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The influence of collaborative constructivist approaches on improving science learning outcomes in slow learners in elementary school

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Abstract. This research is motivated by the low value of science learning outcomes for students who are slow to learn, compared to those of their peers. This study aims to investigate how the collaborative constructivist approach can enhance science learning outcomes and effectively apply it to meet the learning needs of students who are slow learners. The method used is an experimental quasi-design in the form of a Nonequivalent control group design. The population in this study consisted of 42 children, divided into 18 children from 2 treatment elementary schools and 24 children from 2 control elementary schools. Data was obtained from the results of the Pretest and post-test. The use of non-parametric statistical analysis techniques involves two statistical test techniques: the Mann-Whitney test and the Wilcoxon signed rank test. The study results indicate that the collaborative constructivist approach can enhance natural science learning outcomes for children with learning difficulties in inclusive elementary schools. Proven through the analysis test of the Mann-Whitney statistical test and the Wilcoxon Signed Rank Test, the result is significant at 0.000 < 0.05. means there is a practical difference in improving natural science learning outcomes. Thus, teachers need to be equipped with related training on mastering the collaborative constructivist approach in teaching slow learners in inclusive elementary schools to strengthen their mastery of concepts and the development of the potential possessed by slow learners, as needed, and to enable them to enjoy the presence of other children socio-psychologically.

Introduction

Children with special needs are children who have emotional, physical, or social disorders, or have the potential for intellectual disability and special needs. Children with special needs have the right to learn alongside their peers, which is the purpose of special education. Children with special needs are entitled to quality services and the broadest possible opportunities at every level of inclusive education (Farah Arriani, 2022; Widana et al. 2023a). Science education at the elementary school level plays an essential role in shaping students' foundational scientific understanding of the natural phenomena around them (Rahmawati, 2018). However, in practice, the achievement of science learning outcomes still shows quite a significant disparity, especially among students with special learning needs such as slow learners (Utami, 2018). Marked by below-average cognitive ability but still within the normal range, slow learner students often struggle to understand abstract and

systemic science concepts. This impacts their low learning motivation, active participation, and learning outcomes that are significantly lagging compared to those of regular students.

Several studies have shown that the application of a constructivist approach in a collaborative atmosphere can significantly improve learning outcomes, critical thinking skills, and active participation of students, including those in special learning needs groups. Therefore, it is important to explore and apply this approach in a more structured and systematic way in science learning at the elementary level, especially for slow learner students, in order to create an inclusive, adaptive, and meaningful learning process (Lestari & Rachmawati, 2024; Widana eta al., 2023b).

An inclusive elementary school is a formal education unit at the basic education level that serves children with special needs. It is where they can receive education with other children and enjoy learning together, participating, and achieving according to their potential. Based on data from the Regional Development Planning Agency of Yogyakarta Province of Indonesia, which the researcher has processed, it is presented in Image 1:

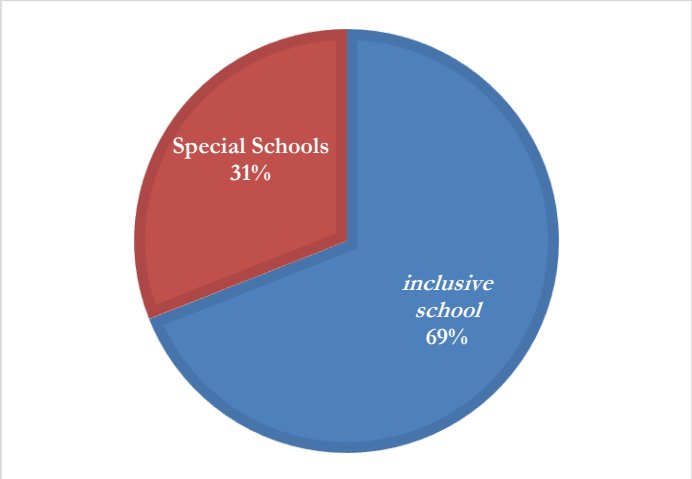

Image 1. School for Students with Special Needs

Image 1. Shows that most (69%) of students with special needs are educated in inclusive schools, and only a small part (31%) are in special schools or have not attended school.

