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IMPROVING STUDENTS' COMPREHENSION OF MATHEMATICAL RESEARCH ARTICLES THROUGH CLASS PRESENTATIONS
(A Classroom Action Research Study)

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ABSTRAK
Kesulitan dalam memahami artikel penelitian matematika berbahasa Inggris masih menjadi kendala umum di kalangan mahasiswa, terutama calon guru, karena terbatasnya paparan terhadap teks akademik. Kondisi ini menghambat kemampuan mereka dalam menghubungkan teori dengan praktik penelitian terkini di bidang matematika. Penelitian tindakan kelas ini bertujuan untuk meningkatkan pemahaman mahasiswa terhadap artikel penelitian matematika melalui kegiatan presentasi kelas yang bersifat aktif dan reflektif. Penelitian dilakukan terhadap 20 mahasiswa semester ketiga Program Studi Pendidikan Matematika di STKIP Kusuma Negara melalui dua siklus yang mencakup tahap perencanaan, pelaksanaan, pengamatan, dan refleksi. Siklus pertama berfokus pada pemahaman struktur dan isi artikel melalui presentasi, sedangkan siklus kedua menekankan analisis yang lebih mendalam melalui pembacaan terarah, klarifikasi istilah, serta umpan balik dosen. Data dikumpulkan melalui pra-tes dan pasca-tes, pengamatan kelas, serta penilaian presentasi individu. Hasil penelitian menunjukkan adanya peningkatan signifikan dalam kemampuan mahasiswa memahami struktur, metode penelitian, dan argumen matematika dengan peningkatan sebesar 20,0% pada Siklus I dan 18,1% pada Siklus II. Simpulan menunjukkan bahwa integrasi kegiatan presentasi dalam pembelajaran berbasis penelitian tindakan kelas efektif dalam meningkatkan literasi akademik, keterampilan analitis, serta kepercayaan diri mahasiswa dalam memahami dan mengomunikasikan isi artikel penelitian matematika secara kritis dan terarah.
Kata kunci: *Penelitian Tindakan Kelas, Presentasi Kelas, Pemahaman Mahasiswa.*

ABSTRACT
The difficulty in comprehending mathematical research articles written in English remains a common issue among university students, particularly pre-service teachers, due to limited exposure to academic texts. This condition often restricts their ability to connect theoretical understanding with current research practices in mathematics. This classroom action research aimed to enhance students' comprehension of mathematical research articles through active and reflective class presentations. The study involved 20 third-semester students of the Mathematics Education Study Program at STKIP Kusuma Negara and was carried out in two cycles consisting of planning, action, observation, and reflection stages. The first cycle emphasized understanding the structure and content of articles through presentations, while the second focused on deeper analysis supported by guided reading, terminology clarification, and lecturer feedback. Data were collected through pre- and post-tests, classroom observations, and individual presentations assessments. The findings indicated a significant improvement in students' ability to understand research structures, methods, and mathematical arguments, with comprehension increasing by 20.0% after Cycle I and 18.1% after Cycle II. It can be concluded that integrating class presentation within a classroom action research framework effectively enhances students' academic literacy, analytical skills, and confidence in critically understanding and communicating mathematical research articles.
Keywords: *Classroom Action Research, Class Presentation, Students' Comprehension*

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INTRODUCTION

Mathematics does not rely solely on numbers and symbols, but also on language to articulate meanings, describe relationships, and convey logical reasoning. Although often considered a universal language due to its symbols and formulas, mathematics still relies heavily on English for explaining reasoning, formulating arguments, and presenting findings. On certain occasions, for example, in an international conference, mathematics students need to read scholarly articles, write proofs, and deliver oral presentations in English; thus, learning English for mathematics is not merely about mastering vocabulary, but about acquiring the discourse and rhetorical structures used by mathematicians. The integration of English for Specific Purpose (ESP) principles in mathematics education can bridge linguistic and conceptual gaps that hinder students from participating in international academic communities (Trujeque-Moreno et al., 2021).

