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The Perspectives of Mathematics Pre-Service Teacher Student Toward the Use of Educational Games in Mathematics Learning

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Abstract. The purpose of this study was to determine the perspective of mathematics education college students or preservice mathematics teachers on the use of educational games in mathematics learning at schools. This research is a descriptive study with a quantitative approach. The research subjects were 48 college students in mathematics education. Student perspective data were obtained through a questionnaire given, then the data were tabulated and analyzed. The results showed that 93.75% of students agreed with the use of games in learning mathematics. The reasons students agree with the use of games are students become interested in learning, learning becomes fun, students do not get bored, game technology needs to be utilized in learning activities, the topic is easy to understand, students can learn while playing, games can increase learning interest, learning becomes not monotonous, students become enthusiastic about learning, current learning must be more modern, students are not surfeited about learning, games are following the current digital era, can be a media of learning, effective in learning, increase students' creative thinking, reduce the negative effects of handphone, students become challenged, and students are more relaxed to learn.

Keywords: Educational Game; Mathematics Game; Mathematics Learning

Abstrak. Tujuan dari penelitian ini adalah untuk mengetahui perspektif mahasiswa pendidikan matematika atau calon guru matematika terhadap penggunaan game edukasi pada pembelajaran matematika di sekolah. Penelitian ini merupakan penelitian deskriptif dengan pendekatan kuantitatif. Subjek penelitian merupakan mahasiswa pendidikan matematika yang berjumlah 48 mahasiswa. Data perspektif mahasiswa diperoleh melalui angket yang diberikan, kemudian data ditabulasi dan dianalisis. Hasil penelitian menunjukkan bahwa 93,75% mahasiswa setuju dengan penggunaan game pada pembelajaran matematika. Alasan mahasiswa setuju dengan penggunaan game adalah siswa menjadi tertarik pada pembelajaran, pembelajaran menjadi menyenangkan, siswa tidak bosan belajar, teknologi game perlu dimanfaatkan dalam kegiatan pembelajaran, materi mudah dipahami, siswa dapat belajar sambil bermain, game meningkatkan minat belajar, pembelajaran menjadi tidak monoton, siswa menjadi semangat belajar, pembelajaran sekarang harus lebih modern, siswa tidak jenuh belajar, game sesuai dengan zaman digital sekarang, dapat menjadi media pembelajaran, efektif pada pembelajaran, meningkatkan pemikiran kreatif siswa, mengurangi efek negatif handphone, siswa menjadi tertantang, dan siswa lebih santai belajar.

Kata kunci: Game Edukasi; Game Matematika; Pembelajaran Matematika

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Volume 3, Nomor 2, November 2020 *p-ISSN 2620-8903*

INTRODUCTION

Learning outcomes and students' math abilities are important points that must be considered in the world of mathematics education. This can indicate the quality of human resources who will compete in the future. Various methods are used in the world of mathematics education to produce students who have mathematical abilities and satisfying mathematics learning outcomes.

Mathematics education in Indonesia needs to make various efforts to improve student learning outcomes. One of them is through the use of learning media that suits the needs of students (Ariyanto, Aditya & Dwijayanti, 2019). Learning media is useful for effective communication and interaction between teachers and students in the learning process (Wati, 2016). One of the media that can be used to learn mathematics is a math education game.

Math education games are alternative media that can be used to learn effectively (Abdullah & Yunianta, 2018). Mathematics learning can be supported by this media, especially now that students are used to using mobile phones that provide game applications. In addition, games are learning media that can make students learn while playing, so that learning becomes fun.

Several studies have been conducted and show the benefits of using educational games in mathematics learning. Research conducted by Setyadi (2017) found that the android-based quiz game can increase student motivation when working on math problems. Also, Bernard (2015) also found that student skills can be improved through games, such as communication skills and mathematical reasoning. Furthermore, students' cognitive mathematical abilities and concept mastery can be improved (Pramesti, Aryuna, Sudjatmiko, & Mardiyana, 2014).

Although various research results of learning mathematics with games show good results, educational games have not been popularly used by teachers as a learning medium. Even though educational games can support effective mathematics learning. Through educational games, learning is more fun than traditional methods, it also allows students to enjoy the learning process and increase student interest (Munoz, Kevitt, Lunney, Noguez, & Neri, 2011). The teacher's ability to use game media when the learning process in the classroom must also be considered.