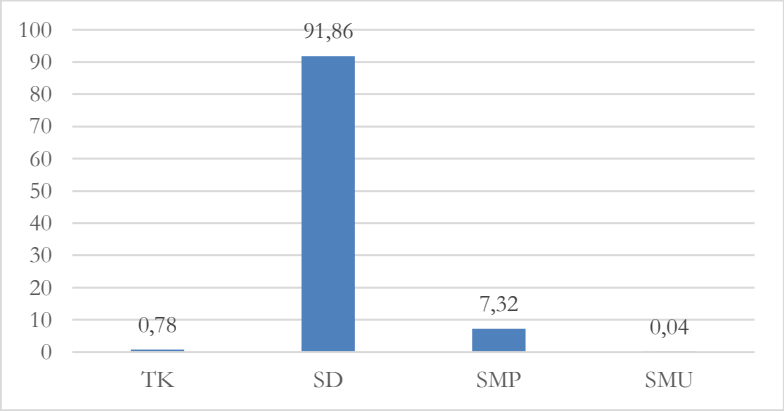

Image 2. Level of Education

Image 2. Most (91.86%) students with special needs in each school level in Yogyakarta Province of Indonesia at the elementary level, while the others are in junior high school (7.32%),

kindergarten (0.78%), and public high school (0.04%). Data on students with special needs at the elementary school level processed by researchers from the Youth and Sports Education Office in Yogyakarta Province, Indonesia, are presented in Image 3:

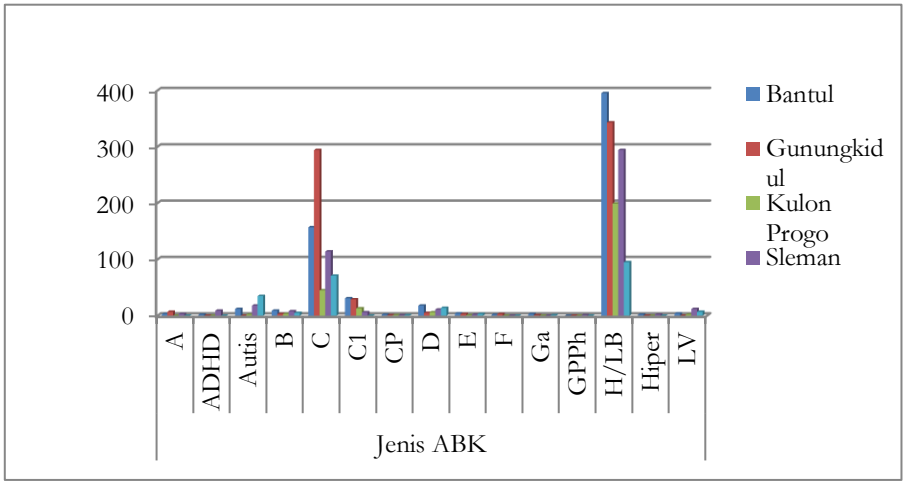

Image 3. Prevalence of Students with Special Needs

Image 3. The prevalence of students with special needs attending elementary school is the type of student who is slow to learn the most out of all the students with special needs. One of the most common disabilities experienced by students with special needs in inclusive schools is slow learning (Cahyono et al., 2024). Slow learners is a term for students who experience slow learning, so the student takes longer than students with average intelligence in general (Amelia, 2016; Ru'iya et al., 2023; Citrawan et al., 2024).

In addition, slow learners are also students with special needs who have intellectual limitations and obstacles to mastering concepts. They also have the same characteristics as children with learning disabilities and learning difficulties, but have different causes (Lee et al., 2023). Slow learners have IQs ranging from 70 to 90, requiring more exercise intensity to repeat the subject matter and meet the everyday demands of education. Slow learners must also receive services tailored to their learning needs, allowing their learning outcomes to align with their potential and enabling them to engage with their peers. Therefore, slow learners are still eligible to learn together with students in general with special treatment (Ru'iya et al., 2023; Sumandya et al., 2023).

Research conducted by Uswatun Hasanah Junaid on Learning Management for Slow Learner Students was carried out in February-March at Bangunrejo 2 Public Elementary School in Yogyakarta, with sources from class teachers and special guidance teachers for grade 4. The results of this study indicate that the learning management for slow learner students includes planning, implementation, strategies, and evaluation of learning (Junaid, 2021). In the classroom, we encounter various types of students. Some grasp concepts like lightning striking, while others take their time like flowers blooming slowly. Slow-learner children are part of that diversity. They are not incapable, but they need different strategies and time. However, in science lessons, especially on the concepts of the digestive system and the respiratory system, they lag far behind regular students. This is because science learning requires abstraction, logical processes, and systemic understanding.

Basic concepts in Natural Sciences, such as the digestive system and respiratory system, require high logical, analytical, and visualization thinking skills. Conventional teacher-centered learning strategies are still predominantly applied, providing less room for exploration and deep meaning-

making for slow learners. As a result, they struggle to construct their understanding and tend to memorize without truly understanding the scientific processes being studied. Research conducted by Wiranda Bayu Aditama regarding the implementation of learning and solutions for slow learners in inclusive schools. This study concludes that although schools implement an inclusive education system, there are still gaps in meeting the special needs of slow learners, which require more attention in terms of curriculum adjustment, methods, and assessment of learning to achieve optimal results (Aditama, 2025).

