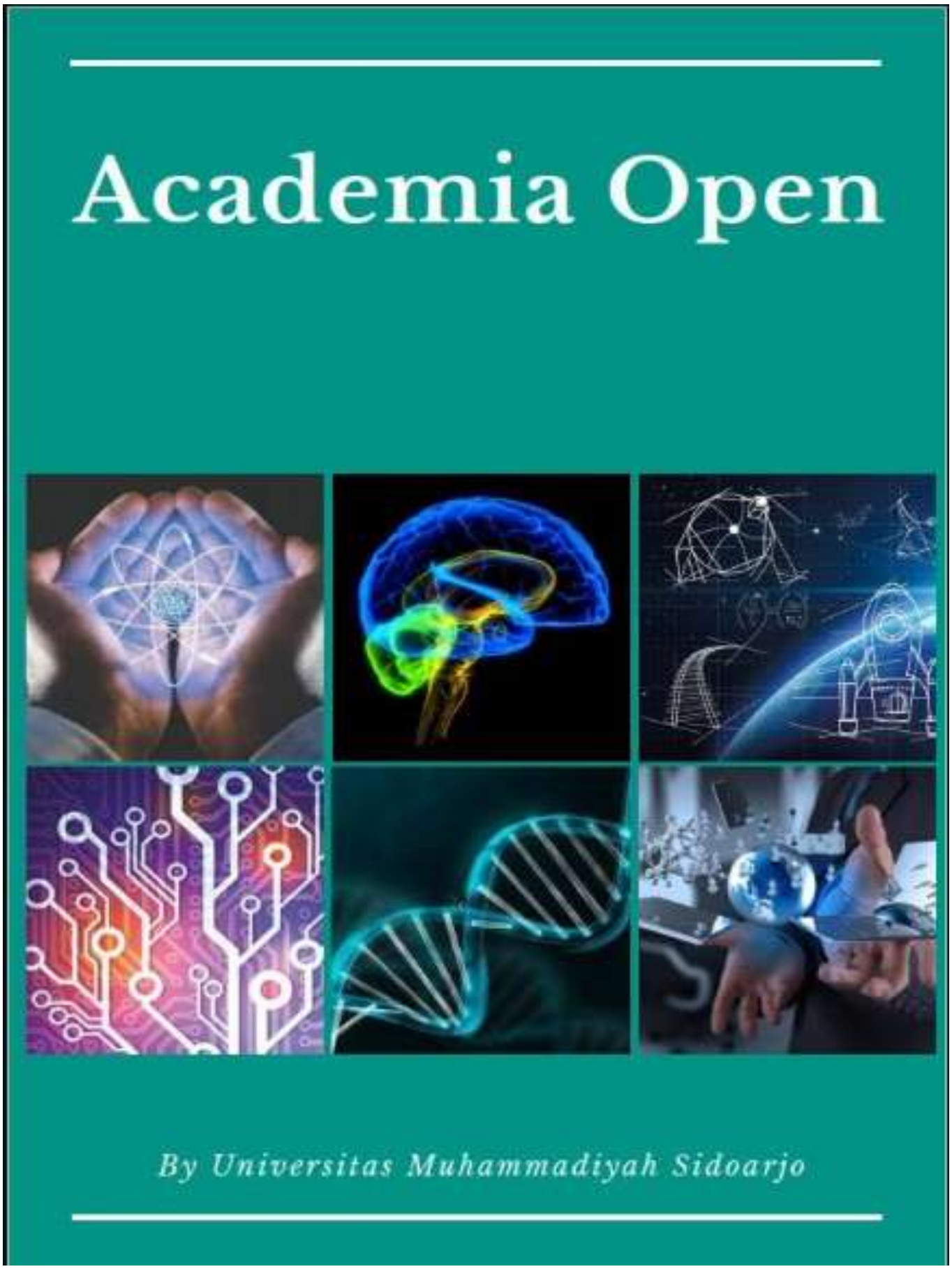
Academia Open

Vol. 11 No. 2 (2026): December
DOI: 10.21070/acopen.11.2026.14927



ISSN 2714-7444 (online), https://acopen.umsida.ac.id, published by Universitas Muhammadiyah Sidoarjo

Academia Open

Vol. 11 No. 2 (2026): December
DOI: 10.21070/acopen.11.2026.14927

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ISSN 2714-7444 (online), https://acopen.umsida.ac.id, published by Universitas Muhammadiyah Sidoarjo

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DOI: 10.21070/acopen.11.2026.14927

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Academia Open

Vol. 11 No. 2 (2026): December
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Academia Open

Vol. 11 No. 2 (2026): December
DOI: 10.21070/acopen.11.2026.14927

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Check this article update (crossmark)