Based on the above background, this study aims to determine the perspective of mathematics education students as prospective mathematics teachers on the use of educational games in mathematics learning in schools. It is necessary to know various aspects that can support learning using games, one of which is the perspective of prospective mathematics teachers.

METHOD

This research is a descriptive study with a quantitative approach. The research aims to describe with numbers then describe it and provide conclusions about the object under study. The

EDUMATIKA: Jurnal Riset Pendidikan Matematika *e-ISSN 2620-8911*
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research is located at a state university in the city of Mataram, West Nusa Tenggara. The research participants were third-semester mathematics education students, totaling 48 students, consisting of 11 male students and 37 female students. Student participants are prospective mathematics teachers in schools at the junior and senior high school levels. Students have received various courses related to education and mathematics, so they can have a deeper perspective regarding learning mathematics.

This study used a research instrument in the form of a participant perspective questionnaire as a prospective mathematics teacher on the use of educational game media in classroom learning. The questionnaire used consisted of questions about the identity of the participants, related to the teaching experience of the participants to see their backgrounds, and questions about the participants' perspectives on the use of games in mathematics learning. Lecturers as well as experts have validated the questionnaire made so that the questionnaire is suitable for use in research.

The data used in this study were collected through a questionnaire instrument that has been made. Questionnaires were given to students to obtain data on students' teaching experiences and their perspectives on educational games. The data obtained were tabulated quantitatively and then described. This research lasted for two months.

RESULTS AND DISCUSSION

Most of the students as research subjects in this study have teaching experience. The various places and teaching experiences of students are presented in Table 1.

Table 1. Number and Percentage of Student Teaching Places

Teaching Place	Number of Students	Percentage
School	7	14,58%
Tutoring	5	10,42%
Private Tutoring	9	18,75%
Home Teaching	15	31,25%
Teaching The Family	11	22,92%
Teaching The Neighbors	3	6,25%
Teaching Friend	1	2,08%
Community Service Activities	1	2,08%
Never Teaching	3	6,25%

Based on Table 1, it can be seen that students have experience teaching mathematics in various places. Most students have experience teaching in their homes. Students who have taught in schools are not permanent teachers but are community service activities or organizations that they participate in. The data above also shows that only 25% of students have a large number of student teaching experiences (teaching in schools and tutoring). Most students have experience teaching students in small groups.

EDUMATIKA: Jurnal Riset Pendidikan Matematika *e-ISSN 2620-8911*
Volume 3, Nomor 2, November 2020 *p-ISSN 2620-8903*

Data on student teaching places based on gender can be seen in Table 2. The results of the questionnaire show that male students teach at home the most. Meanwhile, female students also taught at home the most.

Table 2. Number and Percentage of Student Teaching Places by Gender

Teaching Place	Male		Female	
	Number	Percentage	Number	Percentage
School	1	9.09%	6	16.22%
Tutoring	1	9.09%	4	10.81%
Private Tutoring	1	9.09%	8	21.62%
Home Teaching	3	27.27%	12	32.43%
Teaching The Family	2	18.18%	9	24.32%
Teaching The Neighbors	0	0.00%	3	8.11%
Teaching Friend	1	9.09%	0	0.00%
Community Service Activities	1	9.09%	0	0.00%
Never Teaching	1	9.09%	2	5.41%

The research questionnaire also provides questions about student consent if classroom learning uses math games. Most students agree with the use of math games in class. Table 3 shows that as many as 93.75% of students agreed to use math games, while 3 students disagreed (6.25%). This shows that students as prospective mathematics teachers have a good perception of games that can be used as learning media.

Table 3. Number and Percentage of Students who Agree on Learning using Games

Game Use Agreement	Male		Female		Total	Percentage
	Number	Percentage	Number	Percentage		
Agree	10	90.91%	35	94.59%	45	93.75%
Disagree	1	9.09%	2	5.41%	3	6.25%

Several reasons were also put forward by students who agreed with the use of math games. The reasons are 1) students become interested in learning; 2) learning becomes fun; 3) students are not bored with learning; 4) game technology needs to be used in learning activities; 5) the material is easy to understand; 6) students can learn while playing; 7) games increase interest in learning; 8) learning is not monotonous; 9) students become enthusiastic about learning; 10) learning now must be more modern; 11) students are not tired of learning; 12) games according to today's digital age; 13) games can be a learning medium; 14) the use of games is effectively used in learning; 15) games can improve students' creative thinking; 16) the use of games reduces the negative effects of handphone; 17) students become challenged; and 18) students are more relaxed in learning. Table 4 shows the number and percentage of students based on reasons.

