

Evaluating the Effectiveness of Bilingual Programs in Enhancing Non-English Subject Learning among Junior High School Students

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Abstract

This study was carried out to investigate the effectiveness of bilingual programs in non-English learners and to identify the factors that contribute to their success. The research was conducted at Bunga Matahari International School, involving a sample of 27 junior high school students selected from a population of 65 using Slovin's formula (1960). A quantitative descriptive approach was employed, utilizing documentation of students' assessment scores and a questionnaire to evaluate factors influencing the success of the bilingual program. To assess program effectiveness, the researcher used descriptive statistics and a paired t-test to compare two sets of assessment scores provided by the school. The findings revealed significant improvements in Mathematics and Science, with Mathematics increasing from a mean score of 88 to 91 ($p = 0.002$), and Science from 90 to 94 ($p = 0.000$). In contrast, Social Studies showed only a minimal improvement, from 92 to 93, which was not statistically significant ($p = 0.749$). Key contributing factors to program success included the teacher's role (87%), student engagement (80%), school support (74%), and learning resources (64%). These results suggest that teacher involvement and student engagement are critical to the success of bilingual programs. Future bilingual curriculum development and teacher training initiatives should prioritize enhancing these areas while also strengthening institutional support and access to adequate learning resources.

Keywords: Bilingual programs; Non-English learners; Effective factors

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INTRODUCTION

The rapid development of science and technology driven by globalization has significantly influenced the teaching and learning of English. One method that has gained popularity is the implementation of bilingual programs, particularly in developing countries like Indonesia, where English is seen as a key component for competing on the global stage. Efforts to improve the quality of education through bilingual instruction are a strategic response to these challenges (Jayanti & Sujarwo, 2019). In many countries, including Indonesia, bilingual education is becoming an essential tool in fostering students' ability to think, study, and communicate in both their native language and a foreign language simultaneously (Zein et al., 2020). Bilingual classes often utilize both the students' first language and English to help them achieve proficiency in both languages (Simbolon, 2021).

In Indonesia, the potential for schools to adopt international standards is reinforced by national regulations, such as Law No. 20 of 2003, Article 50, which mandates that the government or local authorities establish at least one internationally-oriented educational

institution at each level of education. This policy highlights the vital role schools play in preparing students to be creative, active, and competitive in addressing global developments. One effective approach to achieving this goal is through bilingual education, where subjects like mathematics, chemistry, biology, and physics are taught in both Indonesian and English. This dual-language instruction is aimed at accelerating students' English proficiency, which is crucial for mastering cutting-edge technology and scientific advancements, as well as for achieving international standards (Shah & Ahmad, 2007).

Bilingual education has been recognized as a model for delivering curriculum content in two languages, with the objective of enhancing students' competency in both their native language and a foreign language. Through this approach, students gain both scientific knowledge and bilingual literacy. One such school that uses a bilingual curriculum in Banda Aceh is Bunga Matahari International Junior High School. This program, which is designed to improve students' English language skills, incorporates two languages Indonesian and English into its teaching, learning, and communication processes. Preliminary observations at the school show that while it follows the national curriculum, it also creates an environment where students are encouraged to speak multiple languages, including Arabic, English, and Mandarin, thus preparing them to meet the challenges of the global era.

Despite the clear benefits, challenges remain in implementing bilingual education, particularly in non-English subjects. Chin (2015) found that students often struggle to understand lessons due to the lack of adequate teaching materials in both languages, and because much of the academic vocabulary is not commonly used in daily life. Similarly, Ma (2023) found that bilingual education faces challenges such as inadequate learning materials and a shortage of qualified teachers, which hampers effective instruction and adds pressure on educators to create supplementary resources.