Natural science learning outcomes emphasize the ability to master concepts, provide direct learning experiences, strengthen procedural skills, and high-level reasoning with scientific methods (Chusni et al., 2022). Natural science learning outcomes are billed through learning outcomes entrusted to each question item, measuring the learning competencies students must achieve at the end of each phase. Learning outcomes are values achieved in numbers, letters, or symbols after being tested at the end of each learning (Ishak & Suyatno, 2020). However, some science materials are considered quite tricky when it comes to mastering quite complex concepts coupled with the names and functions of various organs, especially in the organ system in humans, both in the form of the circulatory system, digestive system, and respiratory system, as well as their mixed properties and constituent components in daily life.

Mastering concepts and providing direct learning experiences in science learning can make slow learners feel less confident and challenged when encountering abstract concepts. In addition, some of the problems that slow learners often face are related to the same services as those of other children. Although their learning needs differ, teachers' learning approaches remain classical and lack innovation to meet the needs of slow learners. This lack of training in supporting children with slow learning needs makes it challenging for teachers to implement effective learning strategies.

Teachers in inclusive elementary schools lack experience in applying a collaborative constructivist approach, necessitating training to meet the learning needs of slow learners and enhance their potential, as well as natural science learning outcomes. This research is necessary because it can reveal the effectiveness of the collaborative constructivist approach in improving natural science learning outcomes, especially for slow learners in inclusive elementary schools. This research explores how the collaborative constructivist approach can explain science learning that is carried out effectively and meets the learning needs of slow learners.

Method

This type of research uses quantitative research in the form of a quasi-experimental design. The design employs pre-tests and post-tests. The population and sample in this study consist of 42 children, which includes 18 children from the treatment school and 24 children from the control school, while the sampling technique used is saturated sampling.

The data collection technique uses instruments in the form of a pre-test and a post-test consisting of short answer questions. The validity is tested by involving experts in relevant fields to assess the suitability of the question items with the learning objectives through a checklist, testing the correlation between the scores of short answer questions and scores from other validated instruments, and asking students for their opinions on the clarity of the questions. The reliability is tested by re-evaluating the students' work (re-test) in the same group using Cronbach's Alpha formula to measure consistency. The difficulty level of the questions is based on the responses from slow learner students and calculated using the difficulty level formula $P\frac{B}{N}$ to ensure that the desired level of difficulty can be achieved.

The use of non-parametric statistical analysis techniques through 2 statistical test techniques, namely: (a) Mann-Whitney Test, which aims to determine the difference in learning outcomes between two independent groups (free), between the treatment group and the control group, both for initial learning outcomes and final learning outcomes; and (b) The Wilcoxon Signed Rank Test aims to determine the difference in learning outcomes between two paired groups, both in the treatment group and the control group. The use of non-parametric tests is based on considerations: differences in science learning outcomes between slow learner children in the treatment group and the control group. There are variations in the intelligence levels of slow learner children. There are variations in the number of subjects in each class. There are variations in the competencies of science subjects among each slow learner child.

Results and Discussion

The results of the analysis of 12 questions in the science learning outcome ability test for slow learners in inclusive elementary schools are as follows:

Validity of question items

The results of the validity of 12 questions tested on 42 slow learners are presented in Table 1.

Table 1. Question Item Validity

No	Correlation				Information	Category
	Question	N	Sig. (2-tailed)	Pearson Correlation Skor Total		
1.	Number 1	42	0.000	0.635**	Valid	High
2.	Number 2	42	0.000	0.681**	Valid	High
3.	Number 3	42	0.000	0.486**	Valid	sufficient
4.	Number 4	42	0.000	0.626**	Valid	High
5.	Number 5	42	0.000	0.631**	Valid	High
6.	Number 6	42	0.000	0.644**	Valid	High
7.	Number 7	42	0.000	0.512**	Valid	sufficient
8.	Number 8	42	0.000	0.609**	Valid	High
9.	Number 9	42	0.001	0.365**	Valid	Low
10.	Number 10	42	0.000	0.650**	Valid	High
11.	Number 11	42	0.000	0.545**	Valid	sufficient
12.	Number 12	42	0.000	0.581**	Valid	sufficient

From Table 1. The validity of the question items shows that all questions from numbers 1 to 12 are valid. The validity category for item 9 is low; points 3, 7, 11, and 12 are sufficient, and items 1, 2, 4, 5, 6, 8, and 10 are high. Based on the item validity in Table 1, it is proven that all short-answer items (12) are valid. This means that all of them can be used.

Reliability butir soal

The reliability results of 12 questions tested on 42 slow learners are presented in Table 2:

Table 2. Reliability Statistics

Cronbach's Alpha	N of Items
.809	12

Table 2. Shows that Cronbach's alpha value is 0.809. This means that all test items are reliable and have a high degree of reliability.

