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The Effectiveness of Visual Number Card Media in Enhancing the Counting Skills of Students with Mild Intellectual Disabilities

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Abstract: This study aimed to examine the extent to which the use of pictured number card media influences the counting ability of students with mild intellectual disabilities at the Special School (Sekolah Khusus/Fauzan SKh) in Serang Regency. the primary research question was whether the use of pictured number card media had a significant effect on the counting skills of students with mild intellectual disabilities at Fauzan Special School. The hypotheses of this study comprised a null hypothesis (Ho), which stated that the media had no effect on the students' counting skills, and an alternative hypothesis (H1), which posited a significant effect. The study employed a pre-experimental method using a one-group pretest-posttest design. The population consisted of 23 students with special needs, from which a sample of 10 students with mild intellectual disabilities was selected. Data were collected through tests, observations, and documentation. The results, analyzed using the Wilcoxon Matched Pairs test at a significance level of 0.05, yielded ap-value of 0.005. Since this value was less than 0.05, the null hypothesis (Ho) was rejected. These findings indicated that the use of pictured number card media significantly improved the counting skills of students with mild intellectual disabilities.

Keywords: visual number card; counting ability; mild intellectual disabilities

A. Introduction

Education is a right for every citizen, including children with special needs. Children with physical or mental disabilities in society can be categorized into various types and characteristics based on the specific challenges they face. One group of children with special needs that requires particular attention in the learning process is students with mild intellectual disabilities. According to the results of the Stanford-Binet and Wechsler (WISC) tests, individuals with mild intellectual disabilities have an IQ range of 50–70. They belong to a group whose intelligence and social adaptability are limited; however, they still possess the ability to progress in academic learning (Minsih, 2020). Although students with mild intellectual disabilities have intellectual capacities slightly below average, they still have the potential to grow and learn, particularly in fundamental areas such as numeracy skills. Counting is the process of recognizing and determining the number of objects by associating them with numerical concepts, starting from the number one (Malapata & Wijayanigsih, 2019).

Numeracy skills are a fundamental foundation in everyday life. Mastery of number concepts and basic arithmetic operations enables individuals to solve practical problems,

manage simple finances, and participate more actively in social environments. For students with mild intellectual disabilities, the development of counting abilities is not only crucial for future academic success but also for fostering independence and enhancing their overall quality of life.

However, the process of learning to count for students with mild intellectual disabilities often faces challenges. Their cognitive characteristics, such as shorter attention spans, difficulty with abstraction, and slower learning pace require a more concrete, visual, and engaging instructional approach. Conventional teaching methods, which tend to be abstract and verbal, are often less effective in stimulating the understanding of counting concepts in students with mild intellectual disabilities. Therefore, in this context, the use of appropriate learning media plays a crucial role in influencing students' interest in learning mathematics.

Various studies have demonstrated the effectiveness of using visual media in enhancing conceptual understanding among students with special needs. For instance, research conducted by Danang showed that the use of dot cards had a positive impact on the counting abilities of students with intellectual disabilities (Purnomo et al., 2019), Similarly, Hidayat and Machdarini found that students' numeracy skills improved when using counting media such as tasbih bead bags (Machdarini & Hidayat, 2021). Ika and Faiz utilized Busy Books to train counting skills in students with intellectual disabilities, which also proved effective in enhancing their numeracy abilities (Puspitasari & Noormiyanto, 2021). Furthermore, Jimenez reported that the use of story-based learning media can foster the development of students' numeracy skills through Story-Based Math (Jimenez, B. A., & Kemmery, 2013). Therefore, based on these previous studies, it can be concluded that students with intellectual disabilities have the potential to develop their numeracy skills, provided that the appropriate teaching strategies are employed, one of which includes the use of effective learning media

One of the media that can be used in mathematics learning, particularly in teaching counting skills, is pictorial number cards. These cards contain images, text, numbers, or symbols that help remind students of concepts related to the images displayed. According to Fitriani et al., pictured number cards are effective for helping lower-grade students recognize numerical symbols ((Fitriani et al., 2022) ; (Gunardi et al., 2022)) and they can enhance elementary students' understanding of number concepts (Nurfitri et al., 2022). However, the use of pictured number cards in teaching number concepts has mostly been tested on students without special needs. Research that specifically examines the effect of pictured number cards on the counting abilities of students with mild intellectual disabilities remains relatively limited. Therefore, this experimental research entitled "The Effectiveness of Pictured Number Card Media on Improving the Counting Ability of Students with Mild Intellectual Disabilities" is considered important to conduct. This study aims to empirically examine whether the use of pictured number card media has a positive impact on improving the counting skills of students with mild intellectual disabilities. The findings of this research are expected to make a significant contribution to the development of more effective and innovative counting instruction strategies for students with mild intellectual disabilities, as well as to provide a foundation for the creation of instructional media that better meet their specific needs.

