

Integrating Interactive Multimedia Teaching and Learning Mathematics for Online Distance Learning

Syafiqah Saupi¹, Raudzatul Fathiyah Mohd Said^{2*}

¹Faculty of Education, Universiti Teknologi MARA Cawangan Selangor,
Kampus Puncak Alam, MALAYSIA

²Center of Foundation Studies, Universiti Teknologi MARA Cawangan Selangor,
Kampus Dengkil, MALAYSIA

*Corresponding author: raudzahfathiyah@uitm.edu.my

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Abstract

Mathematics is the subject that has the least frequency of using technology in the school. It is preferred chalk and talk method rather than the use of technology or presentation. Due to pandemic Covid19, the suitable method for the teaching and learning process is virtual learning. The same goes for teachers who need to change the method and think about how to implement it through online learning. Interactive multimedia is one of the best media that can attract students to learn in distance education, especially for Mathematics subjects that are most suitable to be conducted on the traditional method. It is more challenging as this new era has happened suddenly and it creates emergency online learning where most teachers do not experts in enhancing the interactivity learning at first. The purpose of this study is (1) to identify students' perception of interactive multimedia in learning Mathematics during online distance learning and (2) to understand students' motivation towards interactive multimedia in learning Mathematics during online distance learning. The sample selected for the questionnaire survey is 100 Mathematics students. Based on the finding, showed there are positive perceptions and high motivation toward interactive multimedia in learning Mathematics during online distance learning.

Keywords Mathematics education; Interactive multimedia; Virtual learning

INTRODUCTION

Pandemic Covid-19 has made the teaching and learning process reform from traditional methods to online methods. It gives a big impact on teachers and students as it is an emergency online distance learning where they are just new to the environment and need to adapt to the current situation. More than 850 million students worldwide result in the suspension from classes due to the global spread of Covid-19 that make the original teaching plans of schools in China disrupted [7]. The cases increase from time to time until they reached Malaysia and rapidly spread to people from early the year 2020. From this uncontrollable issue, many changes happened in the country and the most important is the education system in Malaysia. Due to the increase of the virus, Malaysia has implemented a movement control order. This makes the closure of schools and teachers need to take an initiative to teach their students through online methods.

Online learning is defined as learning via the internet in either a synchronous or asynchronous mode, where students interact with teachers and other students at their leisure and in their preferred location. [9]. Teaching, learning, and assessment must all be done online because of Pandemic Covid-19. Online evaluations help students to demonstrate critical thinking and problem-solving abilities, which are two of the key benefits of switching from traditional to online learning. [10]. However, the challenging part of online learning is to assess the students because it is quite difficult to observe them when it has come to

non-face-to-face learning. Teachers do not have an idea of how to measure performance and effectiveness through distance learning. Nevertheless, online distance learning analysts argue that distance learning can be as efficient or even more effective than a face-to-face pattern [20].

The least amount of technology is used in mathematics in school. Rather than using technology or giving a presentation, it is preferred to use chalk and talk. As a result of the pandemic, the method must be altered in order for online learning to be successful. For successful mathematics online learning, the right tools, as well as well-known learning ideas and theories, are required. [1]. Thus, teachers need to take a survey and read some materials to find out the suitable method or software that is suitable and effective to be used in teaching and learning Mathematics. Teachers must also accept students' ideas, points of view, and grievances about the mathematical principle that they want to address. Because both teachers and students are involved in the teaching and learning process, teachers must be open-minded in order for online learning to be successful.

Mathematics is quite a challenging subject among the other subjects, and it is not easy to conduct it during online classes. Other than choosing the suitable application or software to teach the students, teachers need to think of some other methods to gain attention and attract the students to participate more in the online classes. There are many interactive multimedia in this 21st-century world that teachers can choose to be used in teaching Mathematics during online distance learning. Because most students sought game-based games that increased their thinking skills, the right choice of media can aid to improve student performance by enhancing enthusiasm for learning. [11].

Interactive multimedia is one of the best media that can attract students to learn in online distance learning, especially for Mathematics which prefers to be taught on a traditional method. Interactivity is very important for online learning in a fascinating way and allows students in improving online interaction [6]. While online learning can be effective without interaction, student engagement may be less than satisfactory throughout the class. As a result, interactivity is very crucial and beneficial in engaging students in the learning process. [4][6][25][27][29]. One of the examples of interactive multimedia is computer-based games which can improve cognitive understanding of difficult mathematical concepts and provides multiple types of learning difficulties [2]. Students can go through the module in their own time and engage with the material in a visually rich environment using interactive multimedia modules [4].