Check this article impact (*)

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(*) Time for indexing process is various, depends on indexing database platform

Academia Open

Vol. 11 No. 2 (2026): December
DOI: 10.21070/acopen.11.2026.14927

Differentiated Instruction Strategy For Integer Addition Among Students With Learning Disabilities: Strategi Pembelajaran Berdiferensiasi Untuk Penjumlahan Bilangan Bulat Pada Siswa Berkesulitan Belajar

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Abstract

General Background Inclusive education provides equitable services to learners with diverseneeds, requiring educators to implement adaptive pedagogical strategies in regular classrooms. **Specific Background** Sixth-grade pupils at SDN 001 Sangatta Utara possessing mathematics learning challenges struggle with basic numeracy competencies, particularly positive integer addition, due to the continuous reliance on one-size-fits-all, teacher-centered instructional models. **Knowledge Gap** Although current literature supports adaptive teaching for general mathematics achievement, empirical evidence regarding its specific application for basic arithmetic operations among dyscalculic children in inclusive elementary settings remains limited. **Aims** This Classroom Action Research examines the application of adaptive teaching methods using concrete manipulatives to build positive arithmetic computation skills among four elementary pupils with learning difficulties. **Results** Following three action cycles, teacher performance and classroom participation steadily progressed, while the average mathematics achievement score increased from a baseline of 25 to 85 in the final cycle. The provision of tangible media, such as drinking straws, alongside individualized guidance, enabled thecohort to comprehend placevalue concepts and minimize computational errors. **Novelty** This study provides direct empirical evidence demonstrating how modifying instructional content, processes, and educational environments specifically accommodates the numeracy needs of heterogeneous cohorts. **Implications** Elementary schools and educators mustadoptflexible teaching protocols and utilize concrete visual materials to foster equitable, student-centered mathematics education, necessitating professional development programs focused on inclusive pedagogical practices.

Highlights

- Manipulative media like drinking straws clarify numerical concepts and place values.
- Classroom action cycles successfully raised average formative mathematics scores significantly.
- Adaptive teaching approaches foster active participation and independent problem-solving capabilities.

Keywords

Inclusive Education; Classroom Action Research; Concrete Manipulatives; Numeracy Skills; Mathematics Achievement

Academia Open

Vol. 11 No. 2 (2026): December
DOI: 10.21070/acopen.11.2026.14927

Published date: 2026-07-21

ISSN 2714-7444 (online), https://acopen.umsida.ac.id, published by Universitas Muhammadiyah Sidoarjo

Vol. 11 No. 2 (2026): December
DOI: 10.21070/acopen.11.2026.14927

INTRODUCTION

Inclusive education is a strategic approach for providing equitable, accessible and responsive educational services to learners with diverse needs. In Indonesia, the implementation of inclusive education has been bolstered by the Minister of National Education Regulation No. 70 of 2009 which guarantees that students with disabilities or exceptional abilities have the right to study with their peers in regular schools. This policy is based on the principle of education for all, i.e. every child has a right to equal opportunities to learn according to his/her abilities, needs and developmental characteristics. But the implementation of inclusive education is still a big challenge with the lack of special education teachers, lack of professional development for classroom teachers, lack of disability-friendly learning facilities and lack of public awareness of inclusive education.

The Government of East Kutai Regency has shown its commitment to inclusive education by building special schools, nominating inclusive schools through the local Education Office, and providing professional training programs for teachers at kindergarten, elementary and junior high school levels. Furthermore, teachers are encouraged to undertake Recognition of Prior Learning (RPL) programs in Special Education in partnership with Yogyakarta State University. SDN 001 Sangatta Utara is one of the inclusive education implementing elementary schools. A few initial observations indicated that a number of sixth graders experience difficulties in learning, specifically in the process of adding positive integers. These findings indicate that mathematics teaching to students with learning difficulties needs more flexible teaching strategies that consider individual learning needs. Numeracy skills are basic competences in elementary mathematics education. Understanding how to add integers is the basis for deeper mathematical concepts such as subtraction , multiplication , division , fractions , and mathematical problem solving . However, students with learning disabilities frequently struggle with understanding number concepts, understanding place value, applying computational procedures, and solving addition problems correctly. Dyscalculia or mathematics learning disability negatively affects students' ability to understand numerical concepts, perform calculations and solve mathematical problems. This, in turn, affects their academic achievement, learning motivation, and self-confidence in mathematics.

