

THE APPLICATION OF CROSSWORD PUZZLES IN MATHEMATICS LEARNING

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Abstract. Mathematics learning often causes difficulties for junior high school students, especially in basic topics such as integer operations. Many students encounter difficulties understanding the concepts of addition, subtraction, multiplication, and division of integers, particularly when the material is presented as word problems. To overcome these problems, we, students of the Mathematics Study Program at Universitas Flores, implemented an innovative learning medium in the form of crossword puzzles integrated with Student Worksheets (Lembar Kerja Peserta Didik/LKPD). This activity was conducted at SMPK Wawonato and involved 20 students of class VII B. The crossword puzzles were designed to contain word problems related to integer operations, while the student worksheets functioned to review students' initial and final abilities. The results of the activity showed that implementing crossword puzzles and student worksheets increased students' enthusiasm and motivation for learning and improved their understanding of integer operations. Students became more actively involved in group discussions and were able to solve word problems more effectively.

Keywords: crossword puzzles, integer operations, student worksheets

Abstrak. Abstrak. Pembelajaran matematika sering kali menimbulkan kesulitan bagi siswa tingkat SMP, terutama pada materi dasar seperti operasi bilangan bulat. Banyak siswa mengalami hambatan dalam memahami konsep penjumlahan, pengurangan, perkalian, dan pembagian bilangan bulat, khususnya ketika materi disajikan dalam bentuk soal cerita. Untuk mengatasi permasalahan tersebut, kami mahasiswa Program Studi Matematika Universitas Flores menerapkan media pembelajaran inovatif berupa teka-teki silang yang dipadukan dengan Lembar Kerja Peserta Didik (LKPD). Kegiatan ini dilaksanakan di SMPK Wawonato dan melibatkan 20 siswa kelas VII B. Teka-teki silang dirancang untuk memuat soal cerita yang berkaitan dengan operasi bilangan bulat, sedangkan LKPD berfungsi untuk meninjau kemampuan awal dan akhir siswa. Hasil kegiatan menunjukkan bahwa penerapan teka-teki silang dan LKPD mampu meningkatkan antusiasme dan motivasi belajar siswa, serta memperbaiki pemahaman mereka terhadap konsep operasi bilangan bulat. Siswa menjadi lebih aktif terlibat dalam diskusi kelompok dan mampu menyelesaikan soal cerita dengan lebih efektif.

Kata kunci: lembar kerja peserta didik, operasi bilangan bulat, teka-teki silang

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INTRODUCTION

Mathematics is a fundamental subject in education because it plays a significant role in developing students' logical, critical, analytical, and systematic thinking skills (Jamil et al., 2024; Wang et al., 2025). In addition, mathematics serves as the foundation for various fields of science and technology, making it an essential component in preparing students to face academic and real-life challenges (Kohen & Orenstein, 2021). Through mathematics learning, students are expected not only to master computational skills but also to develop problem-solving abilities, reasoning skills, and the capacity to make informed decisions based on logical thinking (Mendrofa, 2024). Therefore, effective mathematics instruction is crucial for supporting students' overall cognitive development.

Despite its importance, mathematics is often perceived by students as one of the most challenging subjects. This perception is particularly evident in the topic of integer operations taught in Grade VII of junior high school. Integer operations require students to understand abstract concepts, including the distinction between positive and negative numbers and the rules governing the operations of addition, subtraction, multiplication, and division with integers (Khalid & Embong, 2019). Difficulties become more pronounced when these concepts are presented through word problems that require students to interpret contextual situations, identify relevant information, select appropriate mathematical operations, and apply problem-solving strategies systematically (Verschaffel et al., 2020). As a result, many students struggle to solve such problems accurately and confidently.

Observations conducted at SMPK Wawonato revealed that students in Class VII B continue to experience difficulties in understanding integer concepts and applying them to solve contextual problems. Many students encounter challenges in distinguishing between positive and negative integers, interpreting mathematical symbols correctly, and identifying key information contained in word problems (Mayer & Hegarty, 2012). Furthermore, students often find it difficult to translate verbal descriptions into mathematical expressions and determine the appropriate procedures needed to obtain solutions (Castro et al., 2022). These challenges indicate that students have not yet fully developed a conceptual understanding of integer operations, which may hinder their performance in more advanced mathematical topics (Parino et al., 2025).