A fundamental difficulty confronting online distance learning is the design of study materials that can attract and impact students' responsibility, responsiveness, and ownership of their learning. [4]. Mathematics is the subject that most students will ask the teacher questions in the process of learning, thus, the study materials need to be changed according to the pace of students' learning. It is more challenging as this new era happened suddenly and it creates emergency online learning where most teachers are not experts in enhancing the interactivity learning at first. Again, many distance and online learners assume that online distance learning is the second best and that it should not be compared with traditional face-to-face learning methods [26].

Other differences in teachers' levels of usage of educational technology were identified depending on their topic expertise, with science teachers being the most likely to utilise it and mathematics instructors being the least likely. [13]. Mathematics teachers rarely use technology in school compared to fact subjects like science. The interactive multimedia for example themed PowerPoint needs a lot of time in preparing the learning modules to teach during online classes. Thus, teachers have to spend a lot of time preparing the content of the lesson to be taught during online classes for the students. Mathematics is not an easy subject to be combined with interactivity as there are a lot of symbols that need to type and calculations. Mathematics presents course authors with more unique and uncommon obstacles in representing and sharing subject concepts using symbols that learners can understand when learning on their own. [26].

Based on the problem stated above, the purpose of this study is (1) to determine students' perception of interactive multimedia in learning Mathematics during online distance learning. (2) to understand students' motivation towards interactive multimedia in learning Mathematics during online distance learning.

MATERIALS AND METHODS

Technology teaching is not a one-size-fits-all approach as it depends on the types of technology being used at the time and the content of the curriculum being taught. Thus, learning and teaching through technology are not necessary for all subjects and time as it is depending on suitable subjects and the content needs to be delivered during the learning process. Meanwhile, as online learning needs to use technology, all subjects necessarily need to be taught by using online platforms thus it comes with many challenges faced by both teachers and students through the learning process during this pandemic. This is also because during face-to-face learning there is no teaching and learning process through online platforms being practised.

The significance of lesson content during online learning, where the quality of teaching in satisfying personal and professional needs, as well as the perceived amount of learning, influences students' persistence in online classes. [5]. Students who considered giving up admitted negative experiences on the course due to challenging material or poor class organization. There are several flaws in structuring the class using online platforms due to a lack of experience in online learning, which might cause students to become disinterested and confused. Because active involvement is one of the components of efficient online learning in learners, the quality of online courses is an important aspect of the teaching and learning process during online learning. There are also a few advantages of online learning such as flexibility, accessibility, affordability, and opportunities for life-based education [22]. Thus, teachers need to take the initial step to overcome these issues.

Technology facilitates the interaction between students and teachers, and the design of learning environments could have a major impact on learning outcomes. It is mentioned in research done before that video media is one of the effective and practical learning media used in education [18]. Also, as a learning medium, learning videos have a positive effect on the cognitive, affective, and psychomotor aspects of students in the learning process. Hence, students get excited and focus more on paying attention to the presented material during the teaching and learning process.

The choice of video as a learning resource for mathematics subjects in the form of learning media is considered highly important and efficient in stimulating the critical thinking (cognitive) as well as students' motivation (affective) because the lesson requires adequate attention from students as it relates to numbers, symbols, and formulas [18]. This makes the most significant aspect of interactive media is that learners not only pay attention to the media or object but also need to interact while learning [25][32]. One of them is using a computer-based game which can also improve the cognitive learning of challenging mathematical concepts because it can include various levels of learning difficulty [2][18]. Throughout the process of teaching and learning, students prefer the use of interactive multimedia to traditional lecture-based instruction [27]. Thus, the interactive multimedia tool can more clearly clarify complex and dynamic concepts and make it easier to remember content easily and enhance student-based understanding of subject content and make students more interested in learning.

A previous study argued that there is a 'high attrition rate' faced by distance and online mathematics learners compared to other classes [26]. It is due to the perceived difficulty of the subject itself; this level of anxiety is more likely to be increased through distance and online mathematics learners. This is supported by other research, that an interactive multimedia mathematics framework consisting of video, animation, audio, interactive examples, and self-assessment was being used for tertiary students with mathematics anxiety to improve both cognitive and affective learning [29].

