International Journal of Learning, Teaching and Educational Research
Vol. 21, No. 4, pp. 134-149, April 2022
https://doi.org/10.26803/ijlter.21.4.8
Received Aug 15, 2022; Revised Nov 15, 2022; Accepted Apr 12, 2022

Mathematics Teachers' Perceptions on the Implementation of the Quizizz Application

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Abstract. Quizizz is an application proposed by the Ministry of Education Malaysia that can be used to obtain information about pupils' learning acquisition throughout lessons. Quizizz integrates technology and gamification concepts that captivate students' desire to learn. For home-based learning, Malaysian teachers were advised to guide pupils using communication mediums and applications so that the pupils would not be left behind in their learning. This study investigated the prior knowledge and perceptions of mathematics teachers regarding Quizizz, and their attitudes towards using this application. Furthermore, this study aimed to discover the interests among primary school mathematics teachers with different years of teaching experience in integrating the Quizizz application into their classes. We adopted a quantitative research method, using a questionnaire as research instrument. Fifty primary school teachers teaching mathematics in Johor were selected as respondents. The data obtained were analyzed using descriptive statistical analysis and inferential statistical analysis. Findings showed that more than half of the respondents (68%) had followed a course on using Quizizz, and 94% felt that they could access the Quizizz website easily. Most of the respondents (mean > 3.67) had a positive attitude towards the Quizizz application. This study showed that teaching experience does not influence the teacher's decision in implementing the Quizizz application in the teaching and learning process. Teachers are willing to learn new teaching methods.

Keywords: mathematics; online learning; Quizizz; teacher

1. Introduction

The closure of schools and educational institutions due to the outbreak of COVID-19 has significantly impacted education systems worldwide. This has forced most schools and learning institutions to shift from conventional face-to-face instruction by embracing online-based learning platforms (UNESCO, 2020). This has propelled mathematics teachers to use various creative approaches during online lessons. Teachers can conduct their lessons in a fun and engaging

manner by using any of the multiple platforms accessible online, such as the Quizizz application (Ines & Carvalho, 2017). However, some mathematics teachers may need additional skills and knowledge, especially technology-related knowledge, to help them create meaningful and fun-filled mathematics lessons.

The nature of mathematics learning, which requires students to understand abstract mathematical concepts and various mathematical problem-solving procedures, becomes increasingly difficult when distance learning is implemented. Many teachers are unprepared for this sudden change to online teaching, which poses many problems (Lapada et al., 2020). These problems related to distance learning can result in mathematics lessons not being carried out effectively and the development of student learning being slowed down (Garbe et al., 2020). However, math teachers can use various applications to support their teaching, including the Quizizz application. This user-friendly application can help teachers perform various teaching activities, including making exercises and assessments more efficient. This is in line with the implementation of education in the Fourth Industrial Revolution (4IR) and efforts to ensure the continuity of education. The use of Quizizz can help teachers implement teaching more easily. In addition, this application is fun to use and has a variety of setting options suitable for various learning purposes.

As a result of the outbreak of COVID-19, the Malaysian Government has ordered the implementation of a movement control order (MCO) to control the spread of the virus, subsequently making it impossible to implement teaching and learning activities. Therefore, the Ministry of Education (MoE) Malaysia issued a letter of guidelines for the implementation of teaching and learning during the MCO to ensure that the teaching and learning process was not hampered. UNESCO (2020) has provided vivid guidelines for home-based teaching and learning and remote learning to help teachers conduct classes via an online platform as face-to-face teaching is not allowed. Home-based teaching and learning serve as a guideline to help teachers conduct and implement learning in a structured and planned manner. During the MCO period, teachers were advised to guide pupils using communication mediums and applications that are accessible to them so that pupils are not left behind in their learning. Undoubtedly, the role of educational technology is becoming pre-eminently significant in the present day, especially in the education sector.

Students often encounter challenges such as difficulty remembering the necessary steps and mathematical formulas, understanding mathematical problems, and determining solutions such as mathematical problems whenever they answer mathematical questions. As a result, they struggle relating to the mathematical topics and applying the conceptual knowledge they have learned (Mahmud et al., 2021). Nevertheless, there are numerous online mathematics learning resources and technology which make it easier for students to understand the content of mathematics lessons. Making full use of such learning resources indirectly helps teachers improve the quality of their mathematics teaching. Although there is a wide selection of online technology and resources,

it is advised that appropriate teaching strategies should be adopted to suit students' content and levels of understanding to achieve academic success (Konnova et al., 2019).