Scholars in mathematics education have highlighted that understanding mathematical meaning involves both symbolic and linguistic competence, as mathematical expressions are embedded in verbal explanations and argumentation (Planas, 2024). This means that English instruction for mathematics must train students not only to interpret symbols, but also to articulate logical relationships, definitions, and proofs in coherent and concise English. Additionally, ESP specialists recommend that course design should be based on systematic *needs analysis*, ensuring that learning objectives align with the actual communicative tasks mathematics students face in their academic studies and future careers (Dmitrenko et al., 2020). The inclusion of authentic texts, discipline-specific vocabulary lists, and performance-based assessments can significantly enhance learners' engagement and mastery of the target language. Therefore, implementing ESP for mathematics students is not merely a linguistic endeavor. It helps students become active participants in both the mathematical and English-speaking academic worlds (Trujeque-Moreno et al., 2021).

Reading and interpreting mathematical research articles pose significant challenges for many students due to the abstract nature of mathematical reasoning, complex symbolic representations, and discipline-specific discourse. According to O'Halloran (2015), mathematical writing often demands a dual understanding of both linguistic and logical structures. Students must not only comprehend specialized terminology but also map symbolic expressions to conceptual ideas. This integrated skill is often called close reading of mathematical text, which brings together linguistic comprehension, symbolic interpretation, and logical inference (Rezat et al., 2022).

Traditional reading tasks, such as silent reading or worksheets of guided questions, often leave learners passive and minimally engaged. Such passive approaches tend to yield surface understanding, for example, students may recall definitions but struggle to interpret proofs or dissect research arguments (Grabe & Stoller, 2019). Recent research, however, has demonstrated that active learning strategies in reading can substantially improve comprehension, motivation, and engagement. For instance, a 2025 study in Iran found that employing active learning strategies such as peer interaction and task-based reading activities significantly enhanced students' reading comprehension compared to traditional methods (Majdi et al., 2025). Likewise, a Thai study integrating the active learning model with the SQ4R (Survey, Question, Read, Recite, Review, Reflect) technique reported marked improvement in students' English reading skills and satisfaction (Phumpho & Chaiyarak, 2024). In Indonesia, several studies confirmed that interactive read-aloud (Maringka et al., 2025), project-based learning with visual media (Rahayu et al., 2024), and cooperative learning through digital interactive media (Aghisni et al., 2025) significantly increased students' engagement and

comprehension. These findings consistently indicate that embedding active larning in reading comprehension enables learners to externalize reasoning, build conceptual links, and achieve deeper understanding beyond passive text decoding.

To respond to these issues in the context of mathematics education, the present study uses class presentations as a form of active learning embedded in a Classroom Action Research (CAR) design. CAR involves a cyclical process of planning, implementing, observing, and reflecting, enabling teachers to make continuous improvements in teaching and learning (Meesuk et al., 2020). It is an ongoing cycle where teachers plan an intervention, act upon it, observe its effects, and reflect on what has been learned to refine their practice (Norton, 2018). In this intervention, students present their reading and interpretations of mathematical research articles to peers, thereby converting what would otherwise be a solitary, passive reading exercise into a communicative, reflective, and socially-mediated process. Recent studies have reinforced the idea that student-led presentations effectively promote deeper engagement, accountability, and discourse literacy. Within the framework of *Self-Determination Theory*, Chiu (2022) emphasized that when learners are given autonomy and responsibility over their tasks, such as preparing and delivering presentations, they experience heightened motivation and engagement. Similarly, the *Own It–Learn It–Share It* framework proposed by Lee and Hannafin (2016) highlights the importance of authentic learning experiences where students publicly share their knowledge. The "Share It" stage directly aligns with student-led presentations, as learners must synthesize, organize, and communicate their understanding to an audience, thereby fostering accountability and discourse competence.

Although interest in English for Specific Purposes (ESP) in mathematics has grown, empirical studies examining how class presentations support students' comprehension of mathematical research articles in English remain limited. Previous research has mostly focused on vocabulary learning or academic writing, leaving the integration of reading, oral presentation, and disciplinary discourse underexplored. In many mathematics education contexts, students can interpret symbols but struggle to express reasoning or summarize research arguments in English. To address this gap, the present classroom action research aims to examine whether and how class presentations can enhance the comprehension of mathematical research articles among third-semester students in the Mathematics Education Study Program at STKIP Kusuma Negara. This study integrates ESP principles within a Classroom Action Research (CAR) framework to implement a learning process that connects reading, speaking, and mathematical reasoning.