In bilingual programs, the instruction of subjects like math, social sciences, and natural sciences is often delivered primarily in English. This approach aims to help students become accustomed to using English in an academic context. However, due to the infrequent use of subject-specific vocabulary in everyday conversation, many Indonesian students find it difficult to comprehend the material. These difficulties are particularly evident in non-English subjects, where the content requires specialized vocabulary and concepts that are rarely encountered in daily language use. Recognizing these challenges, this study focuses on evaluating the effectiveness of bilingual programs for non-English learning at Bunga Matahari International Junior High School. Specifically, the study seeks to assess improvements in student learning outcomes in subjects such as Mathematics and Science and to examine the key factors that support or hinder this success. To guide the investigation, this study addresses the following research questions: *Is the bilingual program effective in improving students' learning outcomes in non-English subjects? And What factors within the bilingual program influence students' performance in non-English subjects?*

LITERATURE REVIEW

Definition of Bilingual Education

Bilingual education refers to educational approaches where instruction is delivered in two languages, typically the students' native language (L1) and a second language (L2), to foster bilingualism, biliteracy, and academic achievement. These programs aim to enhance language proficiency in both languages while promoting cross-cultural understanding and critical thinking (Rutgers & Evans, 2015; Lozada & Figueiroa, 2023).

There are various models of bilingual education, including one-way and two-way bilingual programs, dual-language bilingual education (DLBE), and content-and-language-integrated learning (CLIL). These programs differ in their implementation but share the common goal of supporting students in acquiring linguistic skills and academic knowledge

simultaneously. For example, in non-English subjects such as mathematics and science, bilingual programs provide content instruction in both languages, allowing students to bridge language gaps while mastering subject-specific concepts (Baker, 2007).

The definition of bilingual education has evolved over time, reflecting broader societal changes and educational priorities. Early definitions focused on language proficiency and academic success, while recent literature expands this scope to include sociocultural goals. For instance, Lozada and Figueroa (2023) argue that bilingual education should also address critical consciousness, cultural democracy, and social equity. This perspective challenges traditional models of bilingual education to counter hegemonic ideologies and address issues such as racism, white supremacy, and coloniality (Chávez-Moreno, 2019).

In essence, bilingual education is not only a means of teaching students in two languages but also a tool for fostering inclusive and equitable learning environments. By addressing both linguistic and sociocultural dimensions, bilingual programs can empower students to succeed academically while embracing their diverse linguistic and cultural identities.

Types of Bilingual Education

Bilingual education encompasses a variety of program types, each designed to meet the linguistic and academic needs of learners in different contexts. These programs can be broadly categorized into Maintenance, Transitional, and Enrichment models, each offering distinct approaches to fostering bilingual proficiency and academic achievement (Baker, 2007).

Maintenance Bilingual Programs

Maintenance programs aim to preserve students' native language (L1) while simultaneously introducing and developing proficiency in a second language (L2). This approach emphasizes the equal value of both languages, with instruction provided in L1 during the initial years to strengthen foundational literacy and cognitive skills. Over time, L2 is gradually integrated into the curriculum. Maintenance programs are particularly effective in promoting biliteracy and cultural identity, as they ensure students maintain strong ties to their linguistic and cultural heritage (Angel & Evelyn, 2009).

Transitional Bilingual Programs

Transitional programs focus on gradually shifting the medium of instruction from L1 to L2. These programs are commonly used in contexts where the goal is to prepare students for full immersion in an L2-dominant academic environment. For non-English learners, transitional programs often provide subject instruction, such as mathematics or science, in L1 initially, with increasing use of L2 as students' proficiency improves. This model aims to bridge language gaps while ensuring comprehension of subject matter, allowing students to build competence in both academic content and L2 communication skills (Baker, 2007; Kim et al., 2013).

Enrichment Bilingual Programs

Enrichment programs, also referred to as "additive bilingual" models, are typically designed for majority-language students who aim to achieve high proficiency in a second language without replacing their native language. These programs often include dual-language or two-way immersion (TWI) approaches, where students from different linguistic backgrounds learn together, receiving instruction in both languages. TWI programs have gained popularity due to their effectiveness in fostering bilingualism, biliteracy, and cross-cultural understanding. Research shows that TWI programs often outperform transitional models in promoting positive attitudes toward bilingualism and achieving balanced proficiency in both L1 and L2 (López & Tashakkori, 2006; Kim et al., 2013).