Ability to differentiate question items

The results of the discriminating power index of 12 questions tested on 42 slow learners are presented in Image 4:

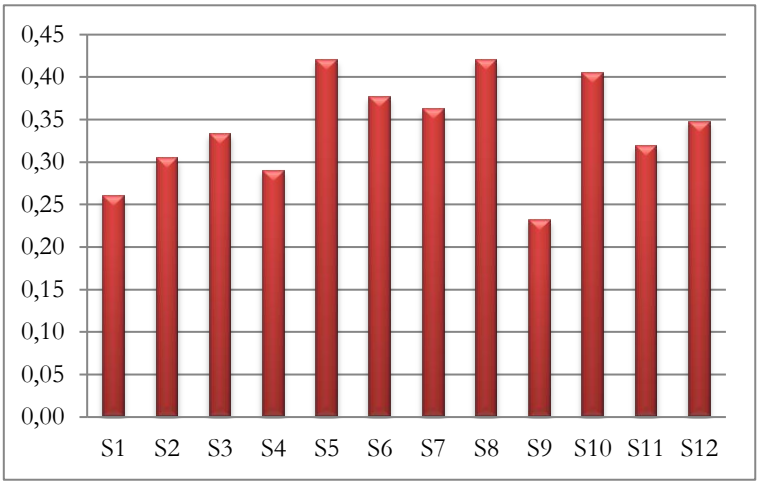

Image 4. The Discriminating Power Index of 12 Questions Tested

In Image 4. The discrimination index showed that all questions from numbers 1 to 12 were in the range $0.20 \leqslant D < 0.40$ and $0.40 \leqslant D < 0.70$. This means that all question items in the category are sufficient and suitable. Based on image four about the index of distinguishing power from the 12 tested question items, it indicates that all question items can identify variations in the abilities of slow learner children, measuring how well slow learner children understand the concepts taught, allowing teachers to design more effective questions so that they can provide feedback, improve the quality of learning, and direct the quality of teaching more specifically to slow learner children.

Level of difficulty of question items

The results of the difficulty index of the 12-item test item tested on 42 slow learners are presented in Image 5:

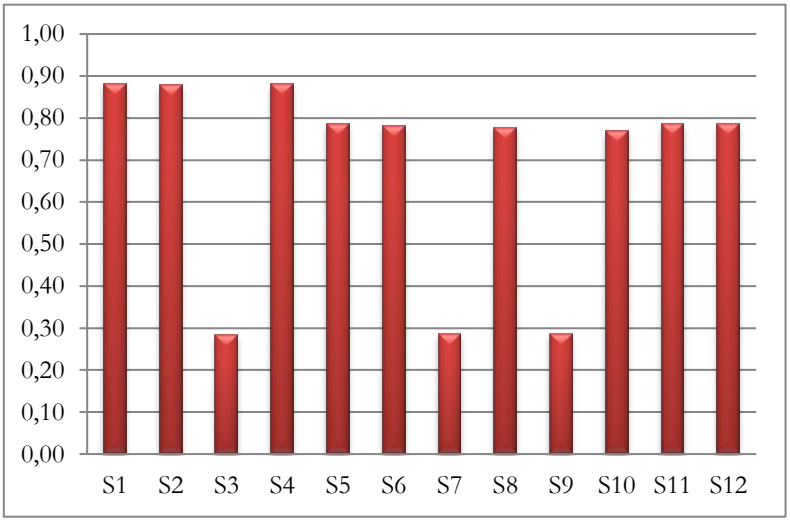

Image 5. Question Item Difficulty Index

Image 5. The difficulty index shows that all questions from 1 to 12 are proportional. This is evidenced by items 1, 2, and 4, which are 25% in the easy category; questions 5, 6, 8, 10, 11, and 12 are 50% in the medium category, and questions 3, 7, and 9 are 25% in the difficult category.

Based on image 5. Related to the difficulty level of the test items, it proves that the questions are in the ideal category because they align with the learning objectives where the questions have a higher weight.