Previous studies have shown that experienced mathematics teachers focus on traditional teaching methods and rely heavily on textbooks and exercise books (Mahmud, 2019). This is evident in the study of Dockendorff and Solar (2018), who concluded that teachers who are competent in information and communication technology (ICT) literacy do not apply this knowledge in teaching mathematical concepts to students. Incorporating technological elements into mathematics teaching lacks among experienced teachers, even though these teachers have professional pedagogical knowledge, teaching strategies, and methods. Novice teachers, on the other hand, are motivated and confident in integrating technology in mathematics teaching (Setiyani et al., 2020).

Teachers should assess learners by gathering information and feedback from them after lessons (Mahmud et al., 2020). According to Jamian et al. (2020), Quizizz is one of the applications proposed by the MoE Malaysia to achieve this. This application can obtain information about pupils' learning acquisition throughout the lesson. This interactive Quizizz application was introduced to educators as an alternative medium to assess student performance (Ines & Carvalho, 2017). This holds to another study carried out by Permana and Permatawati (2020), who agreed that the Quizizz application can create more dynamic online classrooms. Setiyani et al. (2020) found that students have shown a positive attitude towards Quizizz and that the application could enhance mathematical problem-solving skills. Mensah (2018) stated that by using the Quizizz application, students could review their mistakes after conducting a mathematics quiz. Therefore, mathematics teachers can improve the quality of teaching using the Quizizz application.

Furthermore, Quizizz is a suitable medium to test mathematics mastery levels during online classes (Mulyati & Evendi, 2020). Mathematics teachers must conduct practical online assessments to gauge students' mastery levels. It is part and parcel of their teaching, as the information obtained from the assessments can be helpful when designing instructional activities which suit the learners' level of understanding in the upcoming mathematics lessons. The vibrant interface of Quizizz with its engaging music makes it an appealing platform to most students worldwide. Besides this, the power-up abilities of Quizizz were designed to increase pupils' motivation levels (Ditch that Textbook, 2020).

Unfortunately, not much research has been done to determine the efficacy of using Quizizz in mathematical education in Malaysia (Md Saleh & Hajar, 2019). This explains the aim of this study, which is to identify the effectiveness of using the Quizizz application among primary school mathematics teachers in Johor during virtual learning. The scope of this study is to investigate the prior knowledge and perception regarding Quizizz and teachers' attitudes towards

the application. Primary school mathematics teachers' interest in applying Quizizz to their teaching experience is another point of interest in this study.

2. Problem Statement

The performance of Malaysian students in the Programme for International Student Assessment (PISA) has improved from 2009 to 2018 (OECD, 2019). Based on the results released by the Organisation for Economic Co-operation and Development (OECD). Malaysia accumulated 440 points in 2018, which is an increase of 36 points from 2009. Although Malaysia was ranked 57th out of 74 participating countries in 2009, the average global performance is still considered low. The National Council of Teachers of Mathematics (NCTM) (2000) agreed that technology is critical in implementing effective mathematics teaching and learning. A study carried out by Zakaria and Khalid (2016) also supported ICT integration in teaching. Technology helps to capture students' attention and motivates them to learn better. According to Dinc (2019), the effectiveness of the teaching and learning process can be increased through the implementation of technology.

With the advancement of technology, many new technologies, such as online applications and software, have been integrated into education. Therefore, educators must be dynamic, proactive, and ready to embrace new technologies to adapt to the 21st century education system. Nevertheless, Aslan and Zhu (2016) posited that teachers use basic ICT skills such as Microsoft PowerPoint in their teaching. Therefore, the use of various technology applications in mathematics teaching and learning has become a need in recent years. Teaching and learning are evolving in tandem with technological advancement (McCulloch et al., 2018).