According to George Polya (1973), effective mathematical problem-solving involves four essential stages: understanding the problem, devising a plan, carrying out the plan, and evaluating the solution. However, classroom observations indicate that many students tend to skip one or more of these stages, particularly when solving word problems. Instead of carefully analyzing the problem and planning a solution strategy, students frequently attempt to answer immediately without fully understanding the context of the question (Ogilvie, 2009). This tendency often leads to errors in selecting mathematical operations and obtaining incorrect solutions (Dwita & Retnawati, 2022). Such findings suggest that students require instructional support that can guide them through the problem-solving process in a more structured and engaging manner.

Another factor contributing to students' difficulties is the predominance of conventional teaching methods in classroom instruction. Learning activities are often centred on teacher explanations, textbook exercises, and routine practice questions, resulting in limited opportunities for students to actively participate in the learning process (Abedi, 2024). This teacher-centred approach may reduce students' interest and motivation, especially when mathematical concepts are presented abstractly and repetitively. Consequently, students may become passive learners who rely heavily on teacher guidance rather than actively constructing their own understanding of mathematical concepts (Ncube & Luneta, 2025).

One instructional innovation implemented in this learning activity is the use of a Crossword Puzzle media integrated with Student Worksheets. Crossword puzzles are designed as interactive learning tools that encourage students to think critically while solving mathematical problems in a fun and engaging way (Tejeswini et al., 2024). In this implementation, the crossword puzzle contains word problems related to integer operations, requiring students to analyze the questions carefully before determining the correct answers (Tosunöz & Doğan, 2023). This activity not only reinforces students' understanding of integer concepts but also helps them develop problem-solving skills, critical thinking abilities, and mathematical reasoning (Sercenia et al., 2023).

Meanwhile, the Student Worksheets function as structured learning guides that facilitate students' exploration of mathematical concepts and provide opportunities for independent and collaborative learning (Sujatha & Vinayakan, 2022). The worksheets also serve as assessment instruments for measuring students' initial and final understanding of the material. Through the combination of crossword puzzles and worksheets, students are encouraged to participate actively in the learning process, discuss problem-solving strategies with their peers, and reflect on their understanding of mathematical concepts (Bawazeer et al., 2022).

The implementation of crossword puzzle media in mathematics learning is expected to create a more interactive, student-centred, and enjoyable classroom environment. By incorporating elements of educational games into instruction, students may become more motivated to engage with learning activities and demonstrate greater enthusiasm toward mathematics. Furthermore, the use of crossword puzzles can help reduce students' anxiety and negative perceptions of mathematics by presenting learning activities in a more attractive and meaningful format. Ultimately, this approach is expected to improve students' understanding of integer operations, enhance their critical thinking and problem-solving skills, and foster greater motivation, participation, and collaboration throughout the learning process at SMPK Wawonato.

METHOD

This community service activity was carried out by lecturers and students of the Mathematics Education Study Program, Universitas Flores, at SMPK Wawonato, targeting students of Class VII B. The number of participants involved was 20 students. The activity was conducted on November 18, 2025, by adjusting to the school learning schedule so as not to interfere with the ongoing teaching and learning process. The location was selected because, based on the results of preliminary observations, Class VII B students still experienced difficulties in understanding integer operation material, especially when it was presented in the form of word problems.

The method of implementing the activity was carried out through several interconnected stages. The first stage was needed analysis, which aimed to identify the learning problems experienced by students. This analysis was conducted through discussions with the mathematics teacher, informal interviews with several students, and direct observation of students' difficulties in solving integer word problems. The results of the analysis indicated the need for creative and interesting learning tools that could increase students' learning interest and conceptual understanding, one of which was using Crossword Puzzles. The second stage was lectures and discussions, namely providing explanations to students regarding the basic concepts of integer operations and introducing the use of Crossword Puzzles and student worksheets as learning media. At this stage, the benefits of Crossword Puzzles in helping students understand the material, increasing learning motivation, and encouraging active student involvement in the learning process were explained.