The implementation of a pseudo-experiment in this study aims to determine the effectiveness of the collaborative constructivist approach in enhancing natural science learning outcomes, particularly for slow learners in inclusive elementary schools. However, previously, the teachers were given training with the following steps: 1) The implementation was carried out on four inclusive elementary schools consisting of 2 schools as treatment and two as control, 2) The treated school consisted of 18 slow-learner children, while the elementary school used as a control consisted of 24 slow-learner children, 3) The treatment was carried out in 2 schools as a treatment by holding training for high-class teachers (grades IV, V, and VI), Special Assistant Teachers, and school principals related to the implementation of a collaborative constructivist approach in improving natural science learning outcomes, especially for slow learners in elementary schools. In comparison, the two schools were not given training as a control, 4) The training materials include the concept of slow learner children, inclusive education, identification and assessment, curriculum suitability analysis, and a collaborative constructivist approach in developing science learning skills for slow learner children in elementary school, 5) Teachers in treatment and control schools identify slow learners and document intelligence test score data for each slow learner child, 6) Teachers in treatment and control schools give initial science tests in classes with slow learners, 7) Teachers in treatment schools analyze curriculum suitability in science subjects by considering the ability of slow learners. Furthermore, they implement a collaborative constructivist approach to developing science learning skills for slow learners, arranging seats and dividing discussion groups, 8) Teachers plan and carry out science learning for slow learner children, which ends with posttest, 9) The learning outcomes of science for slow learners are adjusted to the learning level by reporting the results of observations of mixed properties and their constituent components in daily life.

Based on the results of data collection in four schools that were used as experimental locations for slow learners related to the level of general intelligence and science learning outcomes, both before and after the learning intervention, as presented in Table 3:

Table 3. Data on Science Learning Outcomes for Slow Learners

No.	Science Learning Outcomes					information
	Value interval	Pretest		Postest		
		Frequency	Percentage	Frequency	Percentage	
1	≤ 50	7	39%	0	0%	
2	51 - 60	11	61%	3	17%	2 treatment
3	61 - 70	0	0%	7	39%	schools
4	71 - 80	0	0%	8	44%	
Total		18	100%	18	100%	
5	≤ 50	19	79%	0	0%	
6	51 - 60	5	21%	23	96%	2 control
7	61 - 70	0	0%	1	4%	schools
8	71 - 80	0	0%	0	0%	
Total		24	100%	24	100%	

Table 3 shows that the number of slow learner children at the experimental location was 42, consisting of 18 treatment school children and 24 control school children.

The effectiveness of implementing the collaborative constructivist approach at the research site was analyzed using statistical tests in the pretest and post-test results in both the treatment and control schools. The two techniques were used for data analysis in the trial at the research site, namely: 1) Data analysis using percentage analysis techniques to determine the percentage of the number of slow learner children who experienced an increase in learning outcomes after treatment by comparing the value of each subject between before and after treatment, and 2) Conducting data analysis using nonparametric statistical analysis techniques by considering that the researcher had difficulties In meeting the requirements for conducting parametric statistical tests because the research subjects in slow learner children have variations in intelligence levels, variations in the achievement of science subject competencies in each child, variations in the number of subjects in each class are not the same, and so on.

Nonparametric statistical analysis techniques were used, along with two statistical test techniques: 1) the Mann-Whitney Test. This aims to determine the differences in learning outcomes of the two groups independently between the treatment group and the control group, both in the initial and final learning outcomes; and 2) the Wilcoxon Signed Rank Test, which aims to find out the difference in learning outcomes between two paired groups, both the treatment group and the control group.

The analysis of science learning outcome data at the research location can be described as follows: (1) The effectiveness of implementing the collaborative constructivist approach in increasing natural science learning outcomes, especially for slow learners in elementary schools, is based on differences in learning outcomes.

Differences in science learning outcomes of slow learners in the treatment group.
The percentage of increase in science learning outcomes of slow learner children in the treatment group, both before and after the treatment, is presented in Image 6:

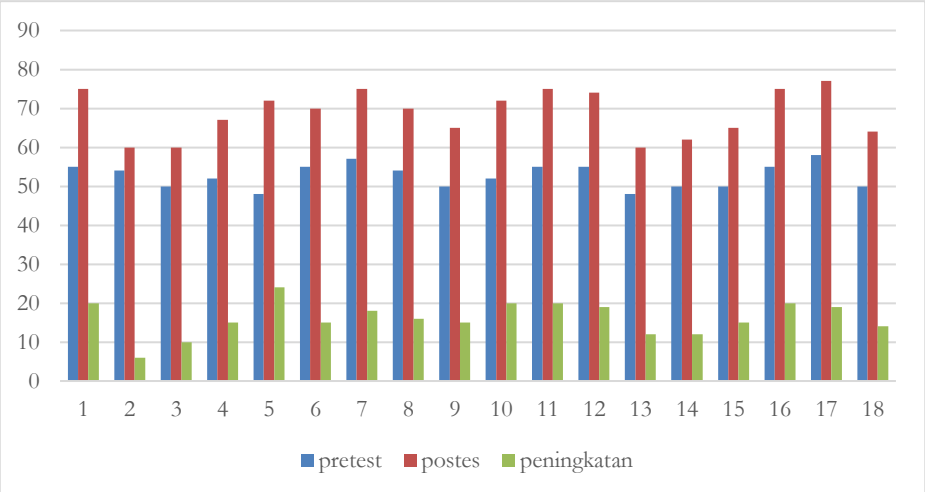

Image 6. Analysis of the Percentage of Improvement in Science Learning Outcomes in the Treatment Group

Based on Table 4, it is known that: (1) Of the 18 slow learner children in the treatment group, the average initial learning outcome was 52.67, while the average final learning outcome was 68.78; (2) The percentage of development of science learning ability from the beginning to the final learning outcome was 30.59%; and (3) all slow learner children improved their learning (100%).