The same condition was also found in sixth-grade students of SDN 001 Sangatta Utara. Preliminary evaluations found that a large number of students with learning difficulties had not achieved the school's Minimum Mastery Criterion (MMC) for positive integer addition. These challenges were seen in students' inability to accurately add two-digit numbers, their misunderstanding of sequences of numbers, and their limited calculation strategies. One reason is that we continue to use teacher-centered instructional models that provide a one-size-fits-all learning experience regardless of students' readiness, interests, or learning profiles. These approaches often do not address the diverse learning needs of students with learning difficulties. In addition, the use of instructional media such as number lines, number cards, manipulatives and other concrete learning materials has not been maximized to support conceptual understanding. Piaget's theory of cognitive development states that elementary school children are in the concrete operational stage of development, which means that mathematical concepts are most effectively learned through concrete experiences, physical objects, visual aids, and hands-on activities. Similarly, Vygotsky's Zone of Proximal Development (ZPD) highlights that learning is more meaningful when students are provided with appropriate scaffolding by teachers or peers that enables them to perform tasks beyond their independent capabilities. Therefore, in order to support students with learning difficulties, instructional support should not only be in the form of verbal explanations, but also concrete learning media, guided practice and individual assistance.

Differentiated instruction presents a promising solution to these challenges. Differentiated instruction is an instructional approach that adjusts the content, process, product, and learning environment to meet the readiness, interests, and learning profiles of students (Tomlinson, 2001). Differentiation in the teaching of mathematics can include the use of learning materials with varied levels of difficulty, the use of concrete and visual learning resources, the design of tiered assignments, the organisation of flexible learning groups and the use of assessment practices that are appropriate for the abilities of individual students. Tomlinson (2003) states that differentiated instruction is particularly helpful in heterogeneous classrooms as it assists teachers to meet the varied educational needs of learners. The results of the previous studies have consistently shown that differentiated instruction has a positive effect on mathematics learning outcomes in elementary schools. Oktaviani (2022) revealed that differentiated instruction based on students' learning styles improved classroom participation and mathematics achievement. Similarly, Sabrikun (2023) found that the use of differentiated instruction significantly increased the mastery of mathematics learning for two learning cycles. Sulianto (2022) also stated that differentiated instruction had a significant effect on students' mathematics achievement in class three. Moreover, Ariyani (2025) concluded that the use of differentiated instruction can be successful in designing more inclusive mathematics instruction by changing content, process, product, and learning environment. Syarifuddin (2022) also found that differentiated instruction improves mathematics achievement through ability grouping, different instructional materials, and individualized learning approaches.

Although the evidence supporting differentiated instruction has increased, few studies have specifically investigated its effectiveness for improving positive integer addition skills of sixth grade students with learning difficulties in inclusive elementary school settings. Current research has primarily examined overall mathematics achievement rather than specific numeracy skills of students with learning disabilities. Thus, this study seeks to fill this gap by presenting empirical evidence on the application of differentiated instruction as an adaptive instructional strategy to enhance the positive integer addition skills of students with learning difficulties. Therefore, this study aims to describe the implementation of differentiated instruction and to examine the effectiveness of differentiated instruction in improving the skills of positive integer addition of sixth-grade students with learning difficulties at SDN 001 Sangatta Utara. The findings are expected to contribute to the development of inclusive, adaptive, and student-centered mathematics learning and provide practical insights for teachers in designing mathematics learning that accommodates the needs of students in inclusive elementary schools.

ISSN 2714-7444 (online), https://acopen.umsida.ac.id, published by Universitas Muhammadiyah Sidoarjo

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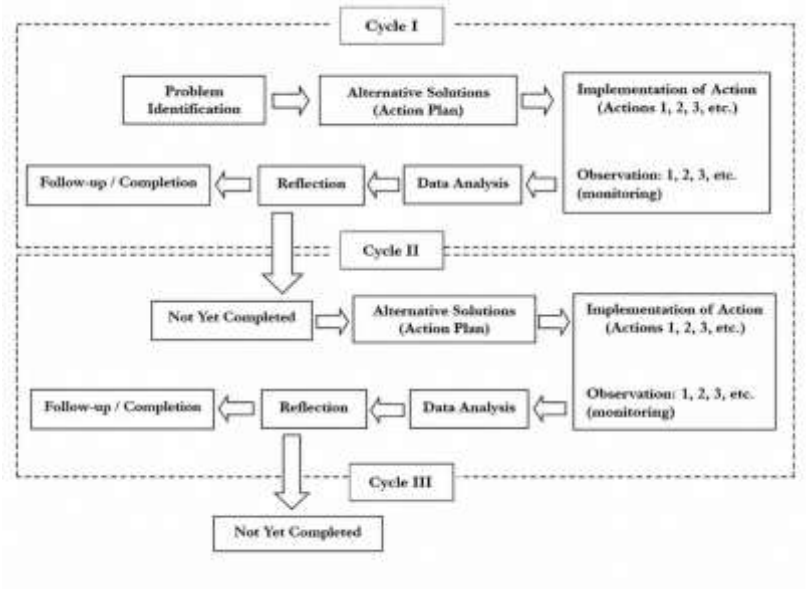
METHOD

