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Cooperative Learning Teams Games Tournament (TGT) with Content Differentiation Approach: An Effort to Improve Student Learning Outcomes in Whole Number Topics

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Abstract: Students often perceive mathematics as difficult and abstract, negatively affecting their interest and motivation to learn. The Teams Games Tournament (TGT) model was chosen because it incorporates healthy competition into the learning process, encouraging students to engage more actively. The main objective of this study is to improve the learning outcomes of fourth-grade students in a whole number topics by applying the Cooperative Learning Teams Games Tournament (TGT) model with a content differentiation approach. This study used Classroom Action Research (CAR) carried out in two cycles. Each cycle consists of four stages: planning, acting, observing, and reflecting. The research subjects were 27 fourth-grade students at SDN Sidosermo I Surabaya in the 2023/2024 academic year. Learning outcome data were collected through pre-tests and post-tests to assess students' understanding before and after the intervention. The data were analyzed using descriptive analysis methods to describe the average scores and the percentage of student mastery in each cycle. Based on the pre-test results, the average student score was 61.48, with a mastery rate of 40.74%, which is below the minimum passing criterion (KKM) of 75. After the intervention in Cycle 1, the average score increased to 80.85, with a mastery rate of 52%. In Cycle 2, following strategy improvements, the average score reached 86.78, with 85% mastery. These results indicate that the TGT model with a content differentiation approach is effective in improving students' understanding and learning outcomes, surpassing the 80% mastery criterion.

Keywords: teams games tournament (TGT); content differentiation; whole numbers

Abstrak: Peserta didik sering menganggap matematika sebagai mata pelajaran yang sulit dan abstrak, yang berdampak negatif pada minat dan motivasi belajar mereka. Model *Teams Games Tournament* (TGT) dipilih karena dapat menggabungkan unsur kompetisi yang sehat dalam proses pembelajaran, sehingga siswa menjadi lebih termotivasi untuk terlibat secara aktif. Tujuan utama penelitian ini adalah meningkatkan hasil belajar peserta didik kelas IV pada materi bilangan cacah melalui penerapan model pembelajaran kooperatif *Teams Games Tournament* (TGT) dengan pendekatan diferensiasi konten. Penelitian ini menggunakan metode Penelitian Tindakan Kelas (PTK) yang dilaksanakan dalam dua siklus. Setiap siklus terdiri dari empat tahapan: perencanaan, pelaksanaan, pengamatan, dan refleksi. Subjek penelitian adalah 27 peserta didik kelas IV di SDN Sidosermo I Surabaya tahun ajaran 2023/2024. Data hasil belajar dikumpulkan melalui *pre-test* dan *post-test* untuk mengevaluasi pemahaman peserta didik sebelum dan sesudah intervensi. Data dianalisis menggunakan metode analisis deskriptif untuk menggambarkan nilai rata-rata dan persentase ketuntasan peserta didik pada setiap siklus. Berdasarkan hasil *pre-test*, rata-rata nilai peserta didik adalah

61,48 dengan ketuntasan 40,74%, yang berada di bawah KKM sebesar 75. Setelah intervensi pada Siklus 1, rata-rata nilai meningkat menjadi 80,85 dengan ketuntasan 52%. Pada Siklus 2, setelah perbaikan strategi, rata-rata nilai mencapai 86,78 dengan ketuntasan 85%. Hasil ini menunjukkan bahwa model pembelajaran TGT dengan pendekatan diferensiasi konten efektif dalam meningkatkan pemahaman dan hasil belajar peserta didik, melampaui kriteria ketuntasan 80%.

Kata Kunci: *teams games tournament* (TGT); diferensiasi konten; bilangan cacah

INTRODUCTION

Mathematics is often perceived as an abstract and challenging subject by many students, primarily due to its requirements for logical reasoning, visualization of mathematical concepts, number comprehension, and problem-solving skills (Permata et al., 2021; Saputri et al., 2024). Students' perceptions of mathematics significantly affect their interest and motivation in learning this subject. If students view mathematics as difficult or boring, they tend to be less enthusiastic and achieve lower learning outcomes (Mariamah et al., 2021; Permata et al., 2021).