Other Program Types

Other bilingual program types include Submersion and Structured English Immersion (SEI). While submersion typically involves placing students in an L2-dominant environment with minimal L1 support, SEI programs provide more structured instruction aimed at rapid acquisition of English or another target language. However, these approaches often lack the cultural and linguistic support necessary for long-term bilingual success (Tong et al., 2008).

The effectiveness of each bilingual program type varies depending on the context and goals. Maintenance programs prioritize linguistic and cultural preservation, transitional programs focus on gradual adaptation to L2 environments, and enrichment programs aim for additive bilingualism and biliteracy. Among these, Two-Way Immersion (TWI) programs have shown significant advantages in fostering balanced bilingual proficiency and cross-cultural understanding. However, successful implementation of any bilingual program requires careful consideration of pedagogical equity, teacher qualifications, and active collaboration between schools and families (Alanís & Rodríguez, 2008).

Challenges of Implementing Bilingual Programs

Implementing bilingual education programs presents various challenges across different contexts. In Taiwan, teachers reported three main challenges in implementing bilingual education in response to the Bilingual 2030 policy, leading to six different arrangements designed to achieve varying outcomes (Graham & Yeh, 2022). This highlights the need for policymakers to clearly define intended policy outcomes.

In the United States, a critical challenge facing dual-language programs is the national teacher shortage, particularly for less commonly taught languages like Mandarin Chinese. A study of Mandarin Dual Language Bilingual Education (MDLBE) teachers revealed themes of outsiderness and a need for humanizing relationships with colleagues and leadership, emphasizing the importance of culturally sustaining practices and systemic changes (Hill & Wong, 2024). Similarly, in Indonesia, school leaders face challenges such as limited resources and teacher shortages when implementing bilingual education (Yong et al., 2024).

Interestingly, some challenges arise from adherence to rigid program models. A case study of a Hebrew-English DLBE program in New York City showed how strict adherence to the model can be prioritized over the actual needs of students and their families, suggesting that more flexible alternatives to DLBE might better serve local communities (Avni & Menken, 2020). Additionally, in pesantren based schools in Indonesia, low student motivation remains a significant concern despite the overall effectiveness of bilingual education models (Murtadho, 2023).

In conclusion, the challenges of implementing bilingual programs are multifaceted, ranging from policy interpretation and teacher shortages to resource limitations and program rigidity. Addressing these challenges requires clear policy definitions, culturally sustaining practices, flexible program models, and strong leadership to create supportive environments for bilingual education to thrive.

The Effectiveness and Contributing Factors to the Success of Bilingual Programs for Non-English Learners

Bilingual education programs have demonstrated significant effectiveness in enhancing both language proficiency and academic achievement among non-English learners. Research highlights that bilingual program, particularly dual-language bilingual education (DLBE), foster academic success, cognitive development, and positive attitudes toward bilingualism (Lindholm-Leary, 2012; Dorner & Cervantes-Soon, 2020). A meta-analysis by Rostad et al. (2005) revealed that bilingual approaches outperform all-English instruction, showing a positive effect size of 0.23 standard deviations in language acquisition for English language learners (ELLs). Similarly, Slavin and Cheung (2005) found that Spanish-dominant students in bilingual programs scored higher in English reading measures compared to their peers in English-only settings.

In non-English subjects such as mathematics and science, bilingual education bridges language gaps by allowing students to learn content in both their native language (L1) and a second language (L2). Tinal et al. (2013) emphasize that the dual-language approach reduces cognitive load and provides linguistic support for complex concepts, aiding comprehension. Strategies like slowing the pace of instruction and offering additional vocabulary support have significantly improved students' understanding and performance (Sclafani, 2017).