The research used Classroom Action Research (CAR) with the spiral model developed by Hopkins consisting of four cyclical stages of planning, action, observation, and reflection. The rationale for adopting the CAR approach is that it provides teachers with a systematic way to improve classroom practices and respond to students' learning difficulties through ongoing reflection and instructional refinement (Hopkins, 2008). In addition, Classroom Action Research is known as an effective research design in solving practical educational problems, and improving the quality of learning directly in the classroom context (Arikunto, Suhardjono, & Supardi, 2015). The research was carried out at SDN 001 Sangatta Utara, East Kutai Regency, Indonesia in the odd semester of the academic year 2025/2026. The participants were four sixth grade students who were classified as having difficulty in performing positive integer addition. The intervention employed was differentiated instruction by varying the learning content, learning processes and learning products according to students' readiness, learning characteristics and instructional needs (Tomlinson, 2001).

Figure 1. *Figure 1. Research Procedure*



The research was performed in two action cycles. Each cycle consisted of planning differentiated learning activities, implementation of the instructional intervention, observation of students' learning participation and numeracy performance, and reflective evaluations to identify the required improvements for the next cycle. Instructional activities involving the use of concrete and visual instructional media like drinking straws, counting sticks, number cards and other manipulatives to help students develop conceptual understanding of positive integer addition. Student achievement was assessed through pre-tests and post-tests given before and after each cycle of intervention. Classroom observations were carried out to record students' participation and the fidelity of implementation of differentiated instruction. The instruments used were achievement test, observation sheets of students' learning activities, and observation sheets of teachers' instructional implementation. Before the implementation, all the research instruments were validated to determine the content validity by expert judgment (Arikunto, 2013). The data collected were analyzed using descriptive quantitative and qualitative methods. The quantitative analysis was done by calculating students' achievement score, percentage of learning mastery, and improvement of learning outcomes through cycles. Descriptive statistics (Arikunto, 2013) were used in the quantitative analysis. The qualitative analysis was performed through describing the students' learning behaviors, participation, and responses during the implementation of differentiated instruction based on the results of classroom observation (Miles, Huberman, & Saldaña, 2014).

RESULT AND DISCUSSION

Result

This research was conducted at SDN 001 Sangatta Utara in the second semester of the 2025/2026 academic year involving four sixth-grade students who experienced learning difficulties in mathematics. The research used a Classroom Action Research (CAR) design implemented in three cycles, where each cycle consisted of two meetings, namely learning using the differentiation method and evaluation of learning outcomes. Research data were obtained through observations of teacher and student activities and a test of the ability to add positive integers. The results of each cycle were analyzed descriptively to determine the improvement in students' numeracy skills while evaluating the effectiveness of the implementation of differentiation learning with the help of concrete media in the form of straws as a counting aid.

Learning Observation Results

The study was conducted over three action cycles to evaluate the effectiveness of differentiated instruction in improving

positive integer addition skills among sixth-grade students with learning difficulties. Each cycle consisted of differentiated learning activities, classroom observations, and a formative assessment administered at the end of the cycle. The progress of the students was measured using data from classroom observation and scores on mathematics achievement tests.

Observations showed that the quality of implementation of learning improved in each cycle. The teacher activity for cycle I had a score of 3 and the category adequate, and student activity had a score of 4 and the category good. This means the implementation of differentiated learning has begun to show results, but teachers still need to adjust their learning management to the characteristics of students who experience learning disabilities. Teacher activity in cycle II increased to a score of 4 which was categorized as good while the students' activity remained at a score of 4 which was categorized as good . This improvement shows that teachers are increasingly able to apply differentiated learning in a systematic manner and students are beginning to be more active in the learning process. Moreover, in cycle III, teacher activity was still in the good category with a score of 4, while student activity was increased to a score of 5, categorized as very good. The findings of these studies point to the fact that differentiated learning can lead to a more active and enjoyable learning environment, which is in line with the learning needs of students.

Table 1. *Results of the Assessment of Learning Interest of Students with Learning Difficulties in Cycle I, Meetings 1 and 2*

Cycle	Teacher Activity	Student Activity	Teacher Category	Student Category
Cycle 1	3	4	Fair	Good
Cycle 2	4	4	Good	Good
Cycle 3	4	5	Good	Very Good

Students' skills of adding positive integers were progressively improved after the differentiated instruction was implemented. The students had a mean score of only 25 before the intervention, which was categorized as very poor. Such a baseline result shows that most of the students had great difficulties in positive integer addition, especially two-digit addition. After the implementation of differentiated instruction, the mean score was improved to 50 in Cycle I which was 50.00% from the baseline. The performance of the students was still categorized as poor. However, the findings indicate that the use of differentiated instruction has started to positively affect the students' conceptual understanding of positive integer addition.