Whole numbers are a fundamental element in mathematics, where students must understand place value, order, and basic operations such as addition, subtraction, multiplication, and division. Students often face various difficulties in learning whole numbers. These challenges include understanding the concept of place value, number ordering, and basic arithmetic operations (Widyatma & Ramadhani, 2024). Additionally, students frequently struggle to connect the information and numbers they learn with real-world problems (Putri & Wutsqa, 2019). Difficulties in understanding basic concepts of whole numbers, such as place value and number order, lead to confusion in basic operations like addition, subtraction, multiplication, and division. This lack of understanding makes mathematics feel difficult and abstract, making it challenging to relate to real-life contexts, thereby reducing students' interest and motivation to learn (Ayu et al., 2021; Rizqi et al., 2023).

Observations in the fourth-grade class at SDN Sidosermo I Surabaya indicate that most students still struggle with understanding the basic concepts of whole numbers. This is reflected in the low level of student engagement during lessons. Many students tend to be passive, waiting for the teacher’s explanations, while only a few are willing to ask questions or respond to material-related inquiries. There is also a noticeable disparity in abilities among students, with higher-achieving students tending to dominate, while those who have difficulty understanding the material appear confused and left behind. From the pre-test results only 40.74% of students achieved the Minimum Passing Criterion (KKM), with an average score of 61.48.

Based on the description above, this Classroom Action Research (CAR) was conducted to explore the effectiveness of the Cooperative Learning model, Team Games Tournament (TGT), combined with a content differentiation approach in improving student learning outcomes in whole numbers for fourth-grade students at SDN Sidosermo I Surabaya. Through the Team Games Tournament (TGT) model

paired with content differentiation, it is expected that students' motivation to learn will increase, as the competitive and collaborative learning environment brings new enthusiasm for understanding the material. With increased learning motivation, students' learning outcomes are also anticipated to improve, as motivated students tend to be more active, diligent, and focused on achieving learning objectives.

THEORETICAL FRAMEWORK

Teams Games Tournament (TGT)

The Teams Games Tournament (TGT) cooperative learning model is designed to enhance student interaction and learning through games and intergroup competition. In TGT, students are divided into heterogeneous groups, typically consisting of 4–5 students with varying academic abilities. Initially, the teacher explains the material to be learned. Following this, each group discusses and practices questions together to prepare for the game phase. This system provides equal opportunities for high-achieving and lower-achieving students to contribute to their group's success. Additionally, rewards are given to the group with the highest score, fostering a spirit of learning and cooperation among group members (Salam et al., 2015; Santosa, 2018; Sugianto et al., 2022). However, given the diverse needs of students within a single class, the TGT model should be supported by a content differentiation approach.

Content Differentiation

Content differentiation is an instructional strategy that adjusts the teaching materials or content delivery methods to meet the needs, interests, and abilities of students (Reis & Renzulli, 2018; Tomlinson, 2014). By applying content differentiation, teachers can ensure that all students, whether high-achieving or in need of additional support, receive material tailored to their individual needs. This is essential, as content differentiation enables students to learn at their own pace or in a style suited to them, thereby reducing comprehension gaps among students and enhancing their engagement in the learning process (Purnawanto, 2023).