(2) Differences in science learning outcomes for slow learner children in the control group.
The percentage of development of science learning ability of slow learner children in the control group, both before and after treatment, is presented in Image 7:

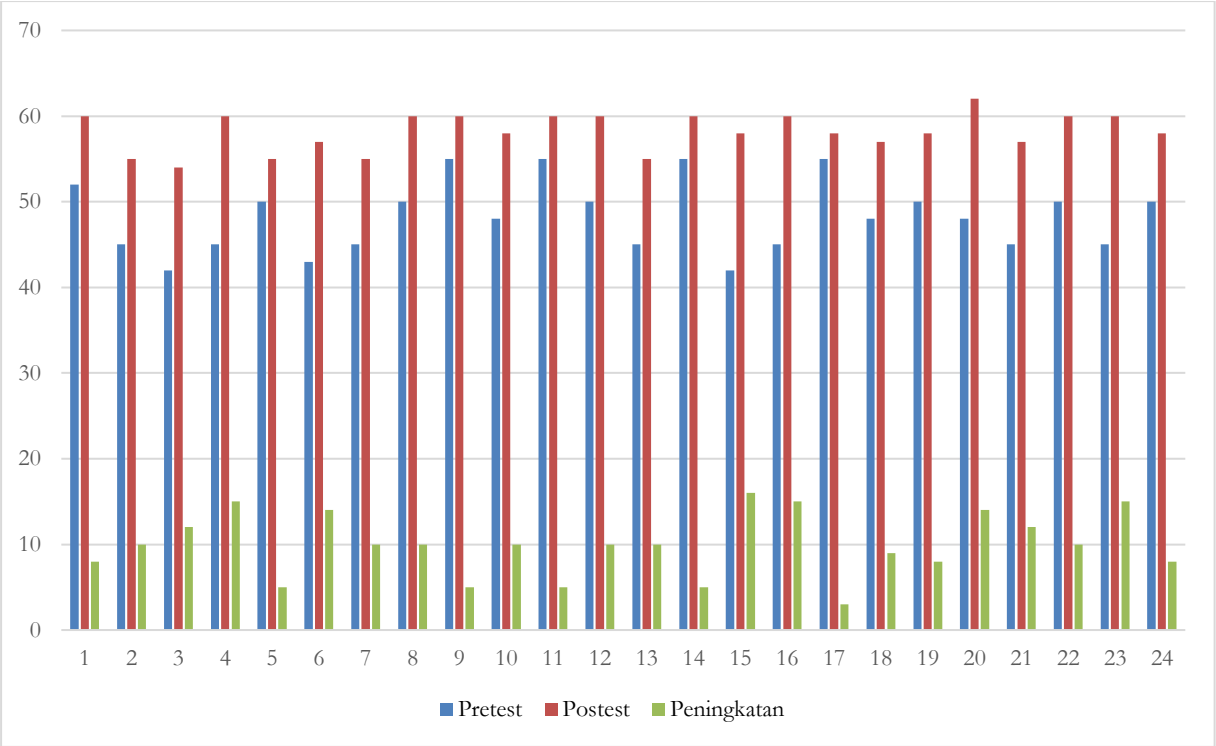

Image 7. Analysis of the Percentage of Improvement in Science Learning Outcomes of the Control Group

Based on Image 7, it is known that: (1) Of the 24 slow learner children in the control group, the average initial learning outcome was 48.25, while the average final learning outcome was 58.21; (2) The percentage of initial science learning outcomes to final learning outcomes is 20.64%; and (3) all slow learner children improved their learning (100%).

The effectiveness of implementing the collaborative constructivist approach in increasing natural science learning outcomes, especially for slow learners in inclusive elementary schools, is based on the results of nonparametric statistical calculations. The stages of data analysis of science learning outcomes in slow learner children include: a) descriptive analysis of data on the initial and final learning outcomes of the treatment and control groups, b) Testing the differences in the initial learning outcomes of the treatment and control groups, c) Testing the differences in the final learning outcomes of the treatment and control groups, d) Testing the differences in the initial and final learning outcomes of the treatment groups, and e) Testing the differences in the initial and final learning outcomes of the control group.

