conducting the debriefing interview with a subset of the participants. According to Faijah et al. (2022), the QuizWhizzer storyboard steps are as follows. The study team used QuizWhizzer to help students learn math during preparation. The study team and teacher planned and observed learning. Second, the teacher groups the class for the main activity. The research team is mapping the content and creating Quiz Whizzer questions based on this distinction. This initial action took two weeks. Three meetings with internet, PCs, and LCD projectors follow the deployment. When using Quiz Whizzer for math, students must fill out this questionnaire. The group also discussed using Quiz Whizzer to evaluate game-based learning (Kenna, 2019).

Result and Discussion

Result

Preparation Phase

The public school that is SMP N 2 Purwanegara provides numerous educational facilities for its students. More specifically, the utilization of digital media to facilitate the education of students. At SMPN 2 Purwanegara, students have access to the internet, computers, and learning management systems that have the potential to be utilized as E-learning mediums in the classroom setting. E-learning is defined as a learning transformation process between students and teachers that makes use of information and communication technology. As a direct consequence of this, SMPN 2 Purwanegara has become one of the educational institutions that has successfully adapted to the requirements of the contemporary digital age.

QuizWhizzer is a free platform that necessitates an upgrade to the premium version in order to enjoy all of its functions. By integrating a game to QuizWhizzer, we may provide some entertainment for the students. Users of QuizWhizzer have the ability to generate their own questions and modify the game board to suit their preferences. There are numbered questions, authentic questions, text matching questions, ordering questions, and open-ended questions accessible. After students have completed the game, students should provide the students with the URL or access code so that they can play it. The students will compete against one another by employing their own strategies to determine the answers to the identities or questions that appear on their laptops or mobile phones.

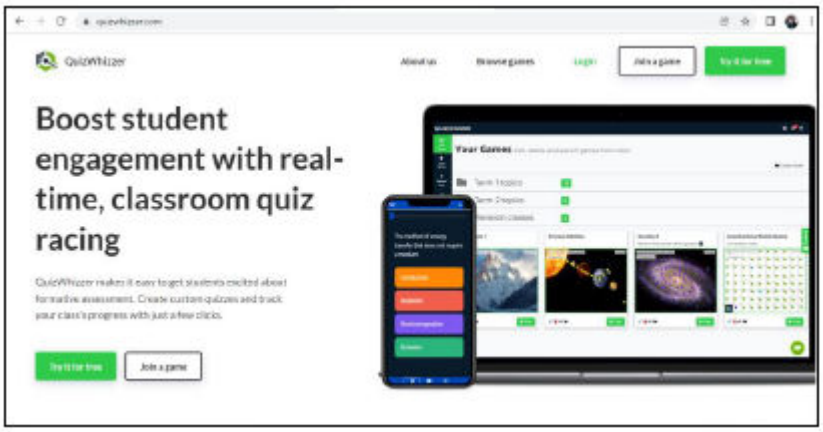

Figure 2. The QuizWhizzer Front View

The QuizWhizzer can be shown in Figure 3a before a user has registered for the website. On the right, students can see how the QuizWhizzer students looks. New users can either follow already existing games or register their own account, which is free of charge but has the potential to be upgraded to a premium account by satisfying the requirements that are now in place. Users of QuizWhizzer will be directed to the game history menu that was only recently constructed.