The next stage was guidance in examining examples of Crossword Puzzles and student worksheets. Students were guided to understand examples of Crossword Puzzles containing terms and word problems related to integer operations and were introduced to student worksheets as a support for problem-solving activities. After that, in the main stage, assistance was provided in applying Crossword Puzzles directly, both through individual and group activities. Students were asked to complete the Crossword Puzzles and the questions in the student worksheets with guidance from lecturers and students. The final stage was drawing conclusions and evaluating the activity. Evaluation was carried out by observing students' involvement, enthusiasm, and ability to complete the CWP and student worksheets. The evaluation results showed that the use of Crossword Puzzles and student worksheets was able to increase learning motivation, activeness, and students' understanding of integer operation material. This evaluation also became the basis for the development of similar learning activities in the future.

RESULTS AND DISCUSSION

Stage 1. Field Observation and Socialization

The first stage of the activity involved field observation and socialization. Field observations were conducted to identify students' learning needs and challenges related to integer operations. The observations revealed that many students experienced difficulties in distinguishing between positive and negative integers, understanding mathematical terminology, and solving contextual word problems involving integer operations (Amir et al.,

2022). In addition, students tended to show limited participation during mathematics lessons and often perceived the subject as difficult and less engaging.

Based on these findings, a socialization session was conducted to introduce students to the objectives and procedures of the learning activity. During this session, students were informed about the use of Crossword Puzzles and Student Worksheets as learning media designed to help them better understand integer operations (Putri & Ambara, 2025). Explanations were also provided regarding the benefits of Crossword Puzzles in enhancing learning motivation, improving conceptual understanding, and encouraging active participation in classroom activities (Bawazeer et al., 2022). The socialization process was carried out through interactive discussions and question-and-answer sessions to ensure that students understood the purpose of the activity (Kadu, 2026). Students responded positively to the introduction of the learning media and showed enthusiasm toward participating in the upcoming activities (Sitompul et al., 2023). This initial stage played an important role in preparing students both cognitively and psychologically for the learning process, creating a more supportive and engaging classroom environment for the implementation of the Crossword Puzzle learning media (Anita & Moetia, 2025).

Stage 2. Planning

During the planning stage, the community service team designed learning activities that integrated Crossword Puzzles with Student Worksheets. The planning process included the development of Crossword Puzzle materials containing important terms related to integer operations, such as negative numbers, absolute value, and difference. In addition, Student Worksheets consisting of contextual word problems were prepared and adjusted to the students' level of understanding (Setiawan & Wardani, 2023). This planning stage was carried out by considering the characteristics of students and the primary objectives of the activity, namely, to improve students' conceptual understanding, learning motivation, and engagement in Mathematics learning (Kariadinata et al., 2019). The learning materials and activities were designed to create an interactive and enjoyable learning environment while providing opportunities for students to strengthen their understanding of integer operation concepts through both individual and collaborative learning experiences (Francisco, 2013).