Great emphasis has been placed on integrating technology into education. The Quizizz application is a game-based learning application that integrates technology and gamification concepts to motivate students to learn (Basuki & Hidayati, 2019; Mac Namara & Murphy, 2017; Mohamad, 2020; Zhao, 2019). However, thus far, not much is known about the level of mathematics teachers' prior knowledge and perception regarding Quizizz and their attitude towards the application. In addition, further research is required on the interest of Malaysian mathematics teachers to use Quizizz based on their mathematics teaching experience. This will expand the literature and show real scenarios about mathematics teachers using the Quizizz application in their teaching. Therefore, a study should be conducted to explore the perceptions of primary school mathematics teachers in the implementation of the Quizizz application during online learning to be in line with the needs of this age of technology. This study will benefit teachers who act as catalysts for change in their teaching field to help learners achieve the desired learning objectives.

3. Research Questions and Hypothesis

For this study, we have formulated three research questions and one hypothesis:

- RQ1: What is the level of mathematics teachers' prior knowledge and perception regarding the Quizizz application?

- RQ2: What is mathematics teachers' attitude towards the Quizizz application?
- RQ3: Is there a significant difference in interest to use the Quizizz application based on mathematics teachers' teaching experience?
- H1: There is no significant difference in interest to use the Quizizz application based on mathematics teachers' teaching experience.

4. Methodology

We adopted a quantitative research method in this study, precisely the survey method with a questionnaire as research instrument. This study investigated the perceptions among mathematics teachers of using the Quizizz application during online classes. The chosen method can therefore be justified as it will allow data to be collected that can be used to describe the characteristics of the research population (Lim et al., 2016; Creswell, 2012; Majid, 2017; Peng & Daud, 2017; Restiana & Pujiastuti, 2019).

This research involved 50 primary school teachers teaching mathematics from Year 1 to Year 6 in Johor. Respondents were selected using random cluster sampling because we could not visit schools due to movement limitations during the MCO period.

We used Google Forms to draft and administer the questionnaire for data collection (Appendix 1) and to save cost, time, and energy due to movement limitations during the MCO period. Notably, the web-based questionnaire is used widely for collecting instant data (Creswell, 2012). The questionnaire contained four parts. Part A consisted of questions on the demographics of the respondents regarding gender, highest qualification obtained, and mathematics teaching experience. For parts B, C, and D, the items were adapted from questionnaires of a previous study (Md Saleh & Hajar, 2019). Cronbach's alpha was used to test the reliability of the items in the questionnaire. The alpha values obtained were larger than 0.70, indicating high reliability and thus suitability for usage (Md Saleh & Hajar, 2019).

We collected data on the respondents' prior knowledge and perception regarding Quizizz (4 items), their interest in applying Quizizz in the teaching and learning process (7 items), and their attitude towards Quizizz (7 items). Questions were selected from the study by Md Saleh and Hajar (2019) that aligned with the aim of this study and would elicit the necessary data to answer the research questions. The questionnaire used a dichotomous scale (Yes/No) for part B and a 5-point Likert scale for parts C and D to analyze the collected data. The five options for the Likert scale were: 1 – strongly disagree, 2 − disagree, 3 – moderately agree, 4 – agree, and 5 – strongly agree. Table 1 shows the distribution of questions.

Table 1: Distribution of questions in questionnaire

Construct	Questions	Scale
Demographics	Part A 1–3	–
Prior knowledge & perception regarding Quizizz	Part B 1–4	Yes/No

Interest to apply Quizizz	Part C 1–7	Likert
Attitudes towards Quizizz	Part D 1–7	Likert

The data obtained were analyzed through descriptive statistics using a summary of the overall data and can provide information directly and efficiently (Pallant, 2020). All data collected were analyzed using Statistical Package for Social Sciences (SPSS) Version 26. Table 2 shows how the mean score was interpreted for data analysis (Ahmad, 1993).

Table 2: Interpretation of mean

Mean score	Interpretation	Level
1.00 – 2.33	Low/negative	Weak
2.34 – 3.66	Average/neutral	Medium
3.67 – 5.00	High/positive	Good

Source: Ahmad (1993)

Furthermore, to determine the differences of interest in applying Quizizz among primary school mathematics teachers based on their mathematics teaching experience, data were analyzed using one-way analysis of variance (ANOVA).

5. Findings

Part A of the questionnaire collected the demographics of the 50 respondents. The results obtained were measured using frequencies and percentages (Table 3).