METHODOLOGY

This study adopted a *Classroom Action Research* (CAR) design aimed at improving students' comprehension of mathematical research articles through individual class presentations. The CAR approach was chosen for its cyclical process consisting of four stages planning, action, observation, and reflection which enables continuous instructional improvement. The participants were 20 third-semester students of the Mathematics Education Study Program at STKIP Kusuma Negara, Jakarta, who were purposively selected based on their completion of a General English course, ensuring sufficient linguistic competence to engage with academic mathematical texts. The implementation was conducted in two cycles. In Cycle I, students individually presented assigned mathematical research articles followed by peer questioning sessions designed to enhance engagement and collaborative understanding. In Cycle II, the intervention focused on improving scaffolding by revising the presentation rubric, providing clearer guidance on proof explanation and structure, and strengthening the use of mathematical terminology during presentations.

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Data were collected through multiple instruments, including pre- and post-tests to measure comprehension gains, classroom observation sheets to monitor engagement, individual presentation rubrics to assess analytical and communicative skills, and comprehension tests based on specific article components to ensure data triangulation (Creswell & Guetterman, 2021). Both quantitative and qualitative analyses were employed. Quantitative data were analyzed using basic descriptive statistics such as mean scores and percentage improvement to determine progress between cycles, while qualitative data from observation notes and reflection journals were thematically analyzed to capture changes in comprehension, confidence, and peer interaction. The success criteria were defined as a minimum of 20% improvement in comprehension scores between pre- and post-tests, accompanied by observable progress in explaining mathematical proofs, using appropriate terminology, and responding to peer questions effectively. Through this structured and iterative process, the applied methodology provided a comprehensive understanding of how class presentation activities integrated within a CAR framework can effectively enhance students' academic literacy and analytical competence in reading mathematical research articles.

RESULT AND DISCUSSION

Result

To evaluate the effectiveness of class presentations in improving students' comprehension of mathematical research articles, this study implemented two cycles of *Classroom Action Research (CAR)* consisting of the stages of planning, action, observation, and reflection. Students' comprehension was measured through written pre-tests and post-tests, as well as through classroom observations and presentation rubrics to capture behavioral and performance changes throughout the intervention. Table 1 displays the mean comprehension scores obtained at each stage, showing consistent progress from the pre-test to Cycle II. The triangulation of test results and observation data provided a comprehensive overview of how students' comprehension evolved as they actively engaged in reading, analyzing, and presenting mathematical research articles.

Table 1. Comprehension scores across the two CAR cycles.

Cycle	N	Mean Score	Improvement (%)
Pre-Test	20	60.0	-
Cycle I	20	72.0	20.0
Cycle II	20	85.0	18.1

To give a clearer picture of students' progress, Figure 1 illustrates the upward trend in comprehension scores from the pre-test to the second cycle. The graph shows a consistent pattern of improvement across all stages, indicating that each intervention contributed positively to students' understanding. This finding reinforces the quantitative evidence in Table 1 by demonstrating that structured classroom presentations gradually strengthened both comprehension and analytical thinking. Moreover, the visual trend reflects not only improved academic performance but also students' growing confidence and independence in interpreting scholarly mathematical texts.

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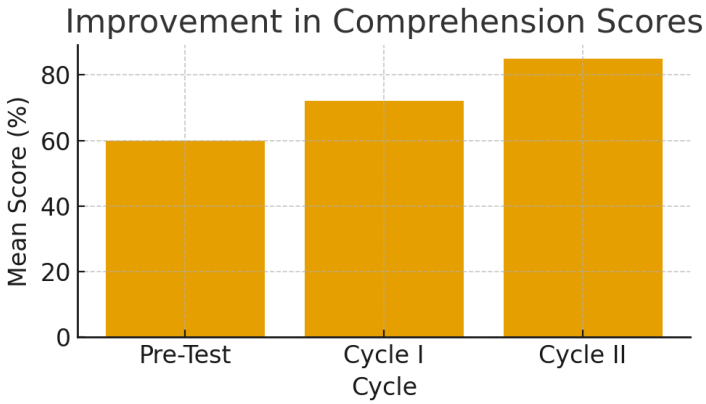

Figure 1. Improvement in comprehension scores across the two CAR cycles.