B. Methods

This study used a pre-experimental approach with a one-group pretest-posttest design, as it involved only one group without a control group (Rukminingsih et al., 2020). The population consisted of 23 students enrolled at Fauzan Special School (*Sekolah Khusus/SKh*) in Bojonegara, Serang Regency, Banten Province. A purposive sampling technique was used to select 10 students identified as having mild intellectual disabilities.

The intervention process involved three main stages: (1) administering a **pretest** to assess the students' initial counting abilities, (2) implementing the treatment using pictured number card media, and (3) conducting a **posttest** to evaluate any changes in their performance.

Data were collected using validated and reliable test instruments, alongside observations and documentation. The data were analyzed using both descriptive and inferential statistical methods. Descriptive statistics involved calculating the mean and N-Gain scores to determine the degree of improvement. For hypothesis testing, the Wilcoxon Matched Pairs Test was employed due to the small sample size and the non-normal distribution of the data. The hypotheses were as follows:

H_o: $\mu_1 = \mu_2$

$H_{a:}$ $\mu_1 > \mu_2$

H_o : There was no difference in the students' counting skills before and after the use of pictured number card media.

H_a : The students' counting skills after the use of pictured number card media was significantly better than before.

C. Results and Discussion

The study's findings included both descriptive statistics of students' counting skills and the results of hypothesis testing. The pretest and posttest scores showed a marked improvement in performance following the use of the pictured number card media.

1. Results of Descriptive Statistical Analysis of Pretest and Posttest

Table 1. Mean Scores of Pretest and Posttest

Student	Scores of Pretest	Scores of Posttest
S1	50	86
S2	33	67
S3	50	86
S4	17	50
S5	17	50
S6	33	67
S7	33	86
S8	33	67
S9	17	50
S10	17	67
Mean	30	67.7

Based on the information in Table 1, it can be seen that the students' counting skills improved significantly, with the average score increasing from 30 to 67.7. an improvement of 37.7 points. To further examine the extent of this improvement, an N-Gain test was conducted using the following formula.

$$N - Gain = \frac{Score\ of\ post\ test - Score\ of\ pre\ test}{ideal\ score - score\ of\ pretest}$$

By inputting the pretest and posttest scores, information was obtained regarding the category of improvement in each student's counting skills as well as that of the group as a whole, as shown in Table 2 below.

Table 2. N-Gain of Students' Counting Skill Improvement

Student	Scores of Pretest	Scores of Posttest	N-gain	Category
S1	50	86	0.72	High
S2	33	67	0.50	moderate
S3	50	86	0.72	High
S4	17	50	0.39	moderate
S5	17	50	0.39	moderate
S6	33	67	0.50	moderate
S7	33	86	0.79	High
S8	33	67	0.50	moderate
S9	17	50	0.39	moderate
S10	17	67	0.60	moderate
Rata-Rata N-Gain			0.55	moderate

Based on the table 2, it is obtained that 3 people (30%) experienced improvement in the high category and 7 people (70%) in the moderate category. Meanwhile, when viewed overall, the average improvement falls into the moderate category.

2. Hypothesis Testing

For the process of generalizing conclusions, hypothesis testing was then carried out using a non-parametric statistical test, namely the Wilcoxon Matched Pairs test, using SPSS 20. The Wilcoxon Matched Pairs test was used for samples that came from the same subjects or the same class. This hypothesis test was conducted to determine whether there was a significant difference in the average results between the pretest and posttest. The decision rule for the hypothesis test using the Wilcoxon Matched Pairs test is as follows:

a. If the sig. value (2-tailed) < 0.05, there is a significant difference between the learning outcomes in the pretest and posttest data.
b. If the sig. value (2-tailed) > 0.05, there is no significant difference between the learning outcomes in the pretest and posttest data

Table 3. Wilcoxon Matched Pairs Test Output

Test Statistics[a]

	POSTEST - PRETEST
Z	-2.820[b]
Asymp. Sig. (2-tailed)	.005

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

From the data processing, it was obtained that the Sig. value (2-tailed) was 0.005 < 0.05, so it can be concluded that there was a significant difference between the learning outcomes in the pretest and posttest data. Therefore, based on these results, it shows that there was a significant effect of the picture number card media on the counting skills of students with mild intellectual disabilities

3. Discussion

The data analysis results in this study consistently show a significant effect of using picture number card media on improving the counting ability of students with mild intellectual disabilities. The average increase in students' counting ability from 30 to 67.7 after the implementation of this media indicates the effectiveness of picture number cards as a substantial learning aid. The difference of 37.7 points quantitatively illustrates how this media positively contributes to the understanding of number concepts and basic arithmetic operations in students.