The instructional strategy was further refined in Cycle II and yielded a mean score of 65, which was equivalent to an improvement of 23.08% from Cycle I. On this stage students showed better conceptual understanding using concrete instructional media and individual guidance according to their learning needs. Cycle III had a mean score of 85 which was a 23.53% improvement from Cycle II. Most students achieved the good achievement category at the end of the intervention with two students getting perfect scores. The results show that differentiated instruction was an effective method in improving positive integer addition skills for students with learning difficulties.

Table 2. *Improvement in Students' Positive Integer Addition Achievement*

Stage	Mean Score	Percentage of Improvement	Category
Baseline	25	-	Very Poor
Cycle 1	50	50%	Poor
Cycle 2	65	23.08%	Fair
Cycle 3	85	23.53%	Good

Individual student achievement was on a consistent upward trend in the intervention. At the baseline assessment, three students scored 20 and one student scored 40. It is a result of differentiated instruction that students' performance improved little by little during the three action cycles. No student scored 100, but two students scored 80 and one student scored 60 at the end of the Cycle III. The results indicate that the differentiated instruction offered opportunities for each student to learn by appropriate means based on his/her readiness and individual learning needs, thus gradually improving the numeracy skills . In general, the results indicate an improvement in the learning process and student achievement. The results revealed that teacher's performance improved from fair to good, student's participation improved from good to very good, and the average of mathematics achievement score improved remarkable from 25 at baseline to 85 at the end of Cycle III. The results indicated that differentiated instruction was effective to improve the positive integer addition skills in sixth grade students with learning difficulties in SDN 001 Sangatta Utara.

Overall Improvement in Students' Learning Outcomes

Table 3 shows the progress made by students in their mathematics achievement during the implementation of differentiated instruction. The baseline achievement of the students before the intervention is quite low (the mean formative score is 25 which is in the very poor category). This result shows that the students in the study had a significant problem in doing addition of positive integers, particularly in solving addition problems involving two-digit numbers. Most students had difficulty correctly identifying place values, often made computational errors, and needed continued teacher assistance to finish the tasks assigned. After the application of differentiated instruction in Cycle I, the average formative score of the students was 50. This was a 50.00% increase from the baseline. The level of achievement was still in the low category but the improvement indicated that students had started to understand the basic concepts of addition of positive integers after being exposed to differentiated activities. In this cycle students were more familiar with the use of concrete learning media such as drinking straws and counting sticks that helped students to visualize the concept of addition. However, even so,

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some students relied heavily on the teacher's guidance in completing the exercises.

Cycle II showed another improvement, with the average formative score increasing from 50 to 65, an improvement of 23.08%. The increase points to students becoming more used to differentiated learning activities and being able to solve mathematical problems by themselves. At this point students exhibited a better understanding of the concepts of place value, made fewer computational errors and were more active participants in classroom discussions and collaborative learning activities. One student still had learning difficulties, but the class as a whole did much better than in the previous cycle. Cycle III had the highest improvement with an average formative score of 85, which showed a further improvement of 23.53% than Cycle II. By this time, most students could successfully work addition problems involving positive integers with little teacher help. Students responded more confidently to questions, actively participated in classroom activities and successfully completed the assigned learning tasks. The findings of this study suggest that the continuous application of differentiated instruction throughout the three action cycles helped in the continuous development of students' numeracy achievement.

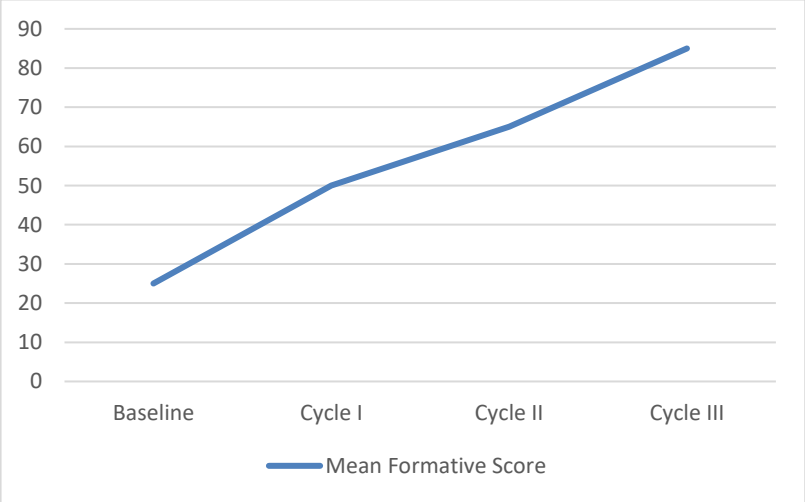
Table 3. *Formative Scores, Achievement Categories, and Percentage of Improvement*