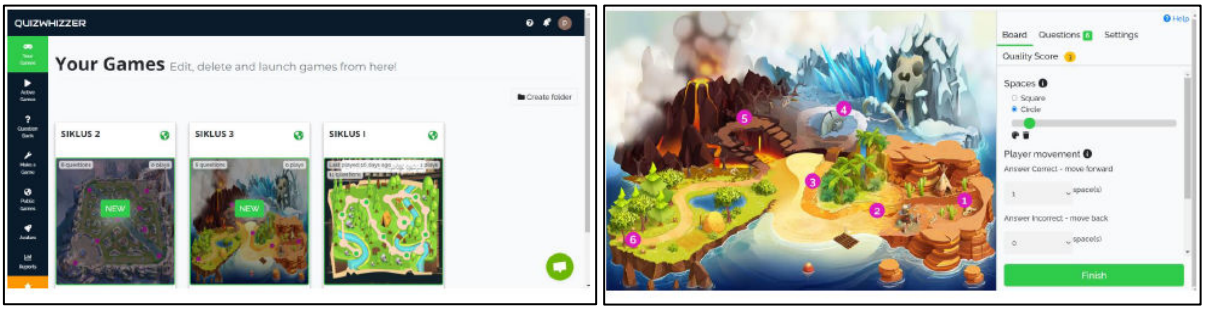

Figure 3 (a & b)

Game History Menu View **Display Game Creation Board**

The game history menu in QuizWhizzer (shown in Figure 3a) lists the games that have been played and provides a concise description of each one. Users get convenient access to QuizWhizzer questions thanks to a question bank. These questions can be accessed by clicking on the question bank. Users have the ability to create their own questions, games, and mods with the Make a Game feature. During the game design process, the user has the ability to select a game board of their liking and position the game level wherever they like (Figure 3b). After that, the user will have the opportunity to add any questions of their choosing to the question menu. Users are given the ability to automatically design questions in a spreadsheet format using QuizWhizzer. The "Question" menu gives the user the option of selecting questions with numerous answer choices. It is possible to adjust the quantity of questions in order to satisfy the requirements.

The QuizWhizzer question section is displayed in Figure 4a. Users can also set question points. Similar to how images can be linked to recordings, videos can do the same. Students can get

the video from either Students Tube or storage computers. The use of photo addition can assist in the expression of some mathematical formulas. Following that, students will be directed to the settings window, where the user must click finish in order to complete game creation and begin playing the game.

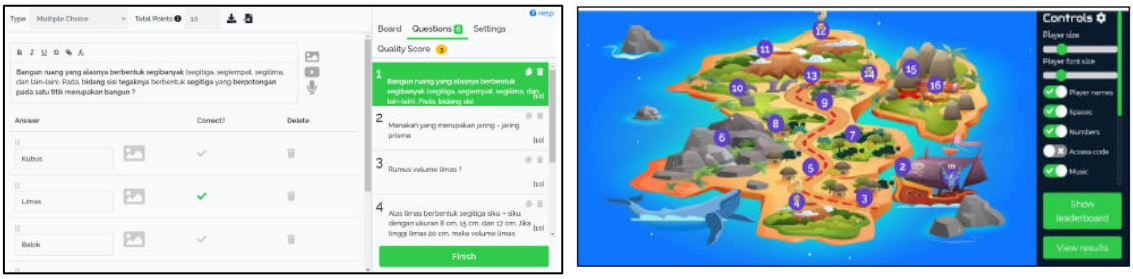

Figure 4 (a & b)

Game Questions Creation Board **Game Start in Initial View**

Implementation Phase

The interactive games offered by QuizWhizzer help students enhance their math skills through the use of a game-based learning paradigm. Students are able to learn mathematics from any location in the world and actively engage with the topic thanks to this medium. When presenting content in the form of a game, one needs to give careful consideration to the indicators that will be assessed at each step. As shown in Figure 4b, students are required to initially make use of the teacher's link or invitation code. After then, students will continue to work on their smartphones, and the teacher will post the outcomes of their work on the game board. They are even able to monitor from their mobile devices.

The following steps provide a model for game-based learning, in which the game and its goals are dissected by the teacher. Planting supplies are a topic that students learn about through their teachers. After receiving an education in the fundamentals in class, students will participate. Every level of media-enhanced QuizWhizzer directs students to relevant information and encourages them to pose pertinent questions regarding the issue. The students will be responsible for interpretation. Students will eventually come upon problems that require them to perform analysis. The mathematical formula and model will be established based on the situation (figure 5). The assessment indication will show up if the hypothesis is challenged. After the students have finished answering problems with the graphical, substitution, or elimination methods, they will be given the final assignment which will instruct them to draw conclusions wherever the inference indications occur.

