Math Educational Game (GEMA) Based on CAI (Computer Assisted Instruction) in Learning Simple Counting for Mentally Impaired Students

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Abstract: Counting is a basic skill in mathematics. Counting skills need to be taught in early childhood. The mentally retarded have problems in mastering the ability to count. This study aims to describe the effect of using CAI-based mathematics education game (GEMA) media in learning simple arithmetic for mentally retarded students. A total of five subjects were students with mild mental retardation at Special School C Autism Kedungkandang State. In the study using the pre-experimental method in the form of one group pretest and posttest design, the data were obtained through the results of the pretest and posttest. Then the data is processed through analysis of hypothesis testing using the Wilcoxon Signed Rank Test technique. The results of the study explained that the average value of the pretest and posttest. each worth 51 and 81. With the results of the hypothesis test obtained the value of Asymp.Sig. (2-tailed) of 0.041, it can be concluded that H1 is accepted and H0 is rejected. Thus, the CAI-Based Mathematical Education Game (GEMA) has an effect on improving simple arithmetic skills in mentally retarded students.

Keywords: Math educational game, simple arithmetic skills, mild mental retardation

INTRODUCTION

Education is one of the processes of a person to gain knowledge. Science plays an important role in human life, as well as in developing the abilities and potentials that exist in humans. Mathematics is one of the fields of science that is taught at all levels in schools. Mathematics is a science that is abstract and interrelated with one another. According to Elea Tinggih in Suherman, (2003), mathematics is a science that is obtained by reasoning. Meanwhile, according to Johnson and Myklebust in Abdurrahman (2003), mathematics is a symbolic language that has a practical function to express quantitative and spatial relationships.

Counting is part of mathematics that can develop children cognitive. Counting According to Nurtiani, (2015), namely the ability to connect objects with the concept of numbers, starting from the number one. Meanwhile, according to Nurhasanah (2007), counting is an activity of doing a count such as adding, subtracting, etc. The ability to count is very important given to children at an early age. This can help children to develop children's reasoning abilities from an early age. In addition, counting can help children to solve problems of daily life (Lestari, 2014). Mentally retarded children are children who experience obstacles and mental developmental retardation is far brought on average in such a way that they experience academic difficulties (Efendi, 2018), while according to Ramadhan (2013) mentally retarded children are individuals who have intellectual mental disorders. Because of the limitations that mentally retarded children have, they have poor numeracy skills. However, in the mild mentally retarded group, numeracy skills can be improved, according to Apriyanto, (2012) children with mild mental retardation or children who are able to educate, namely children who still have the ability to work. Delays in numeracy skills can be caused by influencing factors according to Hidayat (2015) including internal factors and external factors.

Internal factors are factors that exist within the child in the form of motivation, maturity, learning styles that are unique.

The ability to count in mild mentally retarded children can be developed with several special services, including the use of media that attracts mentally retarded children to learn, one of which is by utilizing learning media that are games or games. According to Anggra in Effendi Siti Dina, (2017) a game or game is something that can be played with certain rules so that there are winners and losers, usually in a non-serious context with the aim of refreshing. Games that can be used in the learning process are educational games. According to Bahri in Nugroho (2011) educational games are all types of games that aim to create an educational environment for the benefit of the students while according to Prensky, (2005), educational games are games that are designed to learn, but can still offer play and fun. It can be concluded that educational games are games that have been specifically designed to teach students a certain lesson, to create an interesting learning and still not eliminate the role of the teacher in learning. Teachers can use modern systems such as CAI (Computer Assisted Instructional) based learning. According to Arsyad (2009) that CAI media is a form of computer-assisted learning. CAI-based math education games (GEMA) can make it easier for mentally retarded children to develop simple counting skills. Based on the explanation above, this study utilized CAI-based Math Educational Game (GEMA) media as a means to improve simple numeracy skills 1-10 in mentally retarded children.