There was positive feedback on the effectiveness of interactive learning in generating interest in learning and understanding the topic shown in another study [17]. As a result of interactive learning, the students have shown an increase in exam scores. For instance, good engagement between teachers and students, with interactive multimedia technology enriches the educational process. It is also being proven that positive results have been shown while using interactive multimedia in learning and teaching Mathematics, where most of the students perceived multimedia courseware as an effective method in learning mathematics online distance learning [4].

Motivation is the most used reason for success or failure in completing any complex task, and in most learning theories it has been considered a pivotal principle [28]. It is also a major factor that could affect the learning process and achievements in learning [14] and it is necessary to understand the level of motivation of students in the e-learning environment [8]. There are two types of motivation

which are intrinsic motivation and extrinsic motivation. Intrinsic happened when there are no external rewards offered while extrinsic happened when external rewards are offered [31]. However, some challenges and issues occur due to a lack of motivation from the students through online learning.

The motivation for student learning is affected by different things, one of them is the learning media used for teaching by teachers. The learning media can also assist students to develop their understanding to build up student motivation and interest [11][15]. That is why the selection of video as a learning resource for mathematics subjects is highly important and efficient in stimulating the critical (cognitive) thought of students as well as student motivation (affective) [18].

One of the issues in online distance learning is the drop-out rate in online learning environments among students is higher than in traditional learning environments [24]. The students have expressed online learning pressure and difficulties when finishing schoolwork [23]. The quality of delivery can lead to the learners' demotivation, lack of involvement or even withdrawal [31]. Therefore, to improve the quality of content for maintaining learner motivation in self-directed online distance learning is by integrating interactive presentations that enhance the interest of learners.

The use of videos as a learning tool in mathematics can help students become more motivated to study, improve their knowledge and understanding of the lesson, and improve their grades. [4][18]. When students receive instruction that is beneficial to them, they are more motivated and perform better on assessments. [28]. Thus, it shows that digital learning has greater positive effects than traditional teaching on learning motivation.

This study used a survey method in which a questionnaire had been given to 100 students in the Faculty of Education. In choosing respondents, random sampling was applied. The questionnaires are open-ended questions and contain a 5 Likert scale. There are 23 items to measure the perception of students towards using interactive multimedia during online learning and 13 items to measure students' motivation towards interactive multimedia during online distance learning.

These items are a compilation from other researchers who had done similar research before. 23 items to measure the students' perception and another 13 items for measuring students' motivation were taken from the previous study [3][17] [19][21][30].

The questionnaire was developed using an online survey website as during this pandemic Covid-19 campuses are closed, and students are at their homes. Then the link and information regarding this survey are sent to all Mathematics students in the Faculty of Education through an email dan personal message. The responses from this survey were also collected online as well. Then, it is analysed using descriptive analysis such as mean and standard deviation by IBM SPSS Statistics 24.

RESULTS AND DISCUSSION

A reliability test has been conducted for all items and the result has shown in Figure 1 and 2 that the Cronbach alpha for these items are .932. This test indicated that these items are reliable to measure the perception and students' motivation toward interactive multimedia in online distance learning.

Reliability Statistics	
Cronbach's	
Alpha	N of Items
.932	23

Figure 1: Reliability Statistics on Perception of Students Towards Interactive Multimedia during Online Distance Learning

Reliability Statistics	
Cronbach's	
Alpha	N of Items
.932	13

Figure 2: Reliability Statistics on Motivation of Students Towards Interactive Multimedia during Online Distance Learning

This study found out there is various platforms used by students as one of their tools in online distance learning. Figure 3 showed that 23% of students preferred to use social media such as Facebook, and 22% of students preferred to use themed PowerPoint. Furthermore, only 7% of students chose to use gamification as a tool and 2% to use Powtoon.

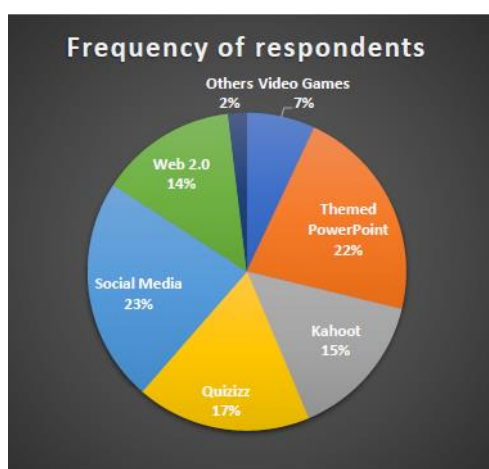


Figure 3: Type of interactive multimedia preferred by the students

In measuring the perception of students in using interactive multimedia while teaching mathematics in online distance learning, students mostly agree that multimedia made the learning process become fun. It is being shown that the highest mean (4.17) for this item. Students also agreed that graphics made learning mathematics easy to understand and they also agreed that putting some interactive learning in the lecture can make the subject more interesting. Furthermore, students also agreed that interactive multimedia in teaching mathematics can improve the quality of learning. This result is shown in Table 1.