Stage	Mean Formative Score	Category	Percentage of Improvement
Baseline	25	Very Poor	–
Cycle I	50	Poor	50.00%
Cycle II	65	Fair	23.08%
Cycle III	85	Good	23.53%

The average formative scores of the students consistently rose across the action cycles, as can be seen in Table 3. The average score at baseline was only 25 and was categorized as very poor, indicating that students still had significant difficulties in performing positive integer addition. After the implementation of differentiated instruction in Cycle I, the mean score increased to 50 but still falls in poor category. The improvement shows that the students began to understand the basic concept of addition through the learning activities that were adjusted to their needs. The improvement kept going on in Cycle II, the mean score rose to 65 and entered the fair category. In Cycle III it was raised to 85 with good category. The results showed that the repeated application of differentiated instruction with concrete learning media and individualized guidance had a positive impact and contributed to the gradual improvement of students' positive integer addition skills.

To provide a clearer visual representation of students' learning progress, the mean formative scores from the baseline stage to Cycle III are presented in Figure 1.

Figure 1. *Improvement in Mean Formative Scores Across the Action Cycles*



Individual Students' Learning Progress

The development of individual students' learning achievement is presented in Table 4. Overall, all four students demonstrated improvements in their mathematics achievement after participating in differentiated instruction, although the rate of improvement varied according to their individual learning characteristics. Student ALF continued to make steady gains throughout the intervention. The result of the student score was increased from 60 in Cycle I to 80 in Cycle II and still 80 in Cycle III. This observation suggests ALF had obtained the targeted learning competencies by the second cycle, and performed consistently during the last intervention. Of all the students, Student FA showed the most improvement. FA scored only 20 in Cycle I, which indicated considerable learning difficulties. But the student's score increased dramatically to 60 in Cycle II and reached 100 in Cycle III. This improvement shows that differentiated instruction worked to meet the student's learning needs and to make significant academic gains.

Similarly, student RF continued to improve across the three cycles. The student's score rose from 60 in Cycle I to 80 in Cycle II and then to a perfect score of 100 in Cycle III. The pattern suggests that RF responded positively to the differentiated learning activities and gradually developed more conceptual understanding and computational accuracy. Student SADE had

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a different pattern of achievement. The student's score decreased from 60 to 40 in Cycle I to Cycle II. However, Cycle III showed a significant improvement in the student's score of 60. This fluctuation might be due to differences in learning pace and readiness of the individual, but the final outcome still shows an improvement when compared to the beginning performance of the student throughout the intervention.

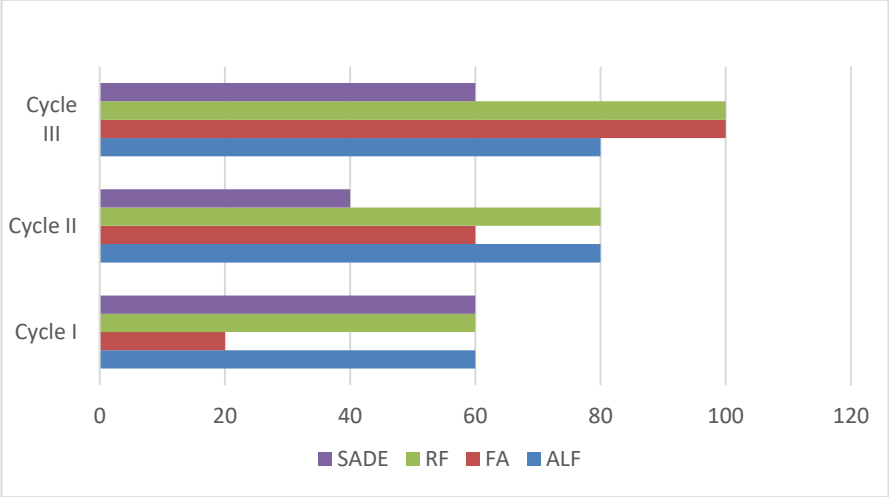
Table 4. *Individual Students' Mathematics Achievement Across the Action Cycles*

Cycle	ALF	FA	RF	SADE
Cycle I	60	20	60	60
Cycle II	80	60	80	40
Cycle III	80	100	100	60