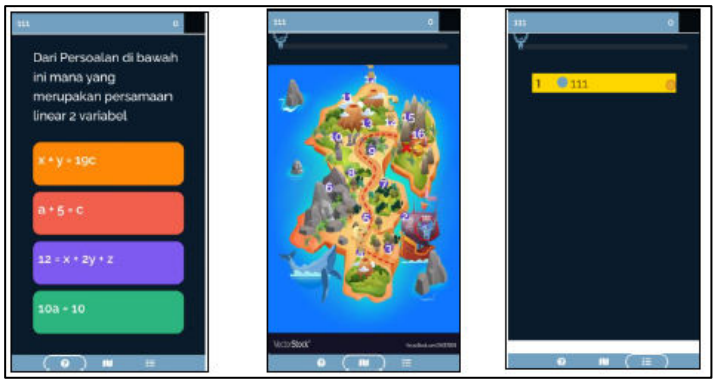

Figure 5. Mathematical Problems in Students' Display

Students will be able to learn how to play the games that they will play as well as analyze them in terms of what buttons to use, the game's procedures and rules, and how to finish the match to win and claim rewards at each level, students will also be able to learn how to play the games that students will play (Figure 6a). The evaluation indicators for the QuizWhizzer game require students to have a strategy or choose the right approach to finish the game by answering questions correctly, which earns points, and using a power bomb, which repels the opponent from the previous level, putting them ahead of the other players in the competition. Last but not least, students might take inferences from game analysis and the strategies that were used to rectify the possible sequel by playing games (Figure 6b).

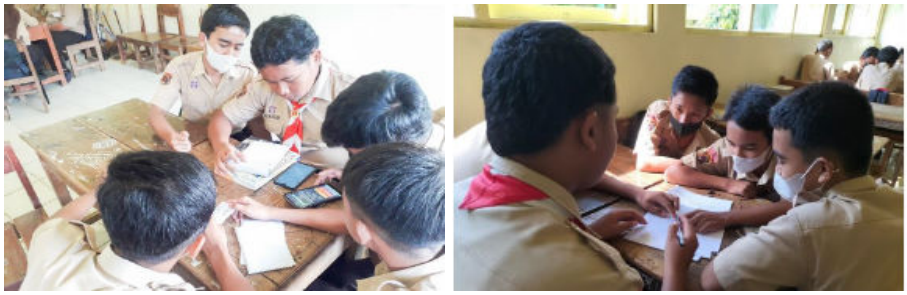

Figure 6 (a & b)
Completing the Game **Drawing the Conclusion**

Who comes out on top when the action is over? In addition, QuizWhizzer shows the outcomes of student tests to the teachers. After then, the teacher and the students have a discussion on the topic. The teacher helps the students articulate their newfound knowledge as students are engaged in playing the game. Researchers in mathematics who are aided by QuizWhizzer employ game-based learning to assist students in developing their mathematical abilities.

Evaluation Phase

At the beginning of class, the teacher will go around the room and shake hands with each student before asking how students are doing. The instructional goals that students should have achieved after studying the materials be communicated to the students. After that, students will participate in games on QuizWhizzer. A QuizWhizzer game play room, complete with the game code and detailed

instructions, is made available to the students by the teacher. After that, the educator demonstrates to the kids how to input their QuizWhizzer codes.

It is important to take note that students are contributing to the process of data collection. The revelation of the winners of the activity at the end of the lesson helps the students comprehend it better, which further strengthens their understanding. Following that, specific students are given instructions to work on subsequent issues based on the summary presented in the game results (representatives from each group come forward to work on the problem), and their progress is dependent on their responses to QuizWhizzer questions (see figure 7). After then, the teacher will elaborate on the students' responses. The students have the ability to challenge and validate the teacher's summary.

