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Use of Mnemonic Products in Volume Unit Conversion Materials in Elementary Schools

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ABSTRACT

This study aimed to improve the numeracy literacy and learning outcomes of fifth-grade students at Sekolah Indonesia Kota Kinabalu (SIKK) in volume unit conversions through the innovative Demonic method, which combines Demonstration and Mnemonic techniques. Employing Classroom Action Research (CAR), the study was conducted in two cycles with 15 students during the 2023/2024 academic year. Data were collected through observations, interviews, and pre- and post-tests. Results showed a significant increase in the average test score from 64.04 in Cycle I to 90.57 in Cycle II, with the percentage of students achieving the Minimum Completion Criteria rising from 38% to 90%. The integration of Mnemonic strategies enhanced memory retention, while Demonstration methods supported active participation and hands-on learning. The study concludes that the Demonic method effectively addresses learning gaps and fosters better comprehension of volume unit conversions.

Keywords: *Numeracy literacy, Demonic method, Classroom Action Research, Mnemonic techniques, Volume unit conversion.*

INTRODUCTION

Teachers are professional educators tasked primarily with educating, teaching, guiding, and assessing students. To achieve this, they engage in various efforts to create learning experiences that are active, creative, effective, and enjoyable. Among these efforts are the selection of appropriate teaching methods and techniques, as well as engaging and information-rich learning resources that can motivate students to learn actively and think creatively. Active and creative learning fosters critical, innovative, and independent scientific thinking and behavior among students, ultimately leading to better learning outcomes. However, several challenges arise regarding student learning outcomes at the researcher's location, specifically at the Sekolah Indonesia Kota Kinabalu (SIKK). The low results of the Minimum Competency Assessment (MCA) highlight this issue. For instance, an analysis of the Numeracy Literacy field for fifth-grade students shows that they struggle to comprehend MCA indicators, particularly those related to solving problems involving calculation operations for converting different volume units.

Numeracy literacy is a critical skill in 21st-century education. According to Ekowati *et al.* (2019), numeracy literacy refers to an individual's ability to analyze and interpret statements through activities involving the manipulation of symbols or language used in daily life and expressing these interpretations in written form. Supporting this perspective,

Dyah & Setiawati (2019) argue that numeracy encompasses applying mathematical principles and concepts to real-life situations, where problems often lack a defined structure and require multiple approaches to solve. These views highlight the importance of teaching numeracy literacy, particularly to elementary school students in grade five, who are preparing for the MCA. The number of fifth-grade students for the 2023/2024 academic year who were assessed through the system provided by the Ministry of Education, Culture, Research, and Technology totaled 15. From the analysis, it was revealed that only 13.33% of students, equivalent to 2 individuals, were able to perform volume conversion accurately, while the remaining 86.67% or 13 students did not meet the MCA standard score of 75. To foster greater interest and improved learning outcomes in numeracy literacy, it is essential to support the process with engaging and enjoyable learning approaches.

One factor contributing to the low interest and subpar learning outcomes in the material on volume unit conversions is the reliance on conventional teaching methods. These typically follow a pattern of lectures/theoretical explanations, example questions, practice sessions, and assessments. To create a more meaningful learning experience and enhance student achievement, the use of teaching aids specifically designed for debit material can be a solution. According to Jean Piaget (as cited in Muhseto, 2012), children aged 7–11 are in the concrete operational stage, while those aged 11 and above transition to the formal operational stage. Thus, fifth-grade students are better equipped to grasp fundamental mathematical concepts when these are taught using tangible (concrete) objects. The author has explored the use of real object-based media to teach the foundational concept of volume unit conversions.

The term "Demonic" an abbreviation of Demonstration and Mnemonic is an innovative approach developed by the author to enable teachers to convey lesson material effectively. According to Oktavianti (2018), the Mnemonic learning model can enhance students' mathematical problem-solving skills, which are often weak. The Mnemonic method significantly influences students' ability to address mathematical problems effectively. Similarly, Wang (2001); Rosidah & Zulkarnain (2022) highlight that the interaction between teaching and learning in the classroom is strongly supported by demonstration methods. Through demonstrations, students can engage actively, gain hands-on experience, and refine their practical skills. Based on this understanding, it is necessary to integrate the Demonstration and Mnemonic (Demonic) methods into a unified teaching aid to assist students in comprehending volume unit conversions at the elementary level. The research problem formulated is whether Demonic teaching aids can improve the learning outcomes of students at the Indonesian Overseas SIKK, Malaysia. The general objective of this study is to enhance the memory and learning outcomes of fifth-grade students in numeracy literacy at the SIKK. The study results are expected to contribute to the education sector by providing insights into tools or memorization techniques that can improve both memory and learning outcomes.