Content differentiation based on learning styles is a strategy that adjusts the method of delivering instructional material to align with how students most effectively absorb information. Each student has a unique learning style, and by understanding and applying content differentiation according to these styles, teachers can help each student achieve more optimal learning outcomes. The forms of content differentiation based on learning styles are described as follows: 1) Visual Learning Style: Students with a visual learning style tend to better understand information through images, diagrams, charts, and other visualizations (Mafirah & Sari Rufiana, 2020). For students with a Visual Learning Style, teachers can provide instructional materials filled with visual elements, such as picture cards, infographics, or videos that illustrate mathematical concepts like place value and whole number operations; 2) Auditory Learning Style: Students with an auditory learning style understand information more effectively through listening (Azis et al., 2020). Teachers can support these students by providing clear verbal explanations, facilitating group discussions, or using

podcasts and audio recordings that explain mathematical content. Songs or rhythms that teach whole numbers can also serve as effective tools (Artanto, 2023); 3) Kinesthetic Learning Style: Students with a kinesthetic learning style learn best through physical activity and hands-on experiences. Teachers can provide activities that involve movement, such as games requiring students to jump to the correct number on the floor or match problems with their solutions on the board (Marpaung, 2015).

Learning Outcomes

Learning outcomes are precise statements that define what a student is expected to know, understand, and demonstrate by the end of a learning process (Popenici & Millar, 2015). According to Bloom's Taxonomy, learning outcomes can be categorized across cognitive, affective, and psychomotor domains, where the cognitive domain is essential in academic settings and includes knowledge, comprehension, application, and higher-order thinking skills (Adams, 2015). This study focuses on the cognitive domain, particularly comprehension and application levels, as students work with whole numbers up to 10,000. Learning outcomes in this domain involve tasks that require students to identify and use place value, read and write numbers, compare and order numbers, and perform operations accurately, reflecting the cognitive skills necessary for foundational mathematical proficiency.

RESEARCH METHOD

This study is a type of Classroom Action Research (CAR). CAR is reflective and systematic research in which specific actions are implemented to improve and optimize classroom teaching practices professionally (Pahleviannur et al., 2022). CAR aims to enhance the quality of learning and student outcomes through a process of reflection and action carried out by the teacher. The research conducted follows the process outlined below:

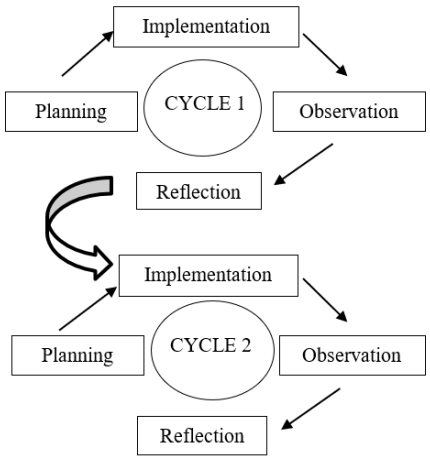


Figure 1. Classroom Action Research Flow Implemented

This study used the Classroom Action Research (CAR) method, following the spiral model of Kemmis and McTaggart, with four main stages adapted from Arikunto et al. (2021): planning, acting, observing, and reflecting. The action cycle in this study consists of two cycles, with each cycle involving the following four stages: 1) Planning: In this stage, students' learning issues are identified, and action plans are formulated. 2) Acting: Learning activities are implemented according to the established action plan. 3) Observing: Data on students' learning outcomes in whole number topics is collected through post-tests to evaluate their understanding and the effectiveness of the action. 4) Reflecting: Post-test results are analyzed to assess the achievement of learning objectives and to determine improvement steps for the next cycle.

This study was conducted at SDN Sidosermo I Surabaya during the 2023/2024 academic year. The research subjects were 28 fourth-grade students in the first semester of 2023/2024, intending to improve students' learning outcomes in a whole number topics by applying the Cooperative Learning Teams Games Tournament (TGT) model with a content differentiation approach. The test instrument used to identify student learning outcomes consisted of 18 short-answer questions and 4 matching questions. These questions were carefully designed to assess students' understanding and application of whole numbers up to 10,000, focusing on place value, reading and writing numbers, comparing, ordering, and performing operations. Real-life scenarios were integrated, such as determining which item is cheaper, calculating total costs of purchases, comparing expenses, and arranging prices from smallest to largest. By using practical contexts, the questions encouraged students to apply mathematical concepts to real-world situations, enhancing the assessment's relevance to everyday problem-solving skills.