METHOD
This study used a pre-experimental design in the form of a one group pretest and posttest design. according to Sugiyono (2015) pre-experimental design is a type of experimental design research that has not been serious. This study aims to describe (1) the simple counting ability of mentally retarded students before using the CAI-based Mathematics Education Game (GEMA), (2) the simple arithmetic ability of mentally retarded students after using the CAI-based mathematics education game (GEMA), and (3) the effect of using the game. CAI-based Mathematics Education (GEMA) on the simple arithmetic ability of mentally retarded students. The dependent variable in this study is simple arithmetic ability, while the independent variable is a CAI-based mathematics education game (GEMA).

This research is located in Special School C Autism Negeri Kedungkandang, Malang, East Java. The study was conducted in April-May 2022. The subjects in this study consisted of five students with mild mental retardation. The five subjects presented in table 1.

Table 1. List of Research Subjects

No.	Name	Gender
1	MN	Female
2	MZF	Male
3	WCP	Male
4	CAB	Male
5	MAG	Male

Data acquisition was obtained by giving a test twice, namely pretest and posttest. According to Siyoto, et al (2015) the test was given to determine initial skills and acquisition or achievement. The test that was tested had 20 questions with four aspects, including choosing the same numbers, sorting numbers, matching numbers with words, and matching numbers with the number of objects that included counting the numbers 1-10. The

measurement in this research uses value. Each question has a weight value of 5 so that the value obtained by the subject is 100.

The implementation of the treatment uses software in the form of a CAI-based Mathematics Education Game (GEMA) and hardware in the form of a laptop as a tool to play the game. GEMA media has followed the validation stage by experts, each consisting of 2 media experts and 2 practitioners. The final validation score for the GEMA learning media is declared valid and can be used as a research instrument. The following is a display from the front page of the CAI-based Mathematics Education Game (GEMA) presented in Figure 1.

Figure 1. Home page display of CAI-based Mathematics Education Game (GEMA)

The data analysed in this study is in the form of nonparametric statistical data, according to Sugiyono (2015) nonparametric statistics is a test method where the data to be analysed does not have to be normally distributed so it does not require a lot of assumptions. This study uses a hypothesis test using the Wilcoxon Signed Rank Test technique (Roni et al, 2020). This test was used to determine the effect of the CAI-based Mathematics Education Game (GEMA) on the simple arithmetic ability of mentally retarded students. Decision making is taken when the Asymp.Sig value <0.05 then H1 is accepted and H0 is rejected and if the Asymp.Sig value>0.05 then H1 is rejected and H0 is accepted.

RESULT AND DISCUSSION
Result(s)
Simple numeracy data were obtained from the results of the pretest given before treatment using the CAI-based Mathematics Education Game (GEMA) media. The pretest activity was carried out once with a total of 20 questions with 2 answer options for each question within a period of 60 minutes. There were four aspects that were tested, including choosing the same number, sorting the numbers, matching numbers with words, and matching numbers with the number of objects that included counting the numbers 1-10. The results of the pretest are presented in table 2.

Table 1. Pretest Results

No.	Name	Pretest Score
1	MN	40
2	MZF	60
3	WCP	65
4	CAB	45
5	MAG	45
Total Number		255
Average value		51

It can be seen from the table above, that the pretest score on the simple arithmetic ability of mentally retarded students before being given treatment received an overall score of 255 so that an average score of 51 out of 5 students could be obtained, with WCP students getting the highest score of 65 and MN students. got a value of 40. The treatment is given by applying the Mathematics Education Game (GEMA). The meeting was held 4 times for 2x30 minutes. The MN and CAB subjects were very enthusiastic about using the game during the treatment and the WCP and MAG subjects followed the treatment well. on MZF subjects tend to get bored easily when using games.

Figure 2. Implementation of Treatment

Table 3. Posttest Results

No.	Name	Pretest Score
1	MN	75
2	MZF	80
3	WCP	85
4	CAB	85
5	MAG	80
Total Number		405
Avarage Value		81

It can be seen from the table above, that the posttest score on the simple arithmetic ability of mentally retarded students after being given treatment received an overall score of 405 so that an average score of 81 out of 5 students could be obtained, with WCP and CAB students getting the highest score of 85 and MN students got the lowest score of 75.