Table 1: Mean of students' perception of interactive multimedia

	Mean	Std. Deviation
Multimedia made learning fun	4.17	.900
Graphics made it easy to understand	4.09	.830
Improving the quality of learning	3.95	.845
Learning environment become more interesting	3.85	.880
Subject acceptance become more flexible	3.86	.841
Including some interactive learning in the lecture made the subject more interesting	4.01	.674
Being able to respond anonymously encourages me to respond	3.97	.758

I often respond when I am asked to call out an answer	4.01	.759
I generally find interactive learning activities help my studies	3.87	.761

Meanwhile, students feel motivated by interactivity in online learning which makes them study better in Mathematic. Also, the interactive module made them highly motivated to learn and explore more knowledge. These are shown in Table 2 where these two items scored high mean (4.03 and 4.01) compared to other items. Students also felt that computer-based teaching activities make them enjoy the learning session which the mean score is 3.99. Interactive content also plays an important role to motivate the students to learn Mathematics using online distance learning as shown that the mean score for this item is 3.99. Generally, students feel motivated to learn Mathematics using online distance learning as long as the interactive multimedia is implemented in the lesson.

Table 2: Mean of students' motivation towards interactive multimedia

	Mean	Std. Deviation
Do computer-based teaching activities make lessons more enjoyable?	3.99	.785
Does using multimedia technology every time make lessons interesting?	3.82	.968
I find learning interesting and engaging	3.83	.842
I found the module useful for learning	3.93	.756
Multimedia increases my motivation to learn	3.85	.833
Interactivity helps me learn better	4.03	.797
This interactive learning module had motivated me in learning or exploring more knowledge	4.01	.674
The content always held my attention	3.99	.732

The finding of this study showed students show a positive perception of interactive multimedia in learning Mathematics during online distance learning. This result is consistent with another study which showed the same result where most of the students perceived multimedia courseware as an effective method of learning mathematics through online distance learning[4]. In addition, similar results from another study also showed positive feedback on the effectiveness of interactive learning has been generated to create interest in learning were found[18][21]. It is proven that interactive multimedia is one of the effective and practical learning media used in online distance learning. As a learning medium, learning interactive multimedia have a positive effect on the cognitive, affective and psychomotor aspects of students in the learning process. Consequently, students get excited and focus more on paying attention to the presented material during the teaching and learning process.

For motivation, this study showed that the students have high motivation in learning Mathematics using interactive multimedia during online distance learning. It can be seen that the highest rating is interactivity helps students to learn better. Students agreed that the course program was useful and made it very interesting and feel engaging to learn mathematics. Thus, motivation can be one of the major factors that could affect the learning process and achievements in learning and it is necessary to understand the level of motivation of students in the e-learning environment [14].

CONCLUSION

This study will give a huge impact on teachers and pre-service teachers since they need to know the suitable method to be used during online distance learning for the students. This study also will give an idea to the mathematics teachers in delivering different methods of teaching during online distance learning. Thus, Mathematics teachers can take this idea to interactive multimedia to be used in delivering the lesson to make it interesting and can be more understood by students.

This research has a positive impact on all educational institutions, including primary schools, secondary schools, colleges, and universities. This is due to the fact that this research contributes to institutional understanding of how to improve interactive multimedia for process teaching and learning in online distance learning. By hosting more webinars on advice or sharing about the deployment of interactive multimedia on Mathematics courses, the institution will be able to create more content for interactive multimedia on such subjects.

Therefore, researchers would like to recommend that to continue this research with a pre-post study. In this case, there will be Mathematics questions that need to be answered by respondents before using interactive multimedia and after using interactive multimedia in the teaching and learning process to look after the result of students before and after. Hence, accurate data on the effectiveness of teaching methods using interactive multimedia during online distance learning can be measured.

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