EDUMATIKA: Jurnal Riset Pendidikan Matematika *e-ISSN 2620-8911*
Volume 3, Nomor 2, November 2020 *p-ISSN 2620-8903*

Table 4. Number and Percentage of Students' Reason for Agreeing if Learning Using Games

No	Reason	Number of Students	Percentage
1	Students become interested in learning	15	31.25%
2	Learning becomes fun	14	29.17%
3	Students do not get bored of studying	14	29.17%
4	Game technology needs to be used in learning activities	14	29.17%
5	The material is easy to understand	10	20.83%
6	Students can learn while playing	5	10.42%
7	Games increase interest in learning	4	8.33%
8	Learning is not monotonous	4	8.33%
9	Students become enthusiastic about learning	3	6.25%
10	Current learning must be more modern	2	4.17%
11	Students are not bored with learning	2	4.17%
12	Games are in line with today's digital age	1	2.08%
13	Can be a medium of learning	1	2.08%
14	Effective at learning	1	2.08%
15	Improve students' creative thinking	1	2.08%
16	Reduces the negative effects of handphone	1	2.08%
17	Students become challenged	1	2.08%
18	Students are more relaxed in the learning	1	2.08%

Table 4 shows that students mostly agree to use math games because learning using math games makes learning interesting (31.25% of students). Interesting mathematics learning can support learning activities. One student (M7; Teaching The Family) argued that students would get bored easily if learning was done only with a monotonous method, learning would usually feel boring. It takes an interesting thing or an interesting method such as (using) educational game media". Anikina dan Yakimenko (2015) also revealed that interactive pedagogy such as educational games can convince students that learning becomes interesting and entertaining.

In addition to making students interested in learning, 29.17% of students thought that math games could also make learning fun. In addition, students will not get bored easily if they learn using math games. The opinion of one female student (F18; Home Teaching) suggested that with educational games learning was more fun. Besides, the fear and mindset of students who think of mathematics as a difficult and boring subject will disappear or decrease with the presence of educational games. It can be said, games are a solution to overcome student boredom when learning.

Furthermore, the use of technology in mathematics learning is essential. A total of 14 students agreed with this. Mathematical games are a form of utilizing technology in mathematics learning. Brown (2017) states that technology must be integrated into learning by teachers. The use of technology can also make it easier for students to understand math material. A total of 10 students argued that it was easier for students to understand the material if they learned to use games. One student (F15; Home Teaching) revealed that today cannot be separated from technology. With the existence of learning mathematics in the classroom using game media can make it easier for students to understand. Games can also (make students) less tense in learning

EDUMATIKA: Jurnal Riset Pendidikan Matematika *e-ISSN 2620-8911*
Volume 3, Nomor 2, November 2020 *p-ISSN 2620-8903*

mathematics and make lessons more fun. Following the research conducted by Hakim dan Sari (2019) that learning to use games can improve students' mathematical abilities. This shows that students can easily understand the material through games to improve student abilities.

Students also argue that through math games, students not only play but can also learn to gain knowledge (10.42% of students). Student interest in learning (8.33% of students) and enthusiasm for learning (6.25% of students) can also be improved if learning mathematics uses games. Bertacchini, Bilotta, Pantano, dan Tavernise (2012) revealed that students' abilities and interests can be increased through educational games. Students (M8; Home Teaching) give reasons that students will tend to have high learning interest when using media, both visual and audio. Moreover, the current curriculum requires students to be active. So the media like this is very good.

As many as 8.33% of students agree that learning is not monotonous when using math games. Also, learning with games facilitates more modern learning. Some students (4.17%) agree that learning now has to be more modern and this can be done through games. Learning that is more modern and not monotonous can cause students not to be bored in taking part in learning. This was also expressed by several students. As many as 4.17% of students thought that students became unsaturated in learning math games.

Students in this study also argue that learning media that are suitable for today's digital age are games. This is in line with the opinions of other students that today is the age of technology so that games are suitable media to support mathematics learning. Learning game technology also makes classroom learning more modern when compared to traditional learning.

Learning mathematics can be effective is one of the reasons put forward by students. Sorathia dan Servidio (2012) suggests that effective student learning can be achieved by using technology. One student also argued that students' creative thinking could be improved if students learned math games. Students also become challenged to complete games and are more relaxed when studying. Besides, the use of handphone games as a learning medium can reduce the negative effects of using a handphone. Students not only use cellphones to play games or find entertainment, but students can also use cellphones to learn through math games.