Table 4. Data Analysis Results

		N	Mean Rank	Sum of Ranks
Post-test / Pre-test	Negatuve Ranks	0[a]	.00	.00
	Positive Ranks	5[b]	3.00	15.00
	Ties	0[c]		
	Total	5		

The Wilcoxon Signed Ranks Test method was chosen to test the research hypothesis. Based on the Rank table. It is known that Negative Ranks is 0 which means there is no decrease in the value of the pre-test and post-test results from 5 subjects, Positive Ranks is 5

which means there is an increase in the pre-test and post-test results from 5 subjects and Ties is 0 which means there is no similarity in the pre-test and post-test scores of each. each subject.

Table 5. Hypothesis Test Results

	Post-test / Pre-test
Z	-2.041^{b}
Asymp. Sig. (2-tailed)	.041

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

Based on the table of hypothesis test results . Given the value of Asymp.Sig. (2-tailed) is 0.041. Because the value of 0.041 is smaller than 0.05, it can be concluded that the hypothesis is accepted. This means that there is a difference between the results of the pretest and posttest, so it can be concluded that the use of the CAI (Computer Assisted Instructional)-based Mathematics Education Game (GEMA) can be said to have an effect on the simple arithmetic ability of mentally retarded students.

Discussion
Based on the results of the initial pre-test before getting treatment. Most students have difficulty in understanding the concept of counting. It can be seen from the average score obtained by 51 out of 5 students. It's almost about choosing the same numbers, sorting numbers, matching numbers with words, and matching numbers with the number of objects. From these difficulties, it can be concluded that mentally retarded students do not understand the material given during the learning process. Mentally retarded students are children with intellectual disabilities. Which causes the mentally retarded child to have difficulty understanding and managing information. According to Soemantri, (2007) Intellectual limitations in mentally retarded children tend to be less in learning information, adapting, thinking abstractly, creatively and critically.

Mathematics is an abstract science and students are intended to use reason to process information so that it becomes whole. According to Suherman (2003), mathematics is a science that is obtained by reasoning. Meanwhile, according to Wahyudi (2013) mathematics is a science that studies abstract concepts that are arranged using symbols and is a language that is exact, accurate, and free from emotions. From the statement above, it can be concluded that in learning mathematics it is necessary to have a basic understanding in order to help mentally retarded children to reason. Counting is a basic part of learning mathematics. Counting According to Nurtiani, (2015) is the ability to connect objects with the concept of numbers, starting from the number one. Counting in children has several purposes, including helping children recognize numbers and recognize simple mathematics in everyday life. Meanwhile, according to Suarni in (Purnomo et al, (2019) counting is an activity or a fun way to learn to understand the concept of numbers. In Grade 1 mentally retarded students at Special School C Autism Negeri Kedungkandang, simple arithmetic skills are still lacking. It can be seen that students with mental retardation in grade 1 have not been able to choose the same numbers, sort numbers, match numbers with words, and match numbers with the number of objects. This is because mentally retarded students do not fully know the symbols for numbers 1-10 and spelling words from numbers 1-10 well.

In improving students' numeracy skills. the selection of material that is appropriate to the child's ability is an important factor in providing mathematics learning to mentally retarded children. According to Mirawati, (2017) the concept of learning mathematics should be adapted to the needs and stages of child development, including the selection of learning approaches to be implemented. Meanwhile, according to Wardhani, (2017) The material and

mathematical concepts taught must be adapted to the abilities and thinking stages of the child concerned so that it builds children's natural curiosity about shapes, sizes, quantities, other basic concepts in mathematics. In addition, the selection of media is an equally important factor to help encourage students' numeracy skills to increase, by growing motivation to learn from within students. Monotonous media will make students bored quickly. so it is necessary to consider choosing media in accordance with the opinion of Arsyad, (2014) which states that the use of appropriate and varied media can overcome student boredom in learning. The CAI-based mathematics education game media (GEMA) is suitable for use because game media can stimulate all sensory children so that children are directly involved during the learning process.