Moreover, incorporating native language support alongside English instruction enhances engagement and academic outcomes, particularly in technical subjects (Malaki et al., 2022). The success of bilingual programs depends on several key factors. First, teacher professionalism is crucial, including the ability to implement effective bilingual teaching strategies. Techniques such as scaffolding meaning, slowing down instruction, and connecting lessons to students' prior knowledge make complex subjects more accessible (Sclafani, 2017). Professional development and coaching for bilingual teachers further ensure instructional quality (Cheung & Slavin, 2012).

Second, collaboration among stakeholders teachers, parents, administrators, and the broader community plays a vital role. A shared vision and active parental involvement, combined with supportive leadership within institutions, create an environment conducive to bilingual education (Montecell & Danini, 2002). Institutional support and positive attitudes towards bilingual education significantly influence program outcomes (Howard et al., 2007).

Third, student motivation and identity are critical contributors. Programs that affirm students' linguistic and cultural identities promote greater engagement and improved learning outcomes (Cummins et al., 2012). A culturally responsive learning environment helps mitigate anxiety and encourages students to actively participate in their bilingual education.

Fourth, equitable resources and policy support are fundamental. Challenges such as insufficient teaching materials and a shortage of qualified bilingual teachers can hinder program effectiveness. Addressing these issues requires targeted policies and sustained investment in bilingual education infrastructure (Dorner & Cervantes-Soon, 2020).

Finally, collaborative institutional support ensures that programs are effectively developed and implemented. Leadership plays a pivotal role in initiating changes and sustaining bilingual policies. Strong institutional commitment, along with ideological alignment, creates an environment that values bilingualism and provides consistent exposure to the target language (Hornberger, 2005).

RESEARCH METHOD

Research Design

This study employed a quantitative descriptive research design, which aims to systematically observe and analyze phenomena based on data collected in the field (Arikunto, 2010). Descriptive research provides a clear and detailed depiction of a situation by focusing on its current state and the underlying factors that contribute to it (Tanzeh, 2004). By utilizing numerical data and statistical analysis, this approach is particularly suitable for assessing the effectiveness of the bilingual program in non-English subject learning at Bunga Matahari International Junior High School. Additionally, this method allows for the identification of key factors that influence the success of the program, offering deeper insights into areas that may require improvement or further enhancement in its implementation.

Population and Sample

In this study, the population consisted of students from Bunga Matahari International Junior High School, with a total of 65 students distributed across five different classes: VIIA, VIIB, VIIIA, VIIIB, and IX. To select a representative sample from this

population, Slovin's formula was applied, with a margin of error set at 15%. The resulted in a sample of 27 students, which were then chosen through simple random sampling to ensure equal representation across the population. According to Arikunto (2010), the selection of a sample must reflect the characteristics of the population accurately, and simple random sampling was deemed the most appropriate technique to achieve this goal.

Instruments

The data collection process for this study employed two principal instruments: documentation and questionnaires, both of which were essential in obtaining valid, relevant, and comprehensive data. The documentation method focused on evaluating the effectiveness of the bilingual education program by examining students' academic performance across key subjects. Specifically, data were gathered from the final scores in Mathematics, Science, and Social Studies, as recorded by subject teachers at the conclusion of Semester 1 and Semester 2. These scores, which encompassed the results of various assessments such as assignments, quizzes, and examinations, represented students' cumulative achievements over each semester. The comparative analysis of scores from both semesters enabled the researcher to identify any academic progress or decline attributable to the bilingual program. An improvement in Semester 2 scores indicated a positive impact, while a decrease suggested ineffectiveness. This approach is supported by Sacramento (2015), who emphasizes that documentation methods in educational research often include institutional records and student data, such as grade reports, to provide evidence of learning outcomes.

