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Improving KPK and FPB Concepts Through Interactive TTS Media

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ABSTRAK

Penelitian ini bertujuan meningkatkan pemahaman siswa kelas V SD Negeri Lobang 02 mengenai konsep Kelipatan Persekutuan Terkecil (KPK) dan Faktor Persekutuan Terbesar (FPB) dengan menggunakan media interaktif berupa teka-teki silang (TTS). Penelitian ini termasuk dalam jenis Penelitian Tindakan Kelas (PTK) yang dilaksanakan dalam dua siklus. Subjek penelitian terdiri dari 16 siswa. Alat pengumpulan data yang digunakan meliputi tes hasil belajar, lembar observasi, dan angket respons siswa. Dari hasil penelitian terlihat adanya peningkatan hasil belajar siswa dari siklus pertama ke siklus kedua. Pada tahap pra-tindakan, hanya 31,25% siswa yang mencapai ketuntasan belajar dengan rata-rata nilai 61,2. Setelah tindakan dilakukan pada siklus pertama, ketuntasan meningkat menjadi 56,25% dengan rata-rata nilai 72,8. Pada siklus kedua, ketuntasan belajar mencapai 87,5% dengan rata-rata nilai 84,5. Peningkatan ini menunjukkan bahwa media TTS efektif dalam membantu siswa memahami konsep KPK dan FPB serta menciptakan suasana belajar yang lebih aktif dan menyenangkan. Kesimpulannya, media interaktif berupa teka-teki silang dapat menjadi alternatif strategi pembelajaran yang mampu meningkatkan hasil belajar matematika siswa di sekolah dasar.

Kata Kunci: teka-teki silang; KPK dan FPB; media interaktif.

ABSTRACT

This study aims to improve the understanding of fifth grade students of Lobang 02 Elementary School regarding the concept of Least Common Multiple (LCM) and Greatest Common Factor (GCF) by using interactive media in the form of crossword puzzles (TTS). This study is included in the Classroom Action Research (CAR) type which is carried out in two cycles. The research subjects consisted of 16 students. Data collection tools used include learning outcome tests, observation sheets, and student response questionnaires. From the results of the study, there is an increase in student learning outcomes from the first cycle to the second cycle. In the pre-action stage, only 31.25% of students achieved learning mastery with an average score of 61.2. After the action was carried out in the first cycle, mastery increased to 56.25% with an average score of 72.8. In the second cycle, learning mastery reached 87.5% with an average score of 84.5. This increase shows that the TTS media is effective in helping students understand the concepts of LCM and GCF and creating a more active and enjoyable learning atmosphere. In conclusion, interactive media in the form of crossword puzzles can be an alternative learning strategy that can improve students' mathematics learning outcomes in elementary schools.

Keywords: crossword puzzles; KPK and FPB; interactive media.

INTRODUCTION

Mathematics instruction in elementary school plays a crucial role in developing logical, systematic, and critical thinking skills from an early age. One of the basic competencies taught in fifth grade is understanding the Least Common Multiple (LCM) and Greatest Common Factor (GCF). These two topics serve as the foundation for understanding advanced mathematical operations, such as simplifying fractions or solving everyday contextual problems. However, in practice, many students struggle to fully grasp the concepts of LCM and GCF because the material is abstract and requires strong numerical reasoning.

Based on initial observations at Lobang 02 Public Elementary School, it was discovered that most fifth-grade students had not yet met the Minimum Completion Criteria (KKM) for LCM and GCF. Of the 16 students, only 5 (31%) were able to answer the questions correctly. Meanwhile, other students still struggled to differentiate between multiples and factors and struggled to determine the LCM and GCF of two numbers. These low learning outcomes indicate that the learning process remains ineffective, both in terms of methods and learning media.

One contributing factor is the use of the lecture method, which still dominates the learning process. This method tends to be one-way and makes students passive. Teachers spend more time explaining problem-solving procedures than building a deeper understanding of concepts. As a result, students lack the space to explore their understanding through meaningful and enjoyable activities. Therefore, learning approaches and media are needed that can encourage active student engagement and make abstract material more concrete.