The results revealed a steady enhancement in students' comprehension of mathematical research articles across the two CAR cycles. As indicated in Table 1 and Figure 1, the mean comprehension score increased from 60.0 in the pre-test to 72.0 in Cycle I and reached 85.0 in Cycle II. This represents a total improvement of 25 points or 41.7% overall, with the first cycle yielding a 20.0% gain and the second cycle adding another 18.1%. These consistent gains demonstrate that the implementation of individual class presentations effectively enhanced students' ability to identify the structure, research methods, and arguments within mathematical research articles.

The quantitative findings were further supported by qualitative data derived from classroom observations and presentation assessments. During Cycle I, most students relied heavily on their notes and appeared hesitant when articulating ideas, which suggested limited confidence in explaining complex academic content. However, in Cycle II, students displayed noticeable improvements—they were more fluent in delivering explanations, used mathematical terminology more accurately, and interacted more actively during peer questioning sessions. Observation notes also revealed that students' discussions became richer in analytical content, with clearer logical flow and stronger arguments related to the articles they presented. These qualitative insights align closely with the numerical data, confirming that the intervention not only improved comprehension but also developed students' communication and critical-thinking skills.

The integration of both quantitative and qualitative findings provides strong evidence that the classroom action research approach successfully enhanced students' academic literacy in mathematics. The iterative nature of the CAR process allowed continuous adjustments to teaching strategies, ensuring that each cycle addressed the challenges observed in the previous one. The consistent upward trend in test scores and the observed behavioral changes highlight that student-led presentations served as an effective active-learning strategy. Overall, the intervention fostered deeper comprehension, greater analytical engagement, and increased confidence among students when interpreting and discussing mathematical research articles.

Discussion

The findings of this classroom action research demonstrate a steady and meaningful improvement in students' comprehension of mathematical research articles across two intervention cycles. The consistent progress suggests that the integration of individual class presentations and peer questioning significantly enhanced students' ability to interpret and

communicate the content and structure of mathematical research articles. These results support the premise that active learning strategies, particularly those involving student-led presentations and interactive questioning, can substantially strengthen comprehension and engagement. When students were required not only to present their assigned articles but also to respond to peers' questions, they became more attentive to textual details, logical coherence, and disciplinary terminology. Such dialogic interactions encouraged students to clarify their understanding, justify interpretations, and re-examine methodological and argumentative components of the articles. This aligns with an evidence that collaborative metacognitive practices allow learners to collectively monitor and regulate understanding, thereby strengthening higher-order thinking and knowledge construction (Türkmen, 2024).

Presentation and peer questioning as active learning is also consistent with Majdi, et al. (2025) assertion that this strategy can significantly enhance students' reading comprehension. Similarly, the integration of individual class presentations and peer questioning in this study fostered a more interactive learning environment that encouraged students to actively interpret and communicate the content of mathematical research articles. This alignment suggests that when learners are positioned as active participants rather than passive recipients of information, their comprehension and engagement tend to improve. Moreover, the findings reinforce the pedagogical value of incorporating student-led and collaborative activities to deepen understanding of complex academic texts. This is in line with the view of ESP specialists that course design should be based on systematic needs analysis to ensure that learning objectives reflect the real communicative demands of the discipline (Dmitrenko et al., 2020). Therefore, embedding student-led and collaborative activities within the ESP framework ensures that classroom instruction remains both pedagogically effective and aligned with the specific objectives of mathematics education courses.

Moreover, the observed improvement in students' ability to interpret and explain mathematical texts reflects the development of what Rezat et al. (2022) describes as *close reading of mathematical text*, which brings together linguistic comprehension, symbolic interpretation, and logical inference, a complex integration of linguistic understanding, symbolic interpretation, and logical inference. Hence, embedding student-led and interactive strategies within a well-aligned ESP course design not only enhances engagement but also cultivates the integrated skills essential for comprehending mathematical articles. The classroom presentations in this study provided authentic opportunities for students to engage with and use such vocabulary in context, thereby reinforcing both their linguistic and disciplinary comprehension. Mathematical vocabulary skill mediates the relationship between reading comprehension and mathematical performance (Munda et al., 2025). This suggests that understanding mathematical texts requires more than general reading ability; it also involves mastery of specialized terminology and discourse patterns.