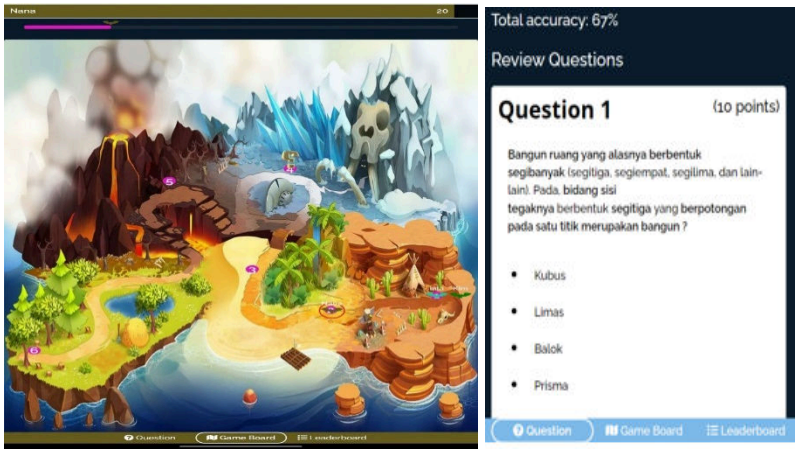

Figure 7. QuizWhizzer Questions

Nevertheless, the teacher's adoption of QuizWhizzer learning demonstrates that the teacher is always attempting to maximize productivity in order to improve students' mathematical abilities. in order to better the learning of students QuizWhizzer was utilized by the educator in order to gain a deeper understanding of game-based learning, which is now undergoing development. It's possible that when the teacher's understanding expands, students will become aware of the limitations of the previous gathering and make the decision to improve it by including the model learning game-based learning that students built using QuizWhizzer, which is to the students' advantage. Subsequently, students' activities during the learning process had greatly improved since their findings in the previous study. Students already have an understanding of how to study using a game-based learning model, have an understanding of the media, and are becoming more involved in excellent learning through conversation activities, questioning, and answering, as well as an increasing number of those who solve the problem, according to the teachers' observations. According to the data, kids have a good understanding of how to study using a model that is focused on playing games.

As a consequence of this, the typical level of mathematical competence among students is improving. When learning something, the behaviors of both the teacher and the students can have an effect on this. The activities of the teacher aligned, for the most part, with the topics covered in class. This location is able to participate in game-based learning thanks to QuizWhizzer. Students participate in activities such as listening to an explanation of the fundamental concept, playing games,

and finishing with an exercise that summarizes what students learned (See figure 8). It is much simpler to instruct and direct students in settings where students are having fun learning. Also, students become more competitive overall when students are exposed to increased competition in their environments. Students learn via playing games. At each meeting, the teacher will provide additional detail regarding these tasks. Both students and teachers will feel more at ease participating in a wider range of educational activities as a result of activity. The more advanced students are responsible for assisting the less experienced students in developing the game and the dialogue, and students collaborate in order to complement one another.

Figure 8. Understanding the Basic Concept in the QuizWhizzer

Discussion

Based on the material and performance indicators, game-based learning with QuizWhizzer can improve math skills. The high learning value helps students improve math, group work, and decision-making. This also helps students work independently (Harikrishnan et al., 2019). Game-based learning is fun and can help students develop cognitive skills like math by challenging them in the game and in real life. Game-based learning can develop cognitive skills like math both in the game and through its challenges (Graceota, Budiyono, & Slamet, 2021).

White and McCoy (2019) stated that during the first meeting, teacher learning completed its tasks. Rondina and Roble (2019) note some shortcomings. The first meeting addressed several issues, including: a) The teacher failed to communicate the lesson's objective during the introductory activity; b) When guiding students in teacher play activities, the teacher asks students to be actively involved and collaborate on answering game questions less often than before; and c) Because the teacher does not reiterate the game's rules, gaming activities are somewhat limited. Due to constraints, d) the teacher failed to guide the class when it was time to draw conclusions.