The results of the nonparametric statistical analysis were carried out as follows:

Pretest in the treatment and control groups.
A descriptive analysis of the Pretest of slow learners in the treatment and control groups is presented in Table 4:

Table 4. Descriptive Analysis of the Pretest of Slow Learners

Descriptive Statistics	N	Minimum	Maximum	Mean	Std. Deviation
Pretest of the treatment groups	18	48	58	52.67	3.049
Pretest of the control groups	24	42	55	48.25	4.142
Valid N (listwise)	18				

Based on Table 4, the average value was not much different between the treatment group (52.67) and the control group (48.25).

Nonparametric statistical results with Mann-Whitney for the Pretest of slow learners in the treatment and control groups are presented in Table 5:

Table 5. Mann-Whitney of Pretest of Slow Learners

Test Statistics	Pretest
Mann-Whitney U	92.000
Wilcoxon W	392.000
Z	-3.207
Asymp. Sig. (2-tailed)	.001

a. Grouping Variable: groups

Table 5 shows that the Pretest of slow learners in the two groups differs from an Asymp. Sig. (2-tailed) value of 0.001 and a Z value = -3.207.

Post-test in the treatment and control groups

A descriptive analysis of the post-test of slow learners between the treatment and control groups is presented in Table 6:

Table 6. Descriptive Analysis of Postest of Slow Learners

Descriptive Statistics	N	Minimum	Maximum	Mean	Std. Deviation
Post-test of the treatment groups	18	60	77	68.78	5.966
Post-test of the control groups	24	54	62	58.21	2.187
Valid N (listwise)	18				

Table 6 shows that the post-test in slow learners obtained an average score of 68.78, better than that of the control group (58.21).

Nonparametric statistical results with Mann-Whitney for post-test of slow learners in the treatment and control groups are presented in Table 7:

Table 7. Mann-Whitney of Postest of Slow Learners

Test Statistics	Postest
Mann-Whitney U	18.500
Wilcoxon W	318.500
Z	-5.106
Asymp. Sig. (2-tailed)	.000

a. Grouping Variable: groups

Table 7 shows that the postest of slow learners in both groups are different, with Asymp scores. Sig. (2-tailed) of 0.000 and Z value = -5.106.

Pretest and post-test in the treatment group.

A descriptive analysis of the Pretest and post-test of slow learners in the treatment group is presented in Table 8:

Table 8. Description of Pretest and Postest in the Treatment Group

Descriptive Statistics	N	Minimum	Maximum	Mean	Std. Deviation
Pretest of the treatment groups	18	48	58	52.67	3.049
Post-test of the treatment groups	18	60	77	68.78	5.966
Valid N (listwise)	18				

Table 8 shows that slow learners' Pretest and post-test obtained an average score of final learning outcomes (68.78), better than early learning outcomes (52.67).

Nonparametric statistical results with the Wilcoxon Signed Rank Test for the Pretest and post-test of slow learners in the treatment group are presented in Table 9:

Table 9. Wilcoxon of Pretest and post-test Slow Learners in the Treatment Group

Test Statistics	Post-test of the treatment groups - Pretest of the treatment groups
Z	-3.733[b]
Asymp. Sig. (2-tailed)	.000
a. Wilcoxon Signed Ranks Test	
b. Based on hostile ranks.	

Table 9 shows that (a) Negative Ranks or the difference (negative) between the Pretest and post-test is 0 based on the value of N, mean rank, or sum of ranks. That is, a value of 0 indicates no decrease (subtraction) from the initial value to the final value; (b) Positive Ranks or the difference (positive) between the initial and final learning outcomes, namely there are 18 positive data (N) which means that 18 students experienced an increase in learning outcomes from the initial to the final score with an average increase of 9.50, while the number of positive rankings was 171; (c) Ties is the same starting and ending values, which is 0. There is no equal value between the initial and final learning outcomes, and (d) The output of the test statistics is known to be Asymp. Sig. (2-tailed) with a value of 0.000, which is below or less than 0.05, and with a value of Z = -3.733, it can be concluded that there is a difference between the initial and final learning outcomes.

Pretest and post-test in the control group

A descriptive analysis of the Pretest and post-test of slow learners in the control group is presented in the following Table 10:

Table 10. Description of Pretest and Postest Slow Learners in the Control Group

Descriptive Statistics	N	Minimum	Maximum	Mean	Std. Deviation
Pretest of the control groups	24	42	55	48.25	4.142
Post-test of the control groups	24	54	62	58.21	2.187
Valid N (listwise)	24				

Table 10 shows that slow learners' Pretest and post-test obtained an average score of post-test (58.21) better than that of Pretest (48.25).