Complementing the documentation, a student questionnaire was distributed to identify specific factors influencing the program's success. The study utilized a structured, closed-ended questionnaire based on a 5-point Likert scale ranging from "never" to "always," which allowed participants to express the frequency of their experiences in a quantifiable manner. The use of Bahasa Indonesia ensured that all respondents could fully comprehend each item, thereby minimizing misinterpretation and enhancing response accuracy. The instrument comprised 18 items, carefully constructed based on insights from existing literature on bilingual education and validated by an academic advisor to ensure content relevance and clarity. The questionnaire measured various dimensions such as instructional clarity, language support, student engagement, and resource availability. To provide a clearer overview, a table was prepared to group these factors and list the corresponding questionnaire items that evaluate the perceived effectiveness of the bilingual program.

Table 1. Factor in the Questionnaire

No	Factors	Item of Questionnaire
1	Student Engagement	1, 2, 3, 4, 5
2	Learning Resources	6, 7, 8, 9, 10
3	School Support	11, 12, 13, 14, 15
4	Teacher Role	16, 17, 18, 19, 20

Data Analysis

In this study, the researcher analyzed the data obtained from documentation and questionnaires using statistical methods facilitated by SPSS software. The data analysis was conducted as follows:

Documentation Analysis

The analysis of the documentation data, which consisted of students' academic scores from two different assessment periods, served as a crucial component in evaluating the effectiveness of the bilingual education program. These scores, representing students' performance in Mathematics, Science, and Social Studies, were analyzed using Statistical Package for the Social Sciences (SPSS) software. The researcher calculated the mean (average) scores for both Assessment 1 and Assessment 2 and applied a paired sample t-test

to determine whether the observed changes in performance were statistically significant. This test is particularly suitable for comparing two sets of related data, such as scores from the same group of students at two different times, and helps to identify whether any observed difference is due to the intervention—in this case, the bilingual program—or merely the result of random variation.

The statistical procedure was underpinned by two hypotheses. The Null Hypothesis (H_0) proposed that there is no significant difference between the two sets of scores, implying that the bilingual instruction had no measurable effect on student outcomes. The Alternative Hypothesis (H_1), on the other hand, posited that there is a statistically significant improvement in scores between the first and second assessments, thereby supporting the effectiveness of the bilingual approach. The level of statistical significance was set at a p-value of 0.05. If the resulting p-value was found to be less than 0.05, the null hypothesis would be rejected in favor of the alternative, indicating that the program had a positive impact. If the p-value exceeded 0.05, the null hypothesis would be accepted, suggesting that the program did not produce a meaningful improvement. This rigorous statistical method ensured that conclusions drawn from the study were supported by empirical evidence, thereby enhancing the credibility and reliability of the research findings.

Questionnaire Analysis

The data collected through the student questionnaires were analyzed using quantitative statistical techniques, with the assistance of Statistical Package for the Social Sciences (SPSS) software. The initial stage of data analysis involved the use of descriptive statistics to summarize the overall trends and tendencies reflected in the participants' responses. Key statistical measures such as total scores, mean values, and percentages were calculated to capture the frequency and central tendency of student perceptions related to the bilingual program. Responses recorded on the 5-point Likert scale—from "never" to "always"—allowed the researcher to quantitatively assess how often students encountered various instructional and environmental factors that might influence the effectiveness of bilingual education.

To delve deeper into the structure of the data and uncover the underlying patterns among the questionnaire items, an Exploratory Factor Analysis (EFA) was performed. EFA is a statistical method designed to identify latent constructs by grouping together items that are interrelated. Through this method, the study aimed to reveal broader thematic categories or factors that students collectively recognized as significant in shaping their learning experiences. For instance, variables such as teacher effectiveness, institutional support, language scaffolding, and student motivation might cluster together, forming coherent constructs like "teacher role," "school support," and "student engagement." These emergent factors provided a more nuanced understanding of how different elements interact to affect student success in non-English subject areas taught under the bilingual framework.