At the second meeting, Felszeghy et al. (2019) found that the teacher had carried out the learning activities well in accordance with the existing learning steps, but there were still some deficiencies, including the following: a) In early learning activities, the teacher does not convey the purpose of learning; b) The teacher does not provide feedback on students' performance; c) The teacher does not provide feedback on students'; d) Because the teacher does not reiterate the rules of the game, students' potential to participate in gaming activities is somewhat limited; and e) The teacher does not encourage students to participate more actively in the learning process. Rahaju and

Rahutami (2018) report that students completed their pre-meeting tasks. The first meeting has some drawbacks, including: a) Students rarely ask questions when given the chance. Some kids play alone. The students completed the exercises in the second meeting. The second gathering's main drawbacks are: a) Students appear passive when learning; b) Some students remain silent when the teacher asks a question.

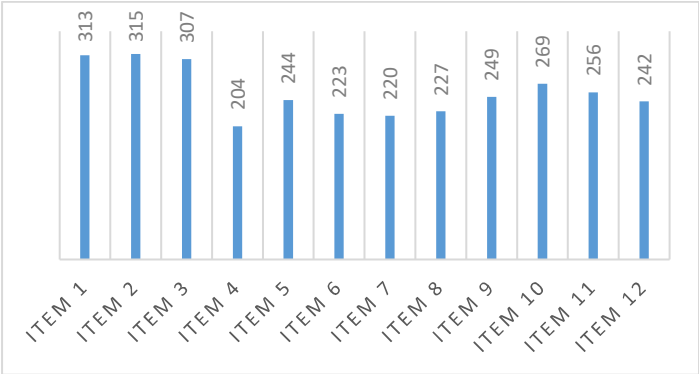

Figure 9. Students' Response Assessment Questionnaires Grid

The teacher must follow the learning implementation plan for most activities. With QuizWhizzer, the activities use game-based learning. Students' learning questionnaires include things like explaining the first concept, playing games, and summarizing at the end. Because the learning environment is more fun, students are more likely to play games instead of working through problems and having discussions. According to Dahlan et al. (2022), competition increases students' desire to win, making them more competitive. The teacher will perform these tasks each time we meet, making them harder. Because of this, students and teachers become better at participating in learning activities. Intelligent students can also lead their peers in the game's progression and discussion, which requires them to collaborate (see figure 9).

According to Game-based Statement Learning, games can teach critical thinking, group communication, and decision-making (Al-Mashhadani & Al-Rawe, 2018). Game-based learning is fun and can teach students how to solve problems using game media and develop thinking skills, including mathematical skills. Game-based learning is fun and teaches students how to solve game-related problems

Conclusion and Recommendation

Conclusion

The teacher's actions show that students strive to improve their performance to help students succeed. The teacher's use of QuizWhizzer to understand the game-based learning model improved with each cycle. The teacher recognizes the earlier gathering's flaws as their comprehension grows. This allows them to improve the gathering by using QuizWhizzer and game-based learning to benefit the students. The results of early observations showed that students still did not understand how the game-based learning model works and how to use the QuizWhizzer, making it hard for them to follow

learning and reduce time effectiveness. Student learning improved. When the second learning takes place, it appears that students have begun to understand the model of learning and know that after this stage students will move on to another level and not panic if each QuizWhizzer fails.

The purpose of this article was to present the practicability of using QuizWhizzer as an educational tool that assists in the learning of fundamental integration. Tests and analyses of the online educational tool's usefulness, efficiency, and the degree to which it satisfies the needs of the students are presented in this article. The findings of the usability scale showed that the learning components, such as the conversations and lecture videos, are useful to effectively meet the goals that were set for the class. It also showed that the online teaching tool is user-friendly, since the respondents were able to navigate the website without the assistance of a technical specialist and did not have any problems doing so. In addition, the students who participated in the study found that the online instructional tool was able to satisfy their needs in terms of learning the fundamental integration lesson

Recommendation

The following class showed that the students understood both game-based learning and media comprehension. More people are asking and answering questions in discussion activities, following good learning, and tackling the issue. The teacher's encouragement and students' awareness of the need to make the learning environment more active, effective, and conducive are responsible for this increase.

References

Al-mashaqbeh, I., & Dweri, A. Al. (2014). Educational Math Game Software : A Supporting Tool for First Grade Students ' Achievement. *Journal of Education and Practice*, *5*(5), 134–141.