Pedagogically, this study highlights the value of integrating individual presentations combined with peer questioning within English for Specific Purposes (ESP) and mathematics education contexts. This dual approach transforms reading from a passive activity into an interactive and interpretive practice where meaning is negotiated through discussion. This transition from passive participation to active inquiry reflects genuine conceptual growth and aligns with the principles of learner-centered pedagogy (Creswell & Guetterman, 2021). The cyclical nature of the CAR framework, such as planning, acting, observing, and reflecting was instrumental in sustaining this progress. Through continuous observation and reflection, the instructor identified challenges such as limited vocabulary and presentation anxiety, and adjusted instructional strategies accordingly. Structured guidance in Cycle I evolved into more autonomous and peer-supported learning in Cycle II, allowing students to internalize both

linguistic and analytical skills necessary for comprehending complex mathematical texts. This result corresponds to Chiu (2022) observation that learners show higher motivation and engagement when granted autonomy and responsibility in their learning tasks.

Engaging with authentic research articles helped students build disciplinary literacy while simultaneously developing communicative competence. Furthermore, peer questioning cultivated a sense of accountability and collective inquiry, mirroring authentic academic dialogue within the mathematical community. In broader terms, the findings suggest that presentation-based learning enriched by peer questioning can serve as an effective model for improving reading comprehension and research literacy in other ESP domains. By promoting critical thinking, collaborative dialogue, and reflection, such approaches can prepare students to navigate academic discourse with greater confidence and analytical depth.

However, this study is not without its limitations. The relatively small number of participants means that the classroom dynamics and peer interactions may have been more easily managed and closely guided by the instructor compared to larger cohorts. As a result, the observed improvement in comprehension and engagement might partly reflect the benefits of an intimate learning environment where individualized feedback and interaction were more feasible. In addition, the intervention was conducted within the span of a single semester, which limited the duration for observing the sustainability of students' learning gains. The one-semester timeframe may have been sufficient to capture immediate progress but not long enough to examine how well students retained or further developed their analytical and linguistic abilities in subsequent academic contexts. Moreover, given the short duration, some affective aspects such as confidence in delivering presentation or consistency in peer questioning skills may not have reached full maturity. These constraints suggest that while the results provide meaningful insights into the effectiveness of presentation-based and peer-interactive learning, they should be interpreted as reflections of a specific, small-scale, and time-bound educational context. Nonetheless, within these limitations, the study still offers a valuable illustration of how active, collaborative, and contextually grounded instruction can positively influence students' comprehension of mathematical research articles.

CONCLUSION

This classroom action research successfully achieved its primary objective of improving students' comprehension of mathematical research articles through structured individual presentations and peer questioning. The intervention effectively addressed the initial challenges of limited vocabulary mastery, low confidence, and difficulty in interpreting academic texts by creating an interactive and reflective learning environment. The findings revealed that positioning students as presenters and discussants encouraged them to actively engage with academic content, clarify complex ideas, and construct meaningful interpretations of mathematical research. Moreover, the process fostered essential analytical, linguistic, and metacognitive skills that contributed to a more independent and confident approach toward understanding and communicating research-based mathematical information. These outcomes demonstrate that student-centered presentation activities, when integrated within a reflective CAR framework, can significantly enhance academic literacy and promote deeper comprehension in mathematics-related ESP contexts.

In a broader pedagogical context, this study highlights the potential of integrating individual presentations and peer questioning as a sustainable instructional model to strengthen students' critical thinking and research literacy. The cyclical nature of the CAR approach provided ongoing opportunities for instructional refinement, emphasizing reflection and improvement in each phase. Consequently, this model can be adapted to various disciplines

such as science, engineering, and business education where learners engage with domain-specific research literature. Future studies may further explore its long-term impact on students' academic performance and communication competence across different educational levels or in digital learning settings. Overall, the results underscore the effectiveness of dialogic, student-centered learning in fostering not only comprehension but also intellectual autonomy and transferable academic skills.

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