Both the descriptive statistical outputs and the results from the EFA were synthesized to answer the study's research questions comprehensively. By identifying and analyzing the most influential factors, the study was able to highlight which aspects of the bilingual program most significantly contributed to positive academic outcomes. These findings offer valuable insights for educators and policymakers aiming to optimize bilingual instruction and enhance student achievement.

RESULTS AND DISCUSSION

Research Results

This study examines the effectiveness of the bilingual program implemented at Bunga Matahari International Junior High School, focusing on student performance in non-English subjects such as Mathematics, Science, and Social Studies. Data were collected from two assessments and analyzed using paired sample t-tests to evaluate the program's impact. The findings, supported by statistical evidence, reveal the varying degrees of improvement

across these subjects. The details are provided below, along with supporting tables and figures.

Table 3. The Mean Grades for Each Subject

Subject	Assessment 1	Assessment 2
Math	88	91
Science	90	94
Social	92	93

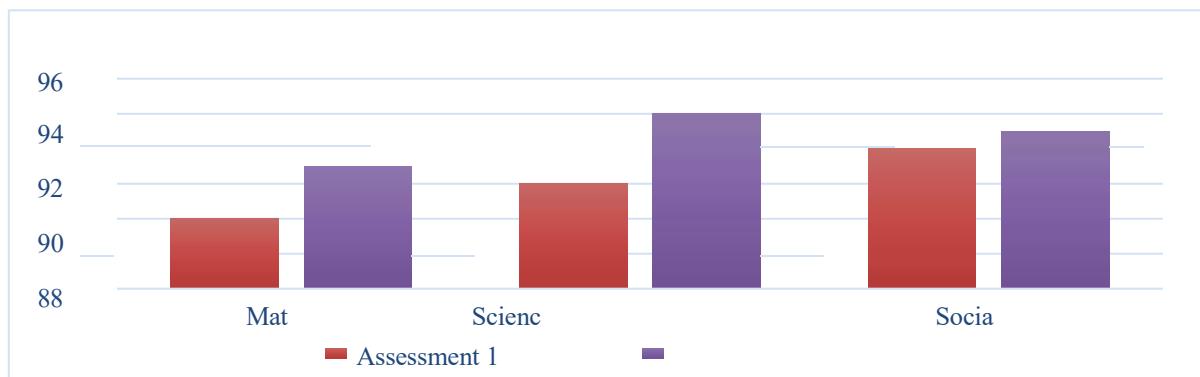


Figure 1. Comparison of Mean Scores of Two Assessment

The data presented above illustrates the average (mean) scores of students in three subjects—Mathematics, Science, and Social Studies—across two assessments, and highlights changes that occurred following the implementation of a bilingual teaching program. Notably, the results indicate a positive trend in Mathematics and Science scores, suggesting improvement in student performance, whereas Social Studies showed only a marginal change. To validate the statistical significance of these observed differences, a paired sample t-test was conducted for each subject.

In Mathematics, students' average scores improved from 88 in Assessment 1 to 91 in Assessment 2. The paired sample t-test for this subject yielded a p-value of 0.002, which is below the conventional significance threshold of 0.05. This finding confirms that the improvement is statistically significant, meaning it is unlikely to have occurred by chance. Thus, it can be inferred that the bilingual approach—teaching Mathematics in English—had a meaningful and positive effect on students' performance, enhancing their comprehension and problem-solving abilities.

Science showed the most notable improvement among the three subjects, with average scores increasing from 90 to 94. The statistical analysis further reinforces this result, with a p-value of 0.000, indicating a highly significant change. This substantial improvement demonstrates that the bilingual instructional method was especially effective in the Science subject. The integration of English language instruction may have enhanced students' engagement with scientific terminology and concepts, leading to better understanding and retention.

In contrast, the improvement in Social Studies was minimal, with the average score increasing from 92 to 93. The paired t-test produced a p-value of 0.749, which is considerably higher than 0.05, indicating that the observed change is not statistically significant. This suggests that the bilingual approach did not have a measurable impact on students' performance in Social Studies, possibly due to the nature of the subject or pre-existing familiarity with the content. Overall, the results indicate that the bilingual program had a positive and statistically significant effect on students' achievement in Mathematics and Science, but not in Social Studies.