Al-Mashhadani, M. A., & Al-Rawe, M. F. (2018). The future role of mobile learning and smartphones applications in the Iraqi private universities. *Smart Learning Environments*, *5*(1), 1–11. https://doi.org/10.1186/s40561-018-0077-7

Brigham, J. (2019). Can Games Work for You ? - Teacher Perceptions of Gamification in Mathematics Grades 6-8. *Journal of Applied Quantitative Methods*, *3*(5), 101–120.

Bringula, R., Reguyal, J. J., Tan, D. D., & Ulfa, S. (2021). Mathematics self-concept and challenges of learners in an online learning environment during COVID-19 pandemic. *Smart Learning Environments*, *8*(1), 33–46. https://doi.org/10.1186/s40561-021-00168-5

Calder, N., & Murphy, C. (2018). Using apps for teaching and learning mathematics : A socio-technological assemblage. *Mathematics Education Research*, *3*(July), 194–201.

Campilla, J., & Castañaga, A. (2021). Teaching Strategies Utilized by Mathematics Teachers in the 21 st-Century. *International Journal of Sciences: Basic and Applied Research (IJSBAR) International Journal of Sciences: Basic and Applied Research*, *59*(2), 140–160.

Chen, Y. C. (2017). Empirical study on the effect of digital game-based instruction on students' learning motivation and achievement. *Eurasia Journal of Mathematics, Science and Technology Education*, *13*(7), 3177–3187. https://doi.org/10.12973/eurasia.2017.00711a

Creswell, J. W. (2014). Research Design: Qualitative, Quantitative, and Mixed Method. In *Research design Qualitative quantitative and mixed methods approaches*. https://doi.org/10.1007/s13398-014-0173-7.2

Dahlan, T., Darhim, D., & Juandi, D. (2022). How Digital Applications As Mathematics Learning Media in the Automation Era. *Journal of Positive …*, *6*(2), 199–211.

Etcuban, J. O., & Pantinople, L. D. (2018). The Effects of Mobile Application in Teaching High School Mathematics. *International Electronic Journal of Mathematics Education*, *13*(3), 249–259. https://doi.org/10.12973/iejme/3906

Ezeugwu, J. J. O., Onuorah, J. C., Asogwa, U. D., & Ukoha, I. P. (2016). Effect of mathematics game-based instructional techniques on students'achievements and interest in algebra at basic education level. *Global Journal of Pure and Applied Mathematics*, *12*(4), 3727–3744.

Faijah, N., & Hetty Marhaeni, N. (2021). QuizWhizzer-Assisted Educational Game Design to Improve Students' Conceptual Understanding Skills. *Interface: The Journal of Education, Community and Values*, *2015*(3), 455–461.

Faijah, N., Nuryadi, N., & Marhaeni, N. H. (2022). Students' Responses to QuizWhizzer Educational Game to Strengthen Mathematical Concept Understanding Ability. *Journal Of Education And Teaching Learning (JETL)*, *4*(2), 94–104. https://doi.org/10.51178/jetl.v4i2.503

Felszeghy, S., Pasonen-Seppanen, S., Koskela, A., Nieminen, P., Harkonen, K., Paldanius, K. M. A., … Mahonen, A. (2019). Using Online Game-Based Platforms to Improve Student Performance and Engagement in Histology Teaching (Use of Gamification in a Histology Course: an Innovative Strategy). *BMC Medical Education*, *19*(273), 1–11.

Graceota, A., Budiyono, & Slamet, I. (2021). Mathematics Game as Interactive Learning Media in COVID-19 Pandemic Era. *IOP Conference Series: Earth and Environmental Science*, *1808*(1), 33–45. https://doi.org/10.1088/1742-6596/1808/1/012041

Harikrishnan, H., Halim, N. D. A., Harun, J., & Arjunan, S. (2019). Exploring the digital game-based elements in mathematics education: A meta-analysis review. *Universal Journal of Educational Research*, *7*(A9), 106–116. https://doi.org/10.13189/ujer.2019.071613

Kenna, A. L. (2019). The impact of maths game based learning on children's higher order thinking skills. *Journal for Research in Math Education*, *35*(November), 67–71.