Learning outcome data were collected through pre-tests and post-tests to assess students' understanding before and after the intervention. The data were analyzed using descriptive analysis methods to describe the average scores and the percentage of student mastery in each cycle. This data collection was aimed at measuring the improvement in students' understanding and abilities in whole numbers after implementing the Cooperative Learning Teams Games Tournament (TGT) model with a content differentiation approach. The success criteria for this classroom action research are achieved if 80% of all students reach scores meeting the school's minimum passing criterion (KKM) (Al-Tabany, 2017). The minimum passing criterion (KKM) for fourth-grade mathematics at SDN Sidosermo I is 75.

RESULTS AND DISCUSSION

This study applied the Classroom Action Research (CAR) method, following the spiral model of Kemmis and McTaggart, which consists of four main stages adapted from Arikunto et al. (2021): planning, acting, observing, and reflecting. The actions carried out at each stage are described as follows:

Planning

In this stage, observations were conducted on the learning process and learning environment, along with pre-tests and diagnostic tests to identify the challenges faced by fourth-grade students at SDN Sidosermo I in learning mathematics. The observation results indicated that mathematics instruction has predominantly relied on lecture or expository methods, where the teacher serves as the primary facilitator in delivering material. This method involves presenting mathematical concepts at the front of the class while students listen and take notes, followed by exercises to reinforce their understanding.

However, this approach has not been effective in enhancing students' understanding of whole number topics, as it lacks active student engagement and fails to connect concepts with relevant real-life situations. This condition indicates the need for a more interactive and collaborative learning model, such as the Team Games Tournament (TGT). Through TGT, students can learn in groups and participate in healthy competition, which can boost their motivation and help them understand mathematical concepts through hands-on experiences and peer interactions. This need is also reflected in the pre-test results conducted before the intervention process. The pre-test results are summarized in the following table:

Table 1. Pre-test Results

Description	Result
Highest learning outcome	94
Lowest learning outcome	0
Average learning outcome	61.48
Number of students passing	11
Number of students not passing	16
Passing percentage	40.74%

From these pre-test results, it is evident that only 40.74% of students achieved the Minimum Passing Criterion (KKM), with an average score of 61.48. This indicates that before the intervention, students' understanding of whole number topics was still low, necessitating a more effective instructional approach to improve their learning outcomes.

In addition, a diagnostic test was conducted to identify the learning styles of fourth-grade students. This test aimed to understand how each student absorbs information most effectively, allowing instruction to be adjusted to their individual needs. The following data presents the learning styles of the students obtained from the fourth-grade class:

Table 2. Summary of Student Learning Styles

Learning Style	Number of Students
Visual	12
Auditory	8
Kinesthetic	6

Based on Table 2, the data reveals a diversity of learning styles within the class, including students with visual, auditory, and kinesthetic preferences. To address this diversity, content differentiation in the learning approach was implemented to effectively accommodate and engage all three learning styles. After identifying the challenges faced by the students, it was decided that the instructional method to be implemented would be the Cooperative Learning Teams Games Tournament (TGT) model with a content differentiation approach in mathematics, specifically for whole number topics in the fourth grade. The next step involved developing a teaching module that includes a detailed lesson plan.