Interactive learning media can be a solution to these problems. According to Heinich et al. (2002), learning media is a tool used to convey learning messages to make the learning process more effective and efficient. Interactive media enables two-way communication between students and the material and provides opportunities for students to play an active role in the learning process. Arsyad (2019) adds that interactive media stimulates various senses, such as visual, auditory, and kinesthetic, thereby helping to strengthen students' understanding and memory. In mathematics learning, interactive media can simplify complex concepts through symbolic, visual, or narrative representations.

One form of interactive media that can be applied in learning is the crossword puzzle (TTS). A crossword puzzle is a word game in the form of empty squares that are filled in based on horizontal or vertical clues. In an educational context, a crossword puzzle can be modified to suit the subject matter, serving as a fun learning aid. Suprijono (2012) states that a crossword puzzle can improve students' concentration, memory, and logical thinking. Through this medium, students not only passively answer questions but also practice critical thinking skills in structuring and understanding terms and concepts, including those learned in the LCM and GCF (Facility, Function, and Functional Group).

LCM and GCF are important topics in the fifth-grade mathematics curriculum, serving as the foundation for understanding more advanced number operations, such as simplifying fractions, determining recurrence times, and solving word problems. However, students often struggle because they don't fully grasp the concepts of multiples and factors. Bruner (1966) suggested that children will more easily understand abstract concepts if they progress through the enactive (direct experience), iconic (visual/picture), and symbolic (numbers and letters) stages. Therefore, the use of crossword puzzles, which can present visualization and symbolization, is highly appropriate for elementary school students' learning stages.

Several previous studies support the use of crossword puzzles (TTS) as an interactive medium in mathematics learning. Research by Burhanudin et al. (2023) showed that TTS media in mixed arithmetic operations in fourth grade significantly improved learning outcomes, from an average of 56.8 to 82.4, and encouraged student engagement in class discussions. Furthermore, Novita Sari Pangaribuan et al. (2024) found that the use of TTS in seventh-grade algebra positively impacted students' conceptual understanding and retention of mathematical terms.

Based on the background and theoretical background outlined above, this study aims to describe the process of implementing interactive crossword puzzles and analyze the

improvement in understanding of the concepts of LCM and GCF in fifth-grade students at Lobang 02 Elementary School.

METHOD

This study is a Classroom Action Research (CAR) study aimed at improving the understanding of the concepts of LCM and FPB through the application of interactive crossword puzzles (TTS) among fifth-grade students at Lobang 02 Public Elementary School. The CAR model used refers to the Kemmis and McTaggart stages, namely: (1) planning, (2) action implementation, (3) observation, and (4) reflection. The study was conducted over two cycles, each consisting of two meetings. The subjects in this study were all 16 fifth-grade students at Lobang 02 Public Elementary School, consisting of 8 boys and 8 girls. The study was conducted in the even semester of the 2024/2025 academic year.

The instruments used in this study included a learning outcome evaluation test to measure understanding of the concepts of LCM and FPB, an observation sheet to determine student learning activities during the lesson, and a student response questionnaire to determine their responses to the use of the TTS media. The data analysis techniques used were quantitative and qualitative analysis. Quantitative data was obtained from student test results which were analyzed using the percentage of classical learning completion, while qualitative data was obtained from observation and questionnaire results which were analyzed descriptively to determine the increase in student activity and involvement during the learning process.