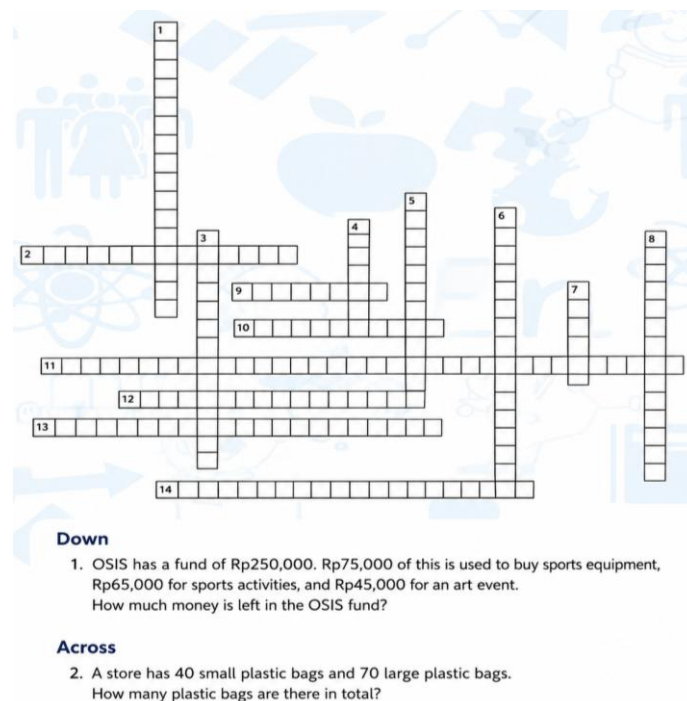


Figure 1. Crossword puzzle addition and subtraction

Stage 3. Implementation

The implementation stage was conducted on November 18 and involved 20 students from Class VII B, with full support from the mathematics teacher. The activity began with an explanation of the basic concept of using Crossword Puzzles as a learning medium. The students showed a high level of enthusiasm because the method used was different from the mathematics learning activities they usually experienced (Mazana et al., 2019). Subsequently, students were provided with examples and crossword puzzle worksheets containing terms and concepts related to integer operations (Dauben, 2025). During the crossword puzzle activity, students worked in groups, which encouraged active discussion, the exchange of ideas, and cooperation among group members. This activity created a more dynamic, interactive, and enjoyable classroom atmosphere. Students actively participated in identifying mathematical terms and concepts while collaboratively completing the crossword puzzles (Torres et al., 2022).



Figure 2. *Students are engaged in solving a mathematical crossword puzzle*

After completing the crossword puzzles, the students continued the activity by working on Student Worksheets consisting of contextual word problems. The observation results indicated that students were more prepared and confident when solving the problems because they had already become familiar with the key terms and concepts through the crossword puzzle activity (Kalkan et al., 2022). The crossword puzzle media functioned as an introductory tool that helped students connect mathematical concepts with their application in solving word problems, thereby facilitating a deeper understanding of integer operations (Darmayanti, 2022).



Figure 3. *Implementation of crossword puzzles in mathematics instruction*

Stage 4. Evaluation and Reflection

The evaluation and reflection stage was conducted through direct observation of students' participation, understanding, and responses during the learning activities. The evaluation focused on students' understanding of integer operations, including positive and negative integers, absolute value, addition and subtraction, and their application in contextual word problems (Miftahudin & Putra, 2025). The evaluation results indicated an improvement in students' understanding of integer operation concepts, particularly in recognizing mathematical terms such as negative numbers, absolute value, difference, and operation results (Harun et al., 2023). Students also appeared more capable of determining the appropriate arithmetic operations when solving word problems. Students who had previously been passive during Mathematics lessons began to demonstrate greater confidence in participating, expressing their opinions, and actively engaging in group discussions (Severe et al., 2024).



Figure 4. Socialization session for class VII B at WAWONATO Catholic Junior High School

Reflection on the implementation of the activity showed that using Crossword Puzzles integrated with Student Worksheets to teach integer operations created a more inclusive, effective, and enjoyable learning environment (Dauben, 2025). The Crossword Puzzles media served as a tool for reinforcing concepts and introducing the material, while the student worksheet helped students apply these concepts through problem-solving activities (Tejeswini et al., 2024). Therefore, the implementation of creative and innovative learning media such as Crossword Puzzles can be an effective solution to overcome students' low interest and understanding of abstract Mathematics topics, particularly integer operations, while also enhancing students' cognitive and emotional engagement in the learning process (Zamani et al., 2021).

CONCLUSION

The implementation of the community service activity in the form of socialization and assistance in applying the Crossword Puzzle (CWP) learning media integrated with Student Worksheets (LKPD) in Mathematics learning at SMPK Wawonato showed positive results. The use of CWP was proven to improve students' understanding of integer operation concepts, particularly in solving word problems, as well as increase the motivation, activeness, and participation of Class VII B students during the learning process. The learning atmosphere became more enjoyable, interactive, and inclusive, enabling students to be more confident in discussing and collaborating with their peers. As a follow-up, the application of CWP media is recommended to be used continuously and developed for other Mathematics topics. Teachers are expected to modify CWP according to learning needs and combine it with other media and methods to make learning more effective. In addition, further activities are needed in the form of training for teachers on developing CWP media and conducting continuous evaluations with a broader range of participants to obtain more optimal and sustainable results.

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