In this activity, the lesson planning included outlining the sequence of activities, assigning tasks to students, preparing instructional materials, and developing assessment instruments. Students were asked to perform several tasks, such as counting visitors at a tourist site, measuring running distances, or tallying the number of vehicles on the road. They also compared food prices, ordered food items from the cheapest to the most expensive, and determined which foods could be purchased with a specific amount of money. This instructional approach not only taught mathematical concepts theoretically but also connected them to real-life situations. The forms of content differentiation applied in this lesson were as follows:

1) Visual Learners: For students with a visual learning style, flashcards were used (Ananda & Sutriyani, 2023). These flashcards were designed in a way that allows students to use them to form units, tens, hundreds, and even thousands. The use of these flashcards enables visual learners to more easily visualize the concepts of place value and whole numbers.
2) Auditory Learners: Students with an auditory learning style were provided with a specially designed song about whole numbers and place value. Through this song, students can listen to and memorize mathematical concepts more easily and enjoyably, aligned with their more effective way of absorbing information through listening (Latifah, 2023).
3) Kinesthetic Learners: For students with a kinesthetic learning style, assignments were provided that required them to find matches for given questions. This task involves physical activity, allowing them to move and interact directly with the material (Supit et al., 2023), aligning with their learning preference for active and hands-on engagement.

Implementation

In the implementation stage, the lesson was conducted according to the prepared teaching module. The instruction utilized a direct teaching model supported by content differentiation. The activities organized in Cycle 1 aimed to reinforce foundational understanding of whole number topics by connecting mathematical concepts to real-life situations relevant to the students' daily lives. Additionally, content differentiation was applied to provide support aligned with the student's learning styles, allowing each student to absorb or receive information in the way most effective for them.

Stage 1: Conveying Objectives and Preparing Students – An introductory activity was conducted by asking stimulating questions about reading banknotes,

interpreting numbers on price lists, and determining place value. Stage 2: Demonstrating Knowledge and Skills – The lesson was delivered using a variety of media to support different learning styles. Flashcards were used as visual tools to help students visualize place values and whole numbers. Additionally, a song about whole numbers and place value was provided to support auditory learners, while a matching activity was implemented to meet the needs of kinesthetic learners.

Stage 3: Guiding Practice – This stage emphasized students' independent exploration. Students were given time to engage with various learning media and practice by arranging numbers using flashcards, recalling concepts through songs, and completing the matching tasks involving physical activity. Stage 4: Checking Understanding and Providing Feedback – Students' understanding was assessed through questions related to the material studied. Feedback was provided to assist students experiencing difficulties or needing further explanation, and some students demonstrated their practice results to the entire class. Stage 5: Offering Opportunities for Further Practice and Application – This was conducted through individual exercises, including problems on place value and the amount of money required for purchases. Upon completion of these exercises, a post-test was conducted to evaluate the achievement of learning objectives. The post-test results showed a mastery percentage of only 52%, which did not meet the minimum passing criterion of 80%, indicating the need for improvement strategies to be applied in Cycle 2.

In Cycle 2, the learning process continued to improve and enhance instructional effectiveness from the previous cycle. The learning process in Cycle 2 followed a cooperative syntax. Stage 1: Conveying Objectives and Motivating Students – In this stage, the learning objectives to be achieved throughout the process were presented, enabling students to understand and assess the knowledge and skills they are expected to acquire. Additionally, orientation to the problem was conducted with a new, more complex introductory question regarding how to determine the amount of money needed for purchases based on the numbers on banknotes. Stage 2: Presenting Information – In this stage, a review of previously learned material was conducted, including reading, writing, determining place value, comparing, ordering, using place value, performing composition and decomposition of numbers, as well as addition and subtraction operations. Learning media from the previous session, such as flashcards and a song about whole numbers, were also utilized. Students were invited to the front of the class to arrange numbers with the help of flashcards.