Lavidas, K., Apostolou, Z., & Papadakis, S. (2022). Challenges and Opportunities of Mathematics in Digital Times: Preschool Teachers' Views. *Education Sciences*, *12*(7), 33–45. https://doi.org/10.3390/educsci12070459

Malik, T. (2022). Pengaruh Game Interaktif Quizwhizzer Terhadap Peningkatan Hasil Belajar Materi Tata Surya Pada Siswa MTs Negeri Kota Probolinggo. *Journal of Educational Sciences*, *22*(3), 34–47.

Nejem, K. M., & Muhanna, W. (2018). The Effect of Using Computer Games in Teaching Mathematics on Developing the Number Sense of Fourth Grade Students. *Educational Research and Reviews*, *8*(16), 1477–1482.

Novita, R., & Herman, T. (2021). Digital technology in learning mathematical literacy, can it helpful? *Journal of Physics: Conference Series*, *1776*(1), 554–563. https://doi.org/10.1088/1742-6596/1776/1/012027

Pardimin, Rochmiyati, S., Wijayanto, Z., & Supriadi, D. (2020). A Needs Analysis of Flipped Classroom -Based Mathematics Learning Model. *PalArch's Journal of Archaeology of Egypt/Egyptology*, *17*(5), 69–94.

Rahaju, R., & Rahutami, R. (2018). Development of Communicative Character through Mathematics Learning - A Monopoly Game Based. *Journal of Advanced Research Design*, *3*(48), 344–347. https://doi.org/10.5220/0007420303440347

Ramli, I. S. M., Maat, S. M., & Khalid, F. (2020). Game-Based Learning and Student Motivation in Mathematics. *International Journal of Academic Research in Progressive Education and Development*, *9*(2), 449–455. https://doi.org/10.6007/ijarped/v9-i2/7487

Rondina, J. Q., & Roble, D. B. (2019). Game-Based Design Mathematics Activities and Students' Learning Gains. *The Turkish Online Journal of Design Art and Communication*, *9*(1), 1–7. https://doi.org/10.7456/10901100/001

Russo, J., Bragg, L. A., & Russo, T. (2020). How primary teachers use games to support their teaching of mathematics. *International Electronic Journal of Elementary Education*, *13*(4), 407–419. https://doi.org/10.26822/iejee.2021.200

Serrano, K. (2019). The effect of digital game-based learning on student learning: A The effect of digital game-based learning on student learning: A literature review literature review. *Graduate Research Papers*, *3*(2), 943–956.

Setyarto, A., Murtiyasa, B., & Sumardi, S. (2020). Development of 21st century skills in mathematics learning with steam in mts negeri 2 wonogiri. *Universal Journal of Educational Research*, *8*(11), 5513–5528. https://doi.org/10.13189/ujer.2020.081155

Tolentino, J. B. (2020). Classroom Management Approach Preferences of the Diverse Mathematics Learners. *HONAI: International Journal for Educational, Social, Political & Cultural Studies*, *3*(1), 27–44.

White, K., & McCoy, L. P. (2019). Effects of Game-Based Learning on Attitude and Achievement in Elementary Mathematics. *Networks: An Online Journal for Teacher Research*, *21*(1), 1–17. https://doi.org/10.4148/2470-6353.1259

Wijaya, A., Elmaini, & Doorman, M. (2021). A learning trajectory for probability: A case of game-based learning. *Journal on Mathematics Education*, *12*(1), 1–16. https://doi.org/10.22342/JME.12.1.12836.1-16

Wulansari, W., & Dwiyanti, L. (2021). Building Mathematical Concepts Through Traditional Games to Develop Counting Skills for Early Childhood. *International Journal of Elementary*

Education, *5*(4), 574–590. https://doi.org/10.23887/ijee.v5i4.39654