Table 3: Demographics of respondents

Item	Category	Frequency (N = 50)	Percentage
Gender	Male	13	26%
	Female	37	74%
Highest qualification	Teaching certificate	–	–
	Diploma in education	4	8%
	Bachelor's degree	36	72%
	Master's degree	10	20%
	Doctoral degree	–	–
Mathematics teaching experience	Less than 5 years	15	30%
	6 to 10 years	16	32%
	11 to 15 years	11	22%
	More than 16 years	8	16%

Table 3 shows that most of the respondents were female (74%), while male respondents constituted 26% of the sample. Regarding highest qualification obtained, 36 respondents (72%) had a bachelor's degree, followed by 10 with a master's degree (20%) and 4 with a diploma in education (8%). No respondents had a teaching certificate or doctoral degree as highest qualification obtained. Furthermore, concerning teaching experience, 32% of respondents had been teaching for 6 to 10 years, with 15 respondents (30%) having taught for less than 5 years. The category of more than 16 years of teaching experience accounted for the smallest number of respondents (16%), while the 11 to 15 years category had the second smallest number of respondents (22%).

Figure 1 shows the frequency distribution of respondents' prior knowledge and perception regarding Quizizz. For the first item, 34 respondents (68%) showed an interest in attending courses related to the use of the Quizizz application. Furthermore, for item 4, more than half of the respondents (68%) had followed a course on using Quizizz. For item 3, the majority of the respondents (94%) reckoned that they could access the Quizizz website easily. In conclusion, the respondents did not experience any issues using the Quizizz application.

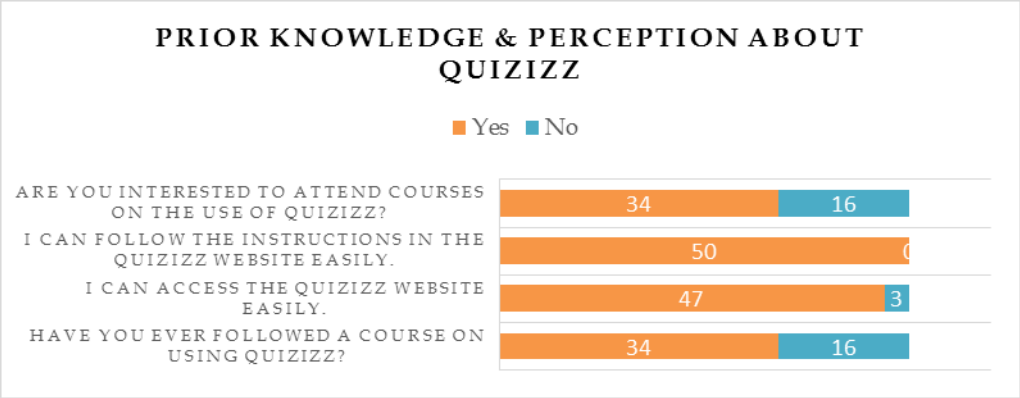

Figure 1: Prior knowledge and perception regarding Quizizz

The findings showed that Quizizz is a user-friendly application. It also showed that the respondents had used this application in their teaching and learning process. Based on the findings, Malaysian mathematics teachers are proactive in filling in the shortcomings of online teaching by participating in courses to enhance their skills to implement the Quizizz application in mathematics teaching.

For the section on respondent attitudes towards Quizizz, the following scale was used: 1 – strongly disagree, 2 – disagree, 3 – moderately agree, 4 − agree, and 5 – strongly agree (Table 4).

Table 4: Distribution of respondents' answers to items regarding attitude towards Quizizz

Item no.	Statement	1	2	3	4	5	Mean score
1	The ranking function (leader board) in Quizizz motivates students to learn mathematics.	0	0	12%	70%	18%	4.06
2	Quizizz makes my students think faster.	0	6%	16%	58%	20%	3.92
3	My interaction with the students will be more effective when I use Quizizz while teaching.	0	4%	16%	60%	20%	3.96
4	I like to use Quizizz to give students an overview of the learning content.	0	4%	28%	54%	14%	3.78
5	Quizizz will help students understand the concept of mathematics more clearly.	0	4%	20%	60%	16%	3.88

6	Quizizz is suitable for every student, whether weak, average or brilliant.	0	0	12%	70%	18%	4.06
7	My teaching will be easier when I use Quizizz.	2%	4%	16%	62%	16%	3.86
	Overall mean score						3.93