Stage 3: Organizing Students into Learning Groups – In this stage, the teacher explained the learning process to be undertaken, which involved distributing LKPD worksheets and post-it notes. Students were instructed to discuss and complete the Student Worksheets (LKPD) in their groups and write their answers on the post-its. They then simultaneously posted their answers in the designated area for each group. The teacher informed the class that groups completing the task accurately and promptly would receive a reward or prize. The teacher then announced the names of each group's members, organized heterogeneously based on pre-test results, and instructed all students to join their groups in the areas designated by the teacher. The

teacher subsequently distributed the Student Worksheets (LKPD) and Post-it notes. Stage 4: Guiding Students in Group Learning – In this stage, students took turns posting their answers from the Student Worksheets (LKPD) in the assigned space. The teacher provided guidance by explaining any questions students found unclear. Stage 5: Conducting Evaluation – In this stage, the teacher and students reviewed all tasks that had been discussed. The discussion began with questions that students found challenging. The teacher also assessed each group, providing feedback on areas for improvement, especially in terms of understanding questions, fostering teamwork, and managing time. Stage 6: Providing Rewards – In this stage, the teacher announced the group that completed the tasks accurately and quickly, rewarding that group according to the agreement set at the beginning of the lesson.

Observation

After the learning session, observations or assessments were conducted to evaluate the effectiveness of the learning process. The observation of learning effectiveness was based on the post-test results, which were administered to students after the lesson. The post-test results for Cycle 1 are presented in the following table:

Table 3. Cycle 1 Post-test Results

Description	Result
Highest learning outcome	100
Lowest learning outcome	57
Average learning outcome	80.85
Number of students passing	14
Number of students not passing	13
Passing percentage	52%

Students who achieved the highest score in the Cycle 1 post-test reached a score of 100, indicating that seven students had fully understood the material and were able to answer all questions correctly. The average learning outcome was 80.85. Although this average score is above the minimum passing criterion (75), it indicates that, overall, students showed an improvement in understanding the material after learning with the Cooperative Learning Teams Games Tournament (TGT) model supported by a content differentiation approach.

Nevertheless, the passing percentage only reached 52%, meaning that only 14 out of the total students achieved the minimum passing criterion. This percentage is still far below the success target of 80%, which was set as the research success indicator. The low passing percentage indicates that the learning process in Cycle 1 was not yet fully effective in improving students' learning outcomes to meet the expected target. Therefore, improvements and optimization of the learning strategy were necessary in Cycle 2. The post-test results for Cycle 2 can be seen in the following table:

Table 4. Cycle 2 Post-test Results

Description	Result
Highest learning outcome	100

Description	Result
Lowest learning outcome	63
Average learning outcome	86.78
Number of students passing	23
Number of students not passing	4
Passing percentage	85%

In Cycle 2, improvements in the learning strategy were made with a focus on group investigation to enhance student collaboration and understanding. The post-test results in Cycle 2 showed a significant increase compared to Cycle 1. While the highest score remained at 100, the lowest score rose to 63. The average learning outcome also increased to 86.78, indicating that most students showed a better understanding after the instruction in Cycle 2.

Additionally, the number of students reaching the minimum passing criterion increased to 23, with a passing percentage of 85%. This represents a 33% improvement compared to Cycle 1 and has surpassed the success target of 80%. This increase in the passing percentage indicates that the improved learning strategy in Cycle 2, using the Cooperative Learning Teams Games Tournament (TGT) model with a content differentiation approach, successfully enhanced the effectiveness of instruction and student learning outcomes.

Reflection

In the Cycle 1 lesson, the investigation was conducted individually without the support of Student Worksheets (LKPD), using only a variety of media and practice exercises. Although this approach encouraged students to work independently and develop critical thinking skills, the results were not optimal. The student passing percentage reached only 52%, significantly below the success target of 80%. This indicates that, without clear guidance, many students struggled to understand the material and apply whole number concepts independently.

Based on this reflection, improvements were implemented in Cycle 2 by shifting to a group investigation approach and providing Student Worksheets (LKPD) to support the learning process. The group approach encouraged collaboration among students, while the Student Worksheets (LKPD) offered more structured guidance. As a result, the passing percentage significantly increased to 85%, indicating that a more directed and collaborative learning strategy was more effective in helping students achieve the expected understanding.