METHODS

This study employs a Classroom Action Research (CAR) approach, chosen due to its focus on addressing issues arising from classroom learning practices. The objective is to

improve the teaching process and enhance students' abilities. The study subjects consisted of fifth-grade students at SIKK registered during the 2023/2024 academic year, totaling 15 students who participated in the MCA selection process. The study is scheduled to take place from January to June 2024. Data collection techniques include observation and interviews, allowing for in-depth understanding and analysis of classroom interactions and student progress. The structure of the CAR cycle is illustrated in Fig. 1 below.

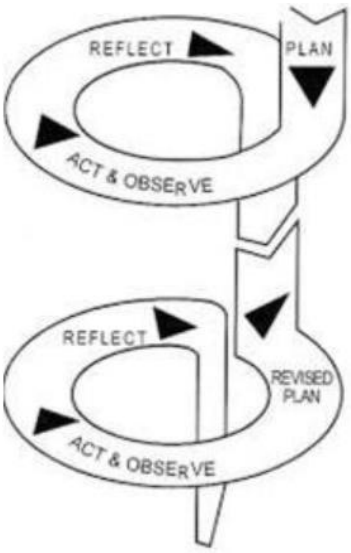

Figure 1. CAR Cycle Structure (Kemmis & Taggart, 1988; Masrida, 2018)

Study instruments, as tools for data collection, play a crucial role in the study process. The accuracy and reliability of study conclusions depend heavily on the quality of the data obtained through these instruments. The specific forms of the study instruments used in this study are outlined in Table 1 below.

Table 1. Form of Assessment Instrument

Objective	Data collection techniques	Research Instrument
Measuring knowledge	Hands	Filling test
Know students' opinions	Interview	interview guidelines
Assessing performance	Observation	Observation sheet work method field notes

To evaluate the success of this action study, the following indicators are used 1) An improvement in the memory of sixth-grade students at SIKK regarding the conversion of volume units, such as 1 dm^3 = 1 liter; and 2) An increase in learning outcomes in Mathematics, particularly in the primary topic of volume unit conversions, as evidenced by at least 80% of the students achieving scores above the Minimum Completion Criteria (KKM) of 75.

The data analysis techniques employed in this CAR include quantitative data, consisting of students' cognitive learning outcomes, which were analyzed using descriptive analysis techniques to determine the percentage of learning mastery and the class mean. The presentation of quantitative data is expressed in the form of percentages and numerical

values, following the reference framework provided by Aqib *et al* (2025). The steps for collecting and analyzing quantitative data through testing are as follows: 1) Providing test materials along with instructions for completion; 2) Administering the test to all students; 3) Collecting students' answer sheets; 4) Marking students' answer sheets using the answer key; 5) Calculating the number of correct answers for each answer sheet; 6) Determining each student's score using a predefined formula; 7) Recording the students' scores and entering them into a data table; and 8) Calculating the average learning outcomes of the students. The percentage of learning mastery is calculated using the formula mentioned, ensuring alignment with the criteria for learning completeness at the sixth-grade level of the Indonesian School in Kota Kinabalu. The results are then categorized into two groups "Complete" and "Incomplete".

RESULTS

3.1 Lesson Plan

The lesson plan involves careful preparation and implementation of materials, tools, and teaching strategies to ensure active and engaging learning.

3.1.1 Preparation

To begin, instructional materials are prepared, focusing on conversions between liters, milliliters, and cubic centimeters. Mnemonic aids are created to support the learning process. For instance, acronyms like "LIM" (Liters to Milliliters) can help students remember key conversion formulas. Visualizations, such as images of containers comparing different volume units, provide tangible and relatable references for students. These materials are further developed into comprehensive teaching resources that cover the fundamentals of volume units and their conversions. To facilitate practice, student worksheets are designed, incorporating exercises that reinforce understanding through Mnemonic techniques. These worksheets encourage hands-on engagement and help solidify the student’s grasp of the material.

3.1.2 Teaching Strategies and Methods

The teaching strategies are designed to create a meaningful and interactive learning experience. The lesson begins with an engaging introduction that presents volume unit conversions through everyday examples, such as measuring water in containers of different sizes. These relatable scenarios help students see the practical relevance of the topic. The teacher then explains the significance of remembering volume unit conversions and demonstrates how Mnemonic techniques can simplify the process. By integrating storytelling, acronyms, and visual aids into the lesson, the teacher creates a multisensory learning environment that caters to diverse learning styles. This approach not only improves memory retention but also fosters a deeper understanding of the concepts. By combining problem identification, targeted learning objectives, and well-planned teaching strategies, this plan aims to make the learning process both enjoyable and effective. The use of Mnemonic techniques and practical applications ensures that students are not only able to memorize volume unit conversions but also apply their knowledge confidently in everyday situations. This comprehensive approach is expected to lead to significant improvements in both student engagement and learning outcomes.