As seen in Table 4, all seven items exceeded the minimum mean score for a good mean (3.67; see Table 2), with the overall mean score for this section being 3.93. All items thus have a good mean and are interpreted as high/positive. For both the first and second last items, 70% of the respondents agreed, and 18% strongly agreed. They thus believed that the ranking function in Quizizz motivates students to learn mathematics, and that Quizizz is a tool that can support students of different proficiency levels, be it weak, average, or brilliant. These two items also showed the highest mean score (4.06). In addition, 80% of respondents thought that the interaction between teacher and students will be more effective when implementing Quizizz in teaching (item 3). Furthermore, the majority of respondents (78%) agreed that Quizizz makes learners think faster (item 2). Item 4 had the lowest mean (3.78) and measured whether respondents liked using Quizizz because it gave students an overview of the lesson. For this item, 28% of the respondents moderately agreed and 4% disagreed.

Items 1 and 6 reported the highest mean (4.06). It is very likely that the ranking function in Quizizz has successfully aroused students' interests. This function displays all the students' names and the ranking in the quiz. In order to achieve a higher rank on the leader board, students participate actively and become motivated during the online mathematics learning. In conclusion, the overall mean score shows that most of the respondents had a positive attitude towards the Quizizz application.

The last test that was carried out was the one-way ANOVA to determine whether there was a statistically significant difference regarding respondents' interest to use Quizizz based on their mathematics teaching experience (Table 5).

Table 5: One-way ANOVA results

	Sum of squares	**df**	**Mean square**	**F**	**Sig.**
Between groups	.143	3	.048	.154	.927
Within groups	14.231	46	.309		
Total	14.374	49			

Before the one-way ANOVA was conducted, Levene's test was applied to check the assumption of homogeneity of variance. The results showed that $F (3, 46) = .630$, $p = .599 > .05$, which indicates the homogeneity of variance was not significant. The variance for the two groups was thus homogeneous. The one-way ANOVA was carried out after this. According to Table 5, the value of $F = .154$, whereas the value of $p = .927$, with the value of $p > .05$. The statistical equation can be written as: $F (3, 46) = .154$, $p > .05$. The study results thus

showed that there was no significant difference in respondents' interest to apply Quizizz based on their mathematics teaching experience.

6. Discussion

Almost all countries across the world have adopted online learning due to its continuity (Wahyono et al., 2020). Thus, the MoE Malaysia has provided various digital online in-service trainings and webinars to improve the skills of mathematics teachers in implementing digital mathematics teaching better. Furthermore, other countries, such as Indonesia, are actively providing Quizizz webinars, which are accessible via YouTube, to assist teachers in conducting online lessons (Tarmini et al., 2020). Besides this, educators can access the relevant information related to the Quizizz application via other platforms as they have this information at their disposal.

In this study, nearly 100% of respondents felt that they could easily access the Quizizz website. This finding is consistent with that of studies carried out by Sodiq et al. (2021) and Mohamad (2020), who found that the Quizizz application is instructor-friendly and practical. This finding shows that most mathematics teachers would be willing to participate in courses on the use of Quizizz. The same findings were made in a study carried out by Md Saleh and Hajar (2019). Most of the mathematics teachers in their study had a positive attitude towards attending courses on the use of Quizizz. Learning is a lifelong process, and therefore educators must expand their knowledge. Therefore, mathematics teachers ought to be creative by exploring the numerous online applications that can serve as indispensable tools in helping them with their teaching process. Besides online quizzes, the Quizizz application is embedded with an instructor-paced function which allows teachers to control the pace of their lesson to further explain questions to students.

Furthermore, the majority of the respondents showed positive attitudes towards Quizizz. Findings by Mohamad (2020), Amri and Shobri (2020), Sodiq et al. (2021), and Md Saleh and Hajar (2019) also showed that mathematics teachers supported the use of the Quizizz application as they believed that this platform helps to achieve student-based learning. It is therefore suitable for implementation in the teaching and learning process. Moreover, many respondents agreed that the ranking function (leader board) in Quizizz motivates students to learn mathematics. Finally, the use of gamification, such as the Quizizz application, in education is believed to be a feasible method that can be used to increase students' engagement and their motivation levels (Denny et al., 2018; Jia et al., 2016). Teachers should therefore be open-minded to explore more exciting platforms to maximize the effectiveness of the mathematics teaching and learning process during online learning.