As shown in Table 4, differentiated instruction resulted in improvements in mathematics achievement for all students, although the rate of improvement differed among individuals. Student ALF experienced continuous improvement from 60 in Cycle I to 80 in Cycle II and was stable in Cycle III which means that the student has achieved the expected learning competencies. The most significant improvement was achieved by Student FA, who increased from 20 in Cycle I to 60 in Cycle II, then to 100 in Cycle III. Similarly, student RF showed consistent progress from 60 to 80 and finally 100, indicating a steady increase in conceptual understanding and computational fluency. Student SADE followed a different pattern. The students score was 60 in Cycle I, 40 in Cycle II and then improved to 60 in Cycle III. The progress was not as significant as for the other participants but the final achievement indicates that the student benefited from the differentiated learning activities. In general, the results indicate that each student responded differently to the intervention due to their individual learning characteristics. However, all participants showed positive progress in learning by the end of the study. The results show that differentiated instruction gave flexible learning opportunities that addressed the different learning needs of students and assisted them to improve their positive integer addition skills.

To provide a clearer illustration of each student's learning progress throughout the intervention, the individual mathematics achievement scores across the three action cycles are presented in Figure 2.

Figure 2. *Individual Students' Mathematics Achievement Across the Three Action Cycles*



Students' Achievement Categories

Students' achievement categories also improved progressively throughout the intervention (Table 5). During Cycle I, three students were categorized as Fair, while one student remained in the Very Poor category. These findings indicate that, despite initial improvements, several students still required intensive instructional support. In Cycle II, two students progressed to the Good category, one student reached the Fair category, and one student remained in the Very Poor category. This distribution reflects the gradual effectiveness of differentiated instruction in accommodating diverse learning needs while acknowledging that some students required additional intervention. By Cycle III, substantial improvement was observed across all participants. Two students achieved the Very Good category, whereas the remaining two students reached the Good category. No student remained in either the Poor or Very Poor category at the end of the intervention. These findings indicate that differentiated instruction successfully promoted learning progress among students with varying levels of mathematical ability.

Table 5 *Achievement Categories of Individual Students Across the Action Cycles*

Cycle	ALF	FA	RF	SADE
Cycle I	Fair	Very Poor	Fair	Fair
Cycle II	Good	Fair	Good	Very Poor
Cycle III	Good	Very Good	Very Good	Good

In conclusion, the results show a consistent improvement in the learning process and learning outcomes through the three action cycles. Classroom observations showed that the teacher's performance improved from fair category in Cycle I to good

ISSN 2714-7444 (online), https://acopen.umsida.ac.id, published by Universitas Muhammadiyah Sidoarjo

category in Cycles II and III. Similarly, the student involvement went from good to very good, i.e. students were more involved in differentiated learning activities. Students' mathematics achievement also improved significantly as evidenced by the increase in the mean formative score from 25 at baseline to 85 in Cycle III. Individual student performance showed similar positive trends with all students scoring higher by the end of the intervention. These findings provide empirical evidence that differentiated instruction contributed to gradual and sustained improvement of positive integer addition skills among sixth grade students with learning difficulties.

Discussion

The results of this research show that the application of differentiated instruction is effective in improving the skills of sixth-grade students with learning difficulties in addition of positive integers at SDN 001 Sangatta Utara. The learning process and the learning outcomes both improved. The students' mean formative scores were improved consistently from 25 at baseline to 50 in Cycle I, 65 in Cycle II and 85 in Cycle III. At the same time, classroom observations indicated an improvement in teacher performance from the fair category to the good category and an improvement in student participation from the good category to the very good category. The results indicated that differentiated instruction not only improved students' academic achievement but also fostered students' engagement and participation in the learning process.

The use of differentiated instruction, which took into account differences among students' readiness, learning characteristics, and instructional needs, led to better learning results for students. During intervention, students were provided with tangible media of learning such as drinking straws, number cards and visual representation and personalized guidance as per their level of understanding. These types of instructional changes allowed students to build mathematical concepts over time rather than just learning computational procedures. Differentiated instruction is an approach to adjust instructional content, learning processes, products, and learning environments according to the learners' readiness, interests, and learning profiles (Tomlinson, 2001). This allows students to be provided with learning experiences that are appropriate for them to be in the best possible position to be successful regardless of their academic abilities.

The present findings also support Piaget's theory of cognitive development that elementary school students generally remain within the concrete operational stage and thus learn mathematical concepts more effectively through direct manipulation of concrete objects than through abstract explanations alone (Piaget, 1970). Students demonstrated greater understanding of positive integer addition when using concrete instructional media to represent numerical values and place value concepts during the intervention. The use of manipulatives gave students a clearer visualization of mathematical operations and resulted in fewer computational errors common in traditional teacher-centered instruction. Moreover, the improvement observed in the three action cycles resonates with Vygotsky's sociocultural theory and the concept of the Zone of Proximal Development (ZPD). Vygotsky (1978) believed that the optimal learning occurs when teachers or more competent peers provide suitable scaffolding for students. The current study demonstrated that individualized teacher guidance, ongoing feedback, and opportunities for collaborative learning enabled students to complete mathematical tasks that they were previously unable to do independently. As students' conceptual understanding became deeper, the level of instructional support was gradually reduced, which allowed students to solve addition problems more independently by the end of the final cycle.