3.2 Action: Implementing Mnemonic Techniques

The action phase focuses on the practical application of Mnemonic techniques to enhance students' understanding and retention of volume unit conversions. This involves a combination of acronyms, storytelling, visualizations, and hands-on practice to create an engaging and interactive learning experience.

3.2.1 Mnemonic Techniques

Acronyms are introduced as a simple and effective way to help students remember the conversion sequence. For instance, the acronym "LM" (Liters to Milliliters) is used to recall that 1 liter equals 1,000 milliliters, while "CCL" (Cubic Centimeters to Liters) reminds students that 1,000 cubic centimeters equal 1 liter. These easy-to-remember mnemonics provide a quick reference for students, reducing cognitive load and making the learning process smoother.

Storytelling is utilized as a creative tool to make volume unit conversions relatable and memorable. For example, a story about a chef who measures ingredients in liters, milliliters, and cubic centimeters can illustrate the importance of conversions in everyday life. By embedding mathematical concepts within engaging narratives, students can associate the learning material with vivid imagery, enhancing memory retention.

Diagrams and images are employed to provide visual comparisons of volume units. For instance, containers of different sizes are labeled with their corresponding volume units (liters, milliliters, cubic centimeters) to help students visualize the relationships between these units. These visual aids bridge the gap between abstract concepts and tangible understanding, making the topic more accessible to young learners.

3.2.2 Practice and Application

Practical exercises and interactive activities form the core of this phase, enabling students to apply the Mnemonic techniques they have learned: 1) Students participate in exercises that require them to convert between volume units using the acronyms, stories, and visual aids provided. This reinforces their understanding and builds confidence in their ability to perform conversions independently; and 2) To further enhance engagement, educational games, and group activities are organized. For example, a relay race where students solve conversion problems at each station can make learning fun and competitive. These activities encourage collaboration, critical thinking, and the practical application of concepts. By combining these techniques, the action phase ensures a multisensory learning experience that caters to different learning styles. The integration of acronyms, stories, visualizations, and active participation not only strengthens students' grasp of volume unit conversions but also fosters a more enjoyable and meaningful learning process.

3.3. Evaluation and Assessment

The evaluation and assessment phase is essential for determining the effectiveness of the Mnemonic techniques implemented during the action phase. This involves both formative and summative assessments, including pre-tests, class observations, post-tests, and feedback analysis, to comprehensively measure student progress and identify areas for improvement.

A pre-test is conducted before introducing the lesson to assess students’ initial understanding of volume unit conversions. This test serves as a baseline to evaluate their

existing knowledge and identifies specific areas of difficulty. The results provide valuable insights that guide the planning and emphasis of the lesson content. Student participation and engagement are monitored during classroom activities to assess the immediate impact of the Mnemonic techniques. Observations focus on how actively students engage with acronyms, storytelling, visual aids, and practice exercises. Class exercises and educational games are also used as informal assessment tools to gauge students' grasp of the material in a collaborative and low-pressure setting. These activities provide real-time feedback on the effectiveness of the teaching methods.

A post-test is administered at the conclusion of the lesson to measure students' improvement in understanding and applying volume unit conversions. By comparing pre-test and post-test scores, the teacher can determine the extent to which the Mnemonic techniques have enhanced students' knowledge and skills. Feedback from students is collected to evaluate their perceptions of the Mnemonic techniques and identify any challenges they faced. Questions focus on the clarity, effectiveness, and enjoyment of the lesson, as well as suggestions for improvement. This qualitative data provides additional insights into how the teaching methods impacted the students' learning experience.

The pre-test and post-test results are analyzed to evaluate the overall success of the Mnemonic model implementation. Key metrics include the average improvement in scores, the percentage of students achieving mastery (a score above the Minimum Completion Criteria of 75), and engagement levels during class activities. This comprehensive evaluation process ensures that the teaching methods are systematically reviewed for their effectiveness. It also provides actionable insights to refine future lessons, ensuring that students continue to benefit from an engaging and effective learning environment.

3.4 Reflection

The reflection phase focuses on evaluating the successes and challenges encountered during the implementation of Mnemonic techniques. The successes may include noticeable improvements in student engagement, participation, and understanding of volume unit conversions. For example, students might demonstrate greater retention of concepts using acronyms and storytelling, and their ability to apply these concepts in class activities may improve significantly.