The results of this study also showed that there was no significant difference related to respondents' interest to apply Quizizz and their experience in teaching mathematics. Hence, we can conclude that teaching experience does not influence the individual's interest to implement the Quizizz application in the teaching and learning process. Permana and Permatawati (2020) stated that most

students were positive towards the Quizizz application and felt that the application could increase their interest in learning. Therefore, to attract students and keep them motivated, all mathematics teachers should implement suitable applications during online lessons. This study proved that both experienced and novice mathematics teachers are fascinated by the Quizizz application as it serves as a great tool to engage pupils actively in the lesson.

7. Conclusion

The implementation of the Quizizz application in the online teaching and learning process has shown a positive impact. By implementing this application, teachers can motivate students to learn mathematics and help them understand mathematical concepts to create a dynamic online classroom atmosphere. Teachers in Malaysia should make an effort to integrate different online technologies and resources throughout the teaching and learning process so that pupils are not left behind during home-based teaching and learning. This could be quite challenging for both experienced and novice teachers who are less skillful in online teaching. Nevertheless, the study results showed that most respondents had positive attitudes towards the Quizizz application and were willing to engage in learning new teaching methods.

This study has shown positive implications for mathematics teachers in using Quizizz in their teaching. Using the Quizizz application ensures the effectiveness of teaching and learning activities and increases students' motivation to learn mathematics. This study revolved around the perceptions and interests of teachers in applying the Quizizz application. We therefore recommend that obstacles and constraints encountered by mathematics teachers in implementing the Quizizz application be further investigated. Besides this, due to the small sample size used in this study, research should be conducted with a larger sample to allow the findings to be more broadly generalized.

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Appendix 1

Perception of Mathematics Teacher's in the Implementation of Quizziz Application during Virtual Learning

Dear teachers,

This questionnaire aims to evaluate the effectiveness of using the Quizizz application among Mathematics teachers during virtual learning. Responses to this questionnaire will be kept strictly confidential. However, your participation in this survey will significantly contribute to the accomplishment of this research project and will be used only for academic purposes.

This questionnaire consists of four parts:

i. Part A: Demographics
ii. Part B: Prior Knowledge & Perception about Quizizz
iii. Part C: Interest to Apply Quizizz
iv. Part D: Attitudes towards Quizizz

Thanks in advance for your contribution, and your honest responses are much appreciated.

Part A: Demographics

1. Gender: Male ☐
Female ☐

2. Highest Qualification : Teaching Certificate ☐
Diploma in Education ☐
Bachelor's Degree ☐
Master's Degree ☐
Doctoral Degree ☐

3. Mathematics teaching experience: Less than 5 Years ☐
6 To 10 Years ☐
11 To 15 Years ☐
Over 16 Years ☐

Part B: Prior Knowledge & Perception About Quizizz

Item Statement	Yes	No
Have you ever followed a course on using Quizizz?		
I can access the Quizizz website easily.		
I can follow the instructions in the Quizizz website easily.		
Are you interested in attending courses on the use of Quizizz?		

Part C: Attitudes Towards Quizizz

The scale used to refer to the following: 1- Strongly Disagree (SD), 2- Disagree (D), 3- Moderately Agree (MA), 4- Agree (A), and 5- Strongly Agree (SA)

Item Statement	1	2	3	4	5
The ranking function (leader board) in Quizizz motivates students to learn Mathematics.					
Quizizz makes my students think faster.					
My interaction with the students will be more effective when I use Quizizz while teaching.					
I like to use Quizizz to give students an overview of the learning content.					
Quizizz will help students understand the concept of Mathematics more clearly.					
Quizizz is suitable for every student, whether weak, average or brilliant.					
My teaching will be easier when I use Quizizz.					

Part D: Interest to Apply Quizizz Among Primary School Mathematics Teachers Based on Teaching Experience

Item Statement	1	2	3	4	5
I will always use Quizizz in my class.					
Quizizz will help in making my Mathematics teaching more current.					
Quizizz will help me prepare teaching materials for Mathematics more easily.					
Quizizz makes students more involved in Mathematics learning.					
I feel that Quizizz supports me in providing effective Mathematics teaching.					
Quizizz will help me prepare teaching materials for Mathematics more easily.					
Quizizz is suitable as a tool for school-based assessment.					