Another important finding was the improvement in the participation of the students in the classroom. At the beginning, many students were reluctant to ask questions, did not feel confident in tackling mathematical problems and depended a lot on the teacher's assistance. The repeated implementation of differentiated instruction resulted in students' increased willingness to participate in classroom discussions, ask questions, express their ideas, and complete learning tasks independently. The results of the behavioral changes show that differentiated instruction not only improved cognitive achievement but also increased students' learning motivation, confidence, and active engagement. Such findings are especially crucial in inclusive education environments where students with learning difficulties often require supportive learning environments that encourage active participation without fear of failure.

The findings of the current study are in line with previous empirical findings. Differentiated instruction based on students' learning styles increased classroom participation and mathematics achievement among elementary school students (Oktaviani, 2022). Likewise, Sabrikun (2023) found significant improvement in mathematics learning mastery after applying differentiated instruction through classroom action research. Similar results were also found by Sulianto (2022) and it was shown that differentiated instruction had a significant positive effect on improving the learning outcomes of mathematics for elementary school students. In addition, Ariyani (2025) also revealed that differentiated instruction can be done by modifying content, process, product, and learning environment to meet the diversity of students' characteristics. Syarifuddin (2022) also concluded that differentiated instruction can improve mathematics achievement by grouping students based on their readiness, offering varied learning materials, and providing personalized instructional support.

All students who participated improved, but the rate of change was different for each student. Student FA showed the most significant change, increasing from a score of 20 in Cycle I to a score of 100 in Cycle III, while student SADE's rate of change was not as fast. These differences suggest that students with learning disabilities respond differently to instructional interventions depending on their initial ability, rate of learning, motivation, and individual characteristics. Differentiated instruction is therefore not to be interpreted as providing identical instructional experiences for all learners. It is instead an approach that aims to offer flexible learning opportunities that recognize individual differences, yet maintain common learning goals. The observed improvement in the teacher performance throughout the study also contributed significantly to the students' learning progress. The teacher improved her ability to organize differentiated learning activities, to use concrete instructional media, to provide individual guidance and to encourage active participation of students along the cycles of action research. Such improvements show that the effectiveness of differentiated instruction is not only related to the instructional model but also to the teacher's pedagogical competence to design adaptive learning experiences to students' diverse educational needs. In general, the results provide empirical evidence that differentiated instruction is an effective instructional approach to improving positive integer addition skills for students with learning difficulties in

inclusive elementary classrooms. Differentiated instruction improves mathematics achievement, but it also promotes active participation, learning confidence, conceptual understanding, and classroom engagement. These results have practical implications for elementary school teachers to design mathematics instruction more flexibly by considering students' readiness, learning profiles, and instructional needs while using concrete learning media and individualized scaffolds. These practices are expected to foster a more equitable and inclusive mathematics education for students with different learning abilities.

CONCLUSION

The results of this study indicate that the application of differentiated instruction can effectively improve positive integer addition skills in sixth-grade students with learning difficulties at SDN 001 Sangatta Utara. The mean formative score of the students was found to be consistently increasing from 25 (very poor) at baseline to 50 (poor) in Cycle I, 65 (fair) in Cycle II and 85 (good) in Cycle III. In addition to improving students' achievement in the mathematics, differentiated instruction improved the classroom participation, engagement in learning and teacher performance throughout the intervention. The results show that differentiated instruction provides adaptive learning experiences that match students' diverse learning needs and that it contributes positively to the implementation of inclusive mathematics education at the elementary school level.

The findings of this study suggest that differentiated instruction is an adaptive instructional approach for teaching mathematics to students with learning difficulties in inclusive elementary classrooms . Teachers are encouraged to use concrete learning media, flexible instructional strategies, and individualized learning supports according to student readiness and learning profiles. Inclusive education requires teachers to possess the skills to differentiate instruction to meet the needs of all students in the classroom. Schools need to develop professional development programs that build teachers' capacity for differentiated instruction in inclusive education settings. It is suggested that future studies include larger samples, longer periods of intervention and more diverse mathematical content in order to examine the effects of differentiated instruction in different educational contexts.

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ISSN 2714-7444 (online), https://acopen.umsida.ac.id, published by Universitas Muhammadiyah Sidoarjo