Nonparametric statistical results with the Wilcoxon Signed Ranks Test for the Pretest and post-test of slow learners in the control group are presented in Table 11:

Table 11. Wilcoxon of Pretest and post-test Slow Learners in the Control Group

Ranks

		N	Mean Rank	Sum of Ranks
Post-test of the control groups - Pretest of the control groups	Negative Ranks	0[a]	.00	.00
	Positive Ranks	24[b]	12.50	300.00
	Ties	0[c]		
	Total	24		

a. Post-test of the control < Pretest of the control groups
b. Post-test of the control > Pretest of the control groups
c. Post-test of the control = Pretest of the control groups

Test Statistics

	Post-test of the control - post-test of the control
Z	-4.302[b]
Asymp. Sig. (2-tailed)	.000

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

Table 11 shows that (a) Negative Ranks or the difference (negative) between the Pretest and post-test is 0, be it on the value of N, mean rank, or sum of ranks. That is, a value of 0 indicates no decrease (subtraction) from the initial value to the final value; (b) Positive Ranks or the difference (positive) between the initial and final learning outcomes, namely there are 24 positive data (N) which means that 24 students experienced an increase in learning outcomes from the initial to final grades with an average increase of 12.50, while the number of positive rankings is 300; (c) Ties is the same starting and ending values, which is 0. There is no equal value between the initial and final learning outcomes, and (d) The output of the test statistics is known to Asymp. Sig. (2-tailed) with a value of 0.000, which is below or less than 0.05, and with a value of Z = -4.302, it can be concluded that there is a difference between the initial and final learning outcomes.

Based on the results of data analysis, it can be concluded that implementing the collaborative constructivist approach can develop science learning skills for slow learners in elementary schools.

An inclusive school is a traditional school that conducts joint learning between children with slow learners and ordinary children in one room (Pratiwi, 2015; Ru'iya et al., 2023). The basic concept of inclusive schools in classroom learning requires a unique strategy to ensure that every child, including slow learners, can achieve their learning goals. Therefore, teachers must provide exceptional services to care for or teach children who are slow learners (Amo-Adjei et al., 2023). Children who are slow learners have unique characteristics and types, distinguishing them from normal children (Amelia, 2016).

This research focuses on children with learning disabilities, specifically those who attend elementary school. The reason is that slow-learner children have the highest prevalence and percentage at the elementary school level in the research area. Inclusive elementary schools in Indonesia, especially in Yogyakarta Province, serve students between the ages of 7 and 12 at the

basic education level. Conditions that describe all kinds of differences, ranging from gender, religion, language, ethnicity, and others, are a form of diversity (Rasmitadila et al., 2022). Given this diversity, it is essential to introduce several innovations in the natural science learning process of elementary schools, particularly for slow learners (Jampel et al., 2018). Researchers have identified several factors contributing to poor learning outcomes for students with learning disabilities compared to general students (Cole, C., & McLesky, 1997).

The difficulties experienced by teachers in carrying out learning are due to the lack of training related to children who are slow learners. Training for teachers is essential to equip them with the ability and experience in dealing with the diversity of students from various aspects, such as teachers can manage the learning needs of diversity, forms of teacher competence for learning, teachers able to transform abstract concepts into concrete forms, obstacles felt by teachers in managing student diversity, and challenges faced by teachers to implement inclusive education consisting of diverse teaching methods, competencies to modify learning and achievement of professional improvement. Therefore, teacher training must be carried out, considering that teachers in inclusive elementary schools are not experienced in implementing a collaborative constructivist approach (Villanueva, M.G., Taylor, J., Therrien, W., 2012).

Classical learning approaches that do not meet the needs of slow learners can be overcome by adopting a collaborative constructivist approach. This approach is designed to cater to the needs of slow learners in science learning, particularly in terms of acquiring factual knowledge. From the results of the treatment carried out in the field, it was found that the collaborative constructivist approach can increase the mastery of concepts and provide a direct learning experience in science learning, which makes slow learners feel confident and makes it easier to understand abstract things.

In essence, the curriculum used in inclusive schools between slow learners and regular students is the same, and there is no difference between the two (Cahyono et al., 2024; Dapudong, 2014; Purnomo et al., 2022). This condition necessitates a socio-psychological approach to learning conditioning (Şener et al., 2023), where students share a learning role with their classmates and can still meet their psychological needs by developing science learning skills following content modification in inclusive elementary schools. Content modification is essential for slow learners to meet the bill on learning objectives for materials that require understanding complex concepts.

Conclusion

The application of a collaborative constructivist approach can enhance science learning outcomes for children with learning difficulties in inclusive elementary schools. This is evidenced by the Mann-Whitney statistical test analysis and the Wilcoxon Signed Rank Test showing a significance of $0.000 < 0.05$. This indicates a significant difference in improving science learning outcomes. This research recommends that school principals provide more training for teachers, while teachers need to be equipped with training in mastering the collaborative constructivist approach when teaching Slow Learner children in inclusive elementary schools to strengthen concept mastery. Subsequently, Slow Learner children can develop their potential and enjoy being together with regular children in general.

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