Factors Influencing the Success of the Bilingual Education Programs in Bunga Matahari School

This section discusses the factors that influence the success of the bilingual education program at Bunga Matahari International Junior High School. The factors under consideration include student engagement, learning resources, school support, and the role of teachers in facilitating bilingual education. These factors were assessed through a questionnaire, and the results provide valuable insights into their respective impacts on the program's effectiveness. The detailed results are presented in the table below.

Table 5 The result of Questionnaire

Factors	Total	Mean	Percentage
Student Engagement	540	4.00	80%
Learning Resources	432	3.20	64%
School Support	499	3.70	74%
Teacher Role	589	4.36	87%

Based on the table above, the Teacher Role emerged as the most influential factor, with a total score of 589 and a mean of 4.36, corresponding to 87%. This highlights the significance of the teacher's expertise and their crucial role in ensuring the success of the bilingual program. Teachers are seen as professionals who effectively use media and resources to engage students in the learning process. Their ability to provide clear explanations in English, while repeating key concepts when needed, ensures that students are able to follow the lessons. Teachers also build positive classroom interactions, creating an environment conducive to language learning, which is essential for student success in a bilingual setting.

Student Engagement also scored highly, with a total of 540 and a mean of 4.00 (80%). This suggests that students are highly engaged in using English, both within the school and outside of it. They actively participate in discussions during lessons and regularly practice new vocabulary. Additionally, many students take part in extra-curricular learning activities like private lessons, which further supports their language acquisition. The active involvement of students in these various activities helps strengthen the overall effectiveness of the bilingual program.

The factor of School Support showed a total score of 499 and a mean of 3.70 (74%). This indicates that while the school provides a solid foundation in terms of support for the bilingual program, there is room for improvement. Students still face challenges in understanding certain vocabulary related to their lessons, and at times, teachers resort to using Bahasa Indonesia to ensure clarity. This suggests that additional support in terms of vocabulary development, instructional materials, and individualized help for students may enhance the program's success.

Finally, Learning Resources had the lowest score, with a total of 432 and a mean of 3.20 (64%). While students use English-language textbooks and dictionaries, and benefit from vocabulary-focused lessons at the start of each class, there is a need for more comprehensive and varied resources. Expanding and improving the learning materials available to students could further enhance their understanding and performance in the bilingual program.

Discussion

The findings of this study demonstrate that the bilingual education program at Bunga Matahari International Junior High School has positively impacted student performance, especially in Mathematics and Science, though the effect in Social Studies was more limited. In Mathematics, the significant increase in students' mean scores, from 88 in the first assessment to 91 in the second, with a p-value of 0.002, highlights the effectiveness of the bilingual program in improving students' engagement with English-based mathematics content. This aligns with existing research by Setyowati (2019) and Ismail (2020), which

stresses the importance of integrating English terminology and providing vocabulary support in enhancing mathematical comprehension. However, the persistence of challenges related to academic vocabulary suggests that additional support in this area could further enhance student performance.

The most pronounced improvement was observed in science, where the mean score increased from 90 to 94, with a statistically significant p-value of 0.000. This improvement suggests that the bilingual program has been particularly effective in helping students understand complex scientific concepts delivered in English. The findings are consistent with research by Tinal et al. (2013), which emphasize the importance of interactive teaching methods and well-structured bilingual resources in improving comprehension in subjects like science. Despite this success, the continued challenge of mastering scientific vocabulary remains, suggesting that further efforts to support students' language development in this subject are necessary.