The treatment process is given four times. In the treatment process, the main focus in giving treatment is to help improve the simple counting ability of mentally retarded children, especially in understanding the material of choosing the same numbers, sorting numbers, matching numbers with words, and installing numbers with the number of objects independently. During the treatment process the students looked enthusiastic and showed their interest in counting material with the help of CAI-based mathematics education game media (GEMA). According to Bahri in Nugroho (2011) educational games are all types of games that aim to create an educational environment for the benefit of the students. Although it is a game, the teacher also plays an important role in helping to strengthen and guide students during the learning process, so that they can achieve the goals to be achieved.

The post-test activity was carried out after giving treatment to 5 subjects, using a CAI (Computer Assisted Instructional)-based mathematics education game (GEMA). There was an increase in post-test scores. It can be seen from the average score obtained by 81 out of 5 students. This can be caused by the provision of effective treatment and the use of tools such as media that attract students' interest during the learning process. Interesting media and help add motivation to students to learn mathematics. According to Turmudi (1999) learning motivation is a very important factor for students to have. Motivation can be seen from the enthusiasm and involvement of students in the treatment process with mathematics education game media (GEMA).

The effect of using CAI (Computer Assisted Instructional)-based mathematics education games (GEMA) on the simple counting ability of mentally retarded students in grade 1 at Special School C Autism Kedungkandang can be seen from the results of data hypothesis testing. Where there is a change seen from the results of the pre-test and post-test scores. The choice of CAI-based mathematics education game media (GEMA) is one of the factors that has an impact on increasing student scores. CAI-based math educational games (GEMA) have the advantage that students can play while learning. Playing according to Morison (in Rasyid, 2009) is a very important part of children's lives in their growth and development, playing makes children have many experiences in their lives. And playing supports children in cognitive development so as to help children reach the next level (Casey, Reeves, & Conner (2012). Assistive technology can helpful in supporting the ability to access electronic learning resources (Andipurnama, Wiguna, Susetyo, & Novianti, 2022) and improving the problem-solving abilities (Suprotun, & Andriyani, 2022). Meanwhile, according to Suyadi, (2009) which states that the play while learning approach has advantages, which involve student activity in learning because learning through games invites every student to try new things. From the above opinion, it can be concluded that playing while learning has a goal so that children can enjoy the learning process comfortably so that children can understand the material being taught. Playing according to Rasyid, (2009) is an activity physical and psychological aspects that involve the five senses, especially hearing and vision and involve

the brain. In line with this opinion, according to Arsyad, (2007) children who learn by utilizing all their senses will succeed in obtaining good knowledge, which facilitates understanding of the material. and increase interest in learning for mentally retarded students in learning to count. Learning by playing can also explore students' creativity in learning. In other hand, online platforms are intertwined and that this could be a new approach to promoting culture within the mathematics learning process (Peni, 2022).

The simple arithmetic ability of mentally retarded students in grade 1 of Special School C Autism Kedungkandang has increased after using the CAI-based math education game (GEMA). the delivery of material using the CAI-based mathematics education game (GEMA) media showed success. Where students can operate the game well and students can absorb the material in the game. Which means that there is an effect of using CAI-based math education games (GEMA) on the simple counting ability of mentally retarded students in grade 1 Special School C Autism Negeri Kedungkandang marked from the post-test results which showed an increase value compared to the pre-test value before being given treatment.

CONCLUSSION

Based on the presentation of the research results, the use of CAI-based Math Educational Game (GEMA) media as a means to improve simple numeracy skills 1-10 in mentally retarded children. have an impact on children's numeracy skills, proven by (1) The simple counting ability of mentally retarded students in Class 1 at Special School C Autism Negeri Kedungkandang before being given treatment was still lacking in terms of choosing the same numbers, sorting numbers, matching numbers with words, and putting numbers with objects 1-10, (2) Ability simple counting students with mental retardation Grade 1 At Special School C Autism Negeri Kedungkandang after being given treatment or treatment experienced an increase in aspects of choosing the same numbers, sorting numbers, matching numbers with words, and placing numbers with objects 1-10, and (3) Use of media The CAI (Computer Assisted Instructional)-based Mathematics Education Game (GEMA) has an effect on the ability to do simple arithmetic in Grade 1 mentally retarded students at Special School C Autism Negeri Kedungkandang.

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