However, challenges are also carefully analyzed. These could involve difficulties faced by certain students in grasping Mnemonic techniques or logistical challenges in implementing group activities and games. Student feedback and evaluation results are key in identifying these areas for improvement. For instance, students might suggest incorporating additional examples or simplifying certain aspects of the teaching aids. Based on these reflections, a concrete improvement plan is developed. This plan may include adjustments to the Mnemonic materials, such as creating more diverse visualizations or refining the acronyms to make them more intuitive. Future lessons might also integrate more tailored support for students who require additional help, ensuring that the teaching approach is inclusive and effective for all learners.

This reflective process ensures that the Mnemonic model evolves and adapts to better meet the needs of students, enhancing both their understanding and practical application of volume unit conversions. The Graph of comparative values for Cycle 1 and Cycle 2 can be seen in Figure 2 below.

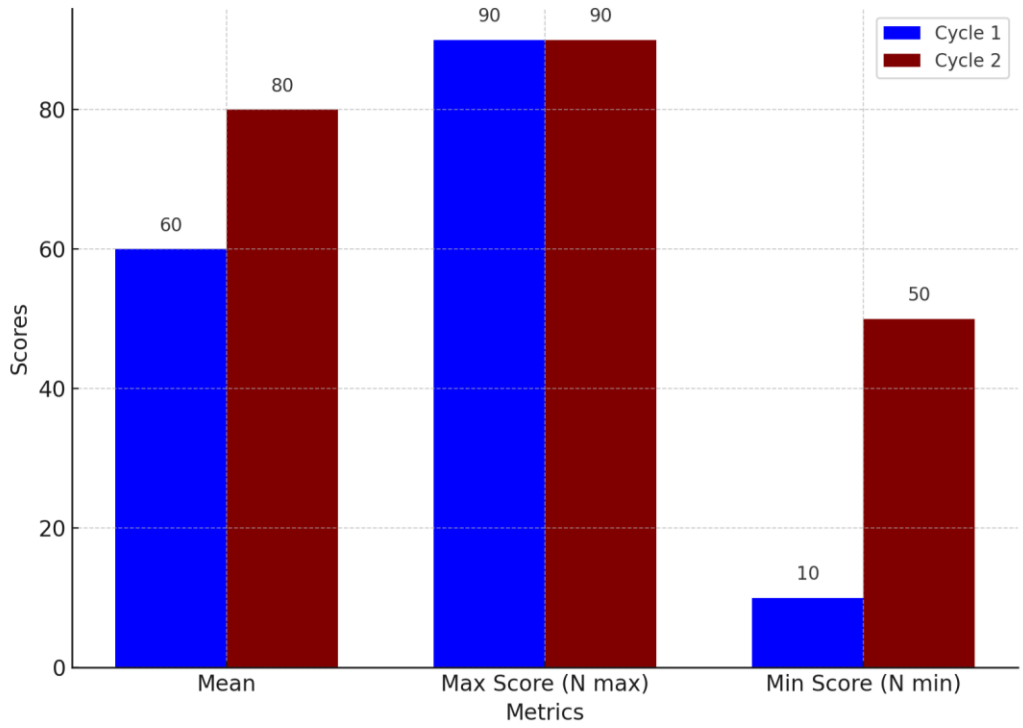

Figure 2. Graph of comparative values for Cycle 1 and Cycle 2

From the data above, it is evident that there was an improvement in student learning outcomes between Cycle I and Cycle II activities. In Cycle I, the average test score was 64.04, whereas in Cycle II, the average learning result increased significantly to 90.57. In Cycle I, only 8 students, accounting for 38%, successfully completed the cycle, while in Cycle II, this number rose to 19 students, or 90%. Additionally, the maximum score in Cycle I was 85, with the lowest being 10, whereas in Cycle II, the highest score reached 100, and the lowest was 70.

- **Cycle I Reflection:** Observations in Cycle I revealed several key findings. First, allowing students to form their own groups resulted in an uneven distribution of abilities, as groups often lacked a balance of high-achieving, average, and struggling students. Consequently, groups that were less skilled in collaboration produced unsatisfactory results. However, the use of the Demonstration Method during worksheet activities generated significant enthusiasm among students, indicating its potential for further development in future learning sessions. Despite this enthusiasm, some students struggled to understand the Mnemonic technique for memorizing the debit formula and volume unit conversion. Additionally, cooperation, participation, and accuracy in group work were insufficient, highlighting the need for improvement. Given these challenges, several revisions were made for Cycle II. These included assigning group members to ensure a balanced mix of abilities, enhancing the teacher's skills in motivating students, providing more detailed explanations of the Mnemonic technique, and adjusting the pace of teaching to avoid rushing through the material. Furthermore, test questions that students found challenging were revised and re-discussed in subsequent meetings.
- **Cycle II Reflection:** Cycle II demonstrated significant improvements in student learning outcomes compared to Cycle I. The average test scores increased notably, which can be attributed to the sequential nature of the material, as Cycle II content built