RESULTS

The results of the study indicate an increase in understanding of the concepts of LCM and GCF after the implementation of interactive crossword puzzles in the learning process. This improvement is evident from the results of the evaluation tests in each cycle, both in terms of average scores and the number of students who achieved the Minimum Completion Criteria (KKM). The following is a summary of student learning outcomes from Cycle I to Cycle II:

Table 1. Recapitulation of Learning Outcomes of Class V Students of SDN Lobang 02

Indicators	Pre- Action	Cycle I	Cycle II
Number of students	16	16	16
Number of students who completed the course	5	9	14
Persentase ketuntasan (%)	31,25%	56,25%	87,5%

The table above shows that before the intervention, only 31.25% of students achieved the KKM with a class average score of 61.2. After the intervention in Cycle I, the completion rate increased to 56.25% with a class average score of 72.8. In Cycle II, learning outcomes improved more significantly, with 87.5% of students achieving the KKM and a class average of 84.5. This indicates that the implementation of crossword puzzles has gradually succeeded in improving students' understanding of the KPK and FPB materials.

The results of the study showed a significant increase in understanding of the concepts of LCM and GCF after the implementation of interactive media in the form of crossword puzzles (TTS) in mathematics learning in fifth grade students at Lobang 02 Public Elementary School. Based on the evaluation results, student learning completion increased from 56.25% in cycle I to 87.5% in cycle II. The class average score also increased from 72.8 to 84.5. This increase indicates that the use of TTS has a positive impact on improving

student learning outcomes, both individually and as a class. This increase not only indicates quantitative improvement but also indicates a more meaningful improvement in the quality of learning, as students appear more enthusiastic, active, and directly involved in the learning process.

Theoretically, the success of implementing TTS as an interactive learning medium can be explained through constructivist learning theory and cognitive development theory. According to Bruner (1966), an effective learning process involves three stages of representation: enactive (direct experience), iconic (pictures or visuals), and symbolic (language or numbers). In this context, TTS encourages students to go through all three stages. When students fill in the TTS boxes based on questions, they are carrying out motoric enactive activities; when observing the shape and arrangement of letters and numbers in the cross grid, they are at the iconic stage; and when understanding the meaning of terms such as "multiple" or "factor", they enter the symbolic stage. The use of TTS allows students to manipulate symbols and relate them to concrete meanings through fun activities. This is in accordance with the opinion of Heinich et al. (2002) which states that learning media functions as an intermediary to channel messages and stimulate students' attention.

The use of interactive media such as crossword puzzles (TTS) also aligns with the principle that effective learning involves students actively in the thinking process and constructing their own knowledge. Arsyad (2019) explains that interactive media can stimulate multisensory activity, namely visual, auditory, and kinesthetic, allowing students to access information through various perceptual channels. The activity of completing a TTS requires active student involvement, both visually when reading the questions, verbally when discussing answers with peers, and motorically when filling in the answer boxes. This activity makes learning more lively, enjoyable, and meaningful for students.

This improvement in learning outcomes also aligns with the findings of several previous studies. Burhanudin et al. (2023) in their study showed that the use of TTS as a learning medium for mixed arithmetic operations in fourth-grade elementary school improved student learning outcomes from an average of 56.8 to 82.4. This study also noted an increase in student engagement in discussions and problem-solving. These results support the findings of this study, where fifth-grade students at Lobang 02 Elementary School showed improvements not only in academic scores but also in aspects of active learning. Similarly, research by Novita Sari Pangaribuan et al. (2024) states that crossword puzzles (TTS) help students remember mathematical concepts more easily and enjoyably. In this context, the use of TTS is not merely a game, but also serves as a strategy to strengthen understanding of the generally abstract concepts of LCM and GCF.

In addition to support from previous research, there is also evidence from recent scientific articles demonstrating the effectiveness of TTS as a learning medium. One such article is an article by Kurniati, Rahmi, and Yuniati (2022) in the Cendekia Journal, which shows that TTS has a validity of 97% and a practicality level of 94.3% in learning integer operations. The article states that TTS designs that are tailored to student characteristics can significantly increase engagement and learning outcomes (https://www.j-cup.org/index.php/cendekia/article/view/1346). This research strengthens the conclusion that appropriately developed TTS can be a solution to the tendency for boring mathematics learning.