Furthermore, Table 5 shows the number and percentage of reasons students agree if learning uses games based on gender.

EDUMATIKA: Jurnal Riset Pendidikan Matematika *e-ISSN 2620-8911*
Volume 3, Nomor 2, November 2020 *p-ISSN 2620-8903*

Table 5. Number and Percentage of Students' Reasons to Use Games based on Gender

Reason	Male		Female	
Number	Number	Percentage	Number	Percentage
1	3	27.27%	12	32.43%
2	2	18.18%	11	29.73%
3	1	9.09%	13	35.14%
4	1	9.09%	12	32.43%
5	2	18.18%	8	21.62%
6	0	0.00%	5	13.51%
7	2	18.18%	2	5.41%
8	2	18.18%	2	5.41%
9	0	0.00%	3	8.11%
10	0	0.00%	3	8.11%
11	1	9.09%	1	2.70%
12	1	9.09%	0	0.00%
13	0	0.00%	1	2.70%
14	0	0.00%	1	2.70%
15	0	0.00%	1	2.70%
16	0	0.00%	1	2.70%
17	0	0.00%	1	2.70%
18	0	0.00%	1	2.70%

Several other students expressed various opinions about the use of math educational games. There are several reasons students agree and disagree. Table 6 and Table 7 show the explanation of students' reasons (Note: M = male; F = female).

Table 6. Some Reasons Students Agree with Math Games

Subject	Reason
M1; Home Teaching	"Learning becomes fun. Nowadays, enjoyable learning is needed. Fun learning will make students study hard and easy to understand."
M5; Never Teaching	"The development of technology is one of the factors that can be used for new learning models. One of them is with this game media. With this game-based learning, it might encourage students to be more interested in mathematics."
M9; Home Teaching	"Nowadays, the digital age, so most of them use technology and students cannot separate from handphones, but when using technology they don't forget to also use textbooks."
F12; Tutoring	"It will increase students' interest in learning mathematics. Because if only with that book it will be very boring, especially mathematics is a subject that students rarely like."
F28; Teaching The Neighbors	"Most students have been taught that mathematics is complicated, difficult, so they were lazy from the start to learn mathematics. Gadgets are now one of the things that take up learning time. If games on cellphones/gadgets can be collaborated with learning, why not."
F33; Tutoring	"By the experience, I have done, most of the children like games. So, if there is a game in which there are elements of mathematics, it can make it easier for students to understand mathematics and students will not be bored."

Table 7. Some Reasons Students Disagree with Math Games

Subject	Reason
M2; Teaching Friend	"Learning that uses technology like cellphones will make it difficult for students to focus. Most students will look for other things besides what the teacher tells them to do. This learning also requires good control by the teacher and this is most difficult to do."
F13; School And Private Tutoring	"Many children do not understand technology (game). Indeed, more people understand the educational game, but what about children who still don't understand."
F22; Tutoring	"Games may make children happy in learning, but this will make them rely on educational games only. When the teacher asks the child to learn in a normal way again, the child will be lazy or bored because they are already dependent on educational games."

EDUMATIKA: Jurnal Riset Pendidikan Matematika *e-ISSN 2620-8911*
Volume 3, Nomor 2, November 2020 *p-ISSN 2620-8903*

CONCLUSIONS

Based on the results of the study, it can be concluded that most students or prospective mathematics teachers agree that mathematics learning is supported by learning media in the form of educational games. Several reasons put forward by students related to the use of games, namely 1) Students became interested in learning; 2) Learning becomes fun; 3) Students are not bored with studying; 4) Game technology needs to be used in learning activities; 5) The material is easy to understand; 6) Students can learn while playing; 7) Games increase interest in learning; 8) Learning is not monotonous; 9) Students become enthusiastic about learning; 10) Current learning must be more modern; 11) Students are not tired of learning; 12) Game according to today's digital age; 13) Can be a medium of learning; 14) Effective at learning; 15) Improve students' creative thinking; 16) Reducing the negative effects of handphone; 17) Students become challenged; and 18) Students are more relaxed in learning. Meanwhile, further research related to games needs to be done to see the effectiveness of using math games.

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EDUMATIKA: *Jurnal Riset Pendidikan Matematika* *e-ISSN 2620-8911*
Volume 3, Nomor 2, November 2020 *p-ISSN 2620-8903*

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