Furthermore, the results of the N-Gain test provide a deeper perspective on the level of improvement experienced by the students. The majority of students (70%) showed improvement in the moderate category, while a small portion (30%) achieved improvement in the high category. Although the average improvement overall falls into the moderate category, this distribution shows that the picture number card media can have a positive impact on most students in the research group, with some students demonstrating remarkable progress. This suggests that the media has the potential to accommodate varying levels of students' initial understanding.

The hypothesis test results, which revealed a significance value (Sig.(2-tailed)) of 0.005, lower than the set significance level ($\alpha = 0.05$), provided strong evidence that the difference between the pretest and posttest data is significant. Thus, it can be concluded that the intervention using picture number card media significantly influences the counting skills of students with mild intellectual disabilities.

Picture number card media offers an interesting and promising alternative for addressing learning challenges in students with mild intellectual disabilities. The picture number cards combine numerical representation with concrete visualization through images. This combination can help students with mild intellectual disabilities better understand number concepts, associate number symbols with quantities, and increase their interest and motivation in learning to count. These findings align with learning principles that emphasize the importance of using visual and concrete media to facilitate understanding of abstract concepts, especially for students with learning difficulties or special educational needs, such as mild intellectual disabilities ((Park et al., 2020) ; (Saunders et al., 2016)). The combination of

numbers and images in this media also has the potential to enhance students' imagination, engagement, motivate them to learn, and assist in processing information more effectively (Sanusi et al., 2020).

The implications of this study have significant practical relevance in the context of inclusive education. These findings provide empirical support for educators, therapists, and other stakeholders to consider and implement picture number card media as an effective learning strategy to improve the counting ability of students with mild intellectual disabilities. The use of this media can be a valuable alternative or complement to traditional teaching methods, which may be less suitable for the learning styles and needs of students with these characteristics. Previous research also shows the effectiveness of using visual media in improving mathematics comprehension for students with special needs ((Hastuti et al., 2023) ; (Wijayanti et al., 2022))

Although the results of this study showed a significant effect, it still had some limitations, such as the relatively small sample size (n=10), which may limit the generalization of the findings to a larger population. In addition, the experimental design was less rigorous because it uses a pre-experimental design. To achieve stronger validity, future research is necessary, involving a larger number of participants and using a more rigorous experimental design. Furthermore, future studies could explore other aspects, such as the impact of the duration of media use, variations in the design of the picture number cards, and the integration of this media with other learning strategies to achieve more optimal results.

Overall, this study makes a valuable contribution to understanding the effectiveness of picture number card media as a tool to improve the counting ability of students with mild intellectual disabilities. Strong evidence from both descriptive and inferential analysis indicates that this media has great potential to support the development of mathematical skills in students with special needs. These findings encourage the adoption of visual and concrete media in inclusive education practices and open opportunities for further research to optimize its use in various learning contexts

D. Conclusion

Based on the data analysis that has been conducted, it can be concluded that there is a significant effect of using picture number card media on improving the counting skills of students with mild intellectual disabilities. This is supported by several key findings. First, there was a significant improvement in the average counting ability of students, from 30 at the pretest stage to 67.7 at the posttest stage, with an increase of 37.7 points. Furthermore, the N-Gain analysis showed that the majority of students (70%) experienced improvement in counting ability in the moderate category, while a smaller portion (30%) showed improvement in the high category. Overall, the average improvement in students' counting skills falls into the moderate category. The hypothesis test results showed a significance value (Sig.(2-tailed)) of 0.005, which was smaller than the significance threshold (α=0.05). This indicates that there was a real and significant difference in the average counting skills of students before and after using the picture number card media.

Therefore, the results of this study provide empirical evidence that the use of picture number card media is effective in improving the counting ability of students with mild intellectual disabilities. These findings imply that visually engaging and concrete media, such as picture number cards, can be a valuable alternative or complement in mathematics learning strategies for students with such characteristics.

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