upon the foundational knowledge from Cycle I. The increased completion rate and achievement of success indicators confirmed that the research objectives had been met, leading to the conclusion of the study at the end of Cycle II. The improvement in student achievement was primarily due to their deeper understanding of the material. The integration of Demonstration and Mnemonic techniques proved effective, particularly in helping students perform volume unit conversion calculations. Conducting tests immediately after the material was taught, without allowing it to accumulate, also contributed to the students' focus and success. This approach ensured that students concentrated on mastering the content and completing the test questions efficiently.

DISCUSSIONS

The data presented above demonstrates a notable improvement in student learning outcomes between Cycle I and Cycle II activities. In Cycle I, the average test score was 64.04, while in Cycle II, it increased significantly to 90.57. Furthermore, the percentage of students who completed the learning cycle rose from 38% (8 students) in Cycle I to 90% (19 students) in Cycle II. In terms of score distribution, the maximum score in Cycle I was 85, with a minimum score of 10, whereas in Cycle II, the highest score reached 100, and the lowest was 70 (Brown, 2020; Smith *et al*., 2021).

The comparison of data between Cycle I and Cycle II clearly illustrates that the implementation of the Demonic technique (a combination of Demonstration and Mnemonic methods) effectively improved the memory and learning outcomes of fifth-grade students at the Kota Kinabalu Indonesian School during the 2023/2024 academic year. About memory-related challenges, students no longer struggled to convert volume units when solving story problems, which positively impacted their overall learning outcomes (Jones & Taylor, 2019; Miller, 2021). The cognitive achievements of students showed a substantial increase, with the average score rising from 64.04 in Cycle I to 90.57 in Cycle II. Additionally, the completion rate increased significantly, from 38% to 90%, prompting researchers to conclude the study after the second cycle. The maximum score also improved, as students who could only reach 85 in Cycle I were able to achieve a perfect score of 100 in Cycle II (Anderson & Carter, 2020).

The application of the Mnemonic learning model has proven to be highly effective in enhancing students' comprehension of volume unit conversion. According to theories by Bower (1970) and Miller (1956), Mnemonics aids memory retention by organizing complex information into more manageable and memorable segments. Specifically, in the context of mathematics education, Mnemonic techniques enable students to overcome the constraints of short-term memory while increasing their engagement and motivation to learn (Taylor *et al.*, 2018; Johnson & Spencer, 2017). However, the successful implementation of Mnemonics requires careful preparation and adjustments to align with students' characteristics (Harrison *et al.*, 2020). Bower (1970) describes Mnemonics as a method for associating difficult-to-remember information with easier-to-recall elements, while Miller (1956), through his "Magic Number Seven" theory, emphasizes that short-term memory typically retains only about seven items at a time. Mnemonics extend memory capacity through processes such as chunking or grouping information into

meaningful units (Lee *et al.*, 2019; O'Connor *et al.*, 2021). Beyond enhancing memory, the use of Mnemonics encourages creativity among students, as they actively engage in imagining and constructing memorable associations for learning material (Evans & Harper, 2019; Wilson *et al.*, 2022).

CONCLUSION

The results of this CAR demonstrate a significant improvement in students' numeracy literacy and learning outcomes on volume conversion material. The average learning score increased notably from 64.04 in Cycle I to 90.57 in Cycle II, accompanied by a substantial rise in the percentage of students achieving completion, from 38% in Cycle I to 90% in Cycle II. This improvement highlights the effectiveness of the Demonic method, which combines Demonstrations and Mnemonics, in enhancing both memory retention and learning outcomes. The application of this method proved successful in fostering better understanding and performance among Class VI students at the SIKK during the 2023/2024 academic year. Based on the findings of this research, several recommendations can be made to further enhance teaching practices and student outcomes. First, teachers should adopt creative and innovative strategies in delivering learning materials to make the lessons more engaging and accessible for students. For Mathematics subjects, especially when teaching volume unit conversion, it is essential to incorporate concrete media to help students understand and internalize fundamental concepts. Furthermore, designing interactive and stimulating worksheets can significantly increase students' enthusiasm and motivation to complete tasks. By implementing these strategies, teachers can create a more effective and enjoyable learning environment that supports the academic success of their students.

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