Overall, the implementation of the Team Games Tournament (TGT) cooperative learning model with a content differentiation approach for a whole number topics proved effective in improving student learning outcomes. The shift in strategy from individual investigation to group investigation, along with the support of Student Worksheets (LKPD), played a crucial role in improving students' understanding, as reflected in the significant improvement in Cycle 2 post-test results. This approach not only increased student engagement in learning but also allowed students to receive support adjusted to their learning styles and abilities, ensuring that each student could

understand the material more effectively. An example of students' work before and after the intervention is presented in Table 5 below:

Table 5. Sample of Student Work Results

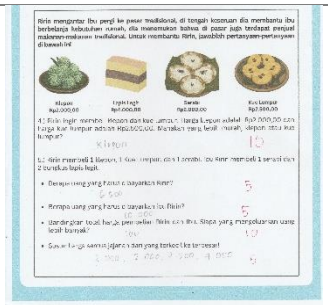
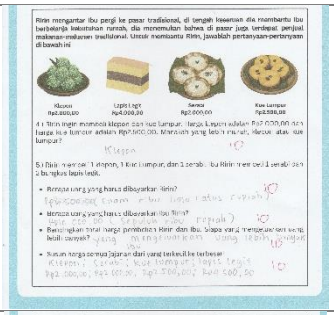
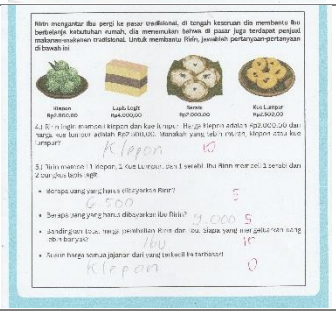
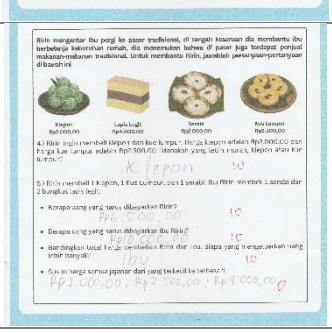
	Before Intervention	After Intervention
Student with the Highest Score		
Student with the Lowest Score		

Table 5 presents a sample of students' work. Based on Table 5, common errors frequently encountered when writing rupiah currency amounts include not placing 'Rp' before the number or 'cent' after it. Students also experience difficulties in performing operations with whole numbers and often make spelling mistakes, such as writing "Tujuh" as "Tuju" or "Dua Belas" as "Duabelas." Additionally, other common errors involve incorrect use of thousand separators and reversed number order, such as writing "21" as "12." Students also sometimes struggle to write large numbers in the correct sequence.

The Teams Games Tournament (TGT) learning model effectively enhances students' learning motivation through an enjoyable competitive environment. In TGT, students work together in groups to complete tasks, fostering motivation through cooperative interaction, a sense of competition, and rewards for the best-performing team (Handayani, 2022). In addition to boosting motivation, TGT also positively impacts learning outcomes, helping students gain a deeper understanding of the material compared to traditional methods (Rani, 2022; Suardin & Andriani, 2021). This high level of motivation plays a crucial role in improving learning results, as motivated students tend to be more enthusiastic and persistent, leading to optimal achievement (Rahman, 2022).

CONCLUSION

This study proves that the implementation of the Team Games Tournament (TGT) cooperative learning model with a content differentiation approach effectively improves learning outcomes for fourth-grade students in a whole number topics. In the initial stage, pre-test results showed an average student score of 61.48, with a mastery level of only 40.74%, below the Minimum Passing Criterion (KKM). After applying the content differentiation approach in Cycle 1, the average score increased to 80.85, with a mastery level reaching 52%, still below the target mastery level of 80%.

In Cycle 2, strategy improvements through the application of TGT with group investigation and the use of Student Worksheets (LKPD) further increased the average student score to 86.78, with a mastery percentage reaching 85%, surpassing the defined target. The implementation of a more structured and collaborative learning strategy proved effective in meeting the diverse learning needs of students, enhancing engagement and motivation, and achieving the expected mastery level.

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