Furthermore, a study by Gema Cow-Pu (2023) in the Journal of Education Learning showed that the use of the TTS module in geometry significantly improved students' critical thinking skills, with the average score increasing from 65.67 to 88.28 (https://journal.assyfa.com/index.php/alj/article/view/128). This study confirms that TTS

media not only improves factual mastery of the material but also encourages higher-order thinking skills (HOTS). In this study, students were required to analyze TTS questions, evaluate answer choices, and formulate answers based on their understanding of the concepts of LCM and GCF. This reflects TTS's effectiveness in developing logical and systematic thinking skills in elementary school students.

In another study conducted by Maslukhah (2022) at MIN 1 Yogyakarta, the use of TTS in fourth-grade social studies learning demonstrated a significant improvement in learning outcomes. The results of the paired sample t-test showed a significance value of 0.000, indicating a significant difference before and after the treatment. This shows that the use of crossword puzzles as a learning medium can have a positive impact on various subjects, including mathematics, social studies, and others (https://digilib.uin-suka.ac.id/id/eprint/56451). Thus, empirical evidence from various studies supports the effectiveness of crossword puzzles as a learning medium across subjects and educational levels.

Furthermore, the use of crossword puzzles (TTS) in learning has also been shown to increase student motivation and interest in learning. A study by Nurkusuma et al. (2023) in the Khatulistiwa Journal stated that TTS provides a fun learning environment and fosters students' curiosity, which directly impacts learning outcomes (https://jurnal.untan.ac.id/index.php/jpdpb/article/view/41060). This aligns with field findings in this study, where students became more enthusiastic and active when learning using TTS, compared to previous learning methods dominated by lectures.

From a teaching strategy perspective, TTS also encourages collaborative learning and strengthens social skills. When students discuss answers to problem clues, they learn to listen to each other, express their opinions, and accept feedback. Learning is no longer individualistic but becomes a space for positive interactions that build shared understanding. In this study, small group discussions while working on TTS were highly effective in sparking academic social interactions among students. This type of interaction is crucial for developing reflective thinking and collaboration skills in solving mathematical problems.

Overall, the results of this study make an important contribution to elementary education, particularly in mathematics learning. The use of interactive media such as crossword puzzles has proven effective in helping students understand abstract mathematical concepts, improving learning outcomes, building motivation, and creating a more lively learning environment. The successful implementation of crossword puzzles in learning about the LCM and FPB at Lobang 02 Public Elementary School demonstrates that learning media need not be sophisticated or digital; they must be innovative and relevant to the characteristics of the students.

Considering the improved student learning outcomes, positive student responses to the media, and strong support from previous and current theories and research, it can be concluded that interactive crossword puzzles are an effective alternative that can be integrated into elementary school mathematics learning. These findings can serve as a reference for other teachers in developing creative learning media that can improve the overall quality of learning.

CONCLUSION

This study shows that the application of interactive crossword puzzles (TTS) in mathematics learning on the Least Common Multiple (LCM) and Greatest Common Factor (GCF) significantly improved the conceptual understanding of fifth-grade students at Lobang 02 Public Elementary School. Prior to the intervention, only 5 out of 16 students (31.25%) met the Minimum Completion Criteria (KKM) with an average grade point average of 61.2. After the implementation of TTS in Cycle I, the number of students who completed the task increased to 9 (56.25%), with an average grade point average of 72.8. Then, in Cycle II, learning completion increased even more significantly, with 14 out of 16 students (87.5%) declared complete, with an average grade point average of 84.5.

This improvement reflects that the use of TTS not only impacts quantitative learning outcomes but also increases student activity, engagement, and enthusiasm in the learning process. Students become more active in discussions, understand mathematical terms more easily, and are more interested in participating in learning due to the pleasant classroom atmosphere. This effectiveness is further supported by Bruner and Arsyad's theory, as well as previous research showing that crossword puzzles are a valid, practical learning medium capable of significantly improving learning outcomes. Therefore, crossword puzzles are a suitable alternative interactive learning medium for abstract mathematics materials in elementary schools.

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