In contrast, the improvement in Social Studies was less significant, with the mean score rising only from 92 to 93, and a p-value of 0.749, indicating no statistically significant change. The integration of bilingual education in social sciences presents a unique set of challenges that educators must navigate to ensure effective learning outcomes. One of the primary challenges is the linguistic proficiency of both teachers and students. In bilingual classrooms, teachers often face difficulties in delivering content in a second language while ensuring that students comprehend complex social science concepts. This challenge is exacerbated when students have varying levels of proficiency in the target language, which can lead to misunderstandings and hinder the learning process (Jaffee, 2020). These results suggest that the bilingual program may not fully address the unique challenges of teaching social science content in a second language. To improve student outcomes in this area, additional strategies, such as increased use of English in classroom discussions or a more focused approach on subject-specific language, could be explored.

In addition to examining the overall effectiveness of the bilingual program, the study also identified several key factors contributing to its success. These factors include the teacher's role, student engagement, school support, and learning resources. Of these, the Teacher Role emerged as the most influential factor, with a mean score of 4.36 (87%). Teachers' expertise, use of multimedia, effective classroom interactions, and clear explanations in English were found to significantly enhance student learning experiences. These findings are in line with studies by Sucitra (2020) and Tinal et al. (2013), which underscore the importance of teacher competency and interactive teaching methods in improving academic outcomes.

Student engagement also proved to be a key factor in the success of the bilingual program, as evidenced by a mean score of 4.00 (80%). The high level of student involvement in English-based activities, both inside and outside the classroom, contributes to their language acquisition and academic performance. This is consistent with research by Baa (2023), which found that active participation in bilingual programs leads to better academic outcomes. The regular use of English in everyday conversations and formal learning environments reinforces language skills, supporting students' success in both language and content mastery.

School Support received a mean score of 3.70 (74%), indicating that while the school provides some support for bilingual instruction, there is room for improvement. Students face challenges in understanding subject-specific vocabulary, and teachers occasionally resort to using Bahasa Indonesia for clarification. This finding aligns with existing research that highlights similar challenges in bilingual programs, where the use of English and the availability of appropriate instructional materials may not fully address students' language needs (Surdyanto, 2018). To enhance this support, targeted vocabulary development programs and a more consistent use of English in classroom interactions could be beneficial.

Learning Resources had the lowest mean score, at 3.20 (64%), suggesting that there is a

need for more diverse and comprehensive learning materials. While students have access to English-language textbooks and dictionaries, the availability of supplementary resources, such as interactive tools and additional reading materials, remains limited. This lack of resources could hinder students' ability to fully benefit from the bilingual program. The importance of diverse learning materials in bilingual education has been emphasized by Abduh & Rosmaldewi (2018) argue that multimodal resources can help bridge gaps in comprehension and support language acquisition.

The bilingual education program at Bunga Matahari International Junior High School has demonstrated effectiveness, particularly in Mathematics and Science, with a more modest effect in Social Studies. The success of the program can be attributed to key factors such as the teacher's role, student engagement, school support, and learning resources. Teachers' expertise and interactive teaching methods have been instrumental in enhancing student outcomes, while high levels of student engagement and involvement in English-based activities have contributed to improved language skills. However, challenges remain, particularly in the areas of subject-specific vocabulary and the availability of learning resources. To further optimize the program's effectiveness, additional support in these areas, along with more targeted strategies in Social Studies, should be considered. Overall, this study underscores the importance of a comprehensive approach to bilingual education that combines strong instructional quality, active student participation, sufficient resources, and ongoing school support to ensure successful outcomes.

CONCLUSION

The findings of this study conclusively demonstrate that the bilingual education program implemented at Bunga Matahari International Junior High School has a significant and measurable impact on student performance in core non-English subjects, particularly Mathematics and Science. The paired t-test analysis revealed that students' average scores in Mathematics improved from 88 to 91, and in Science from 90 to 94, both with statistically significant p-values, indicating that the improvements are not due to chance. This suggests that the integration of English as a medium of instruction in these subjects effectively enhances students' comprehension and academic outcomes. However, the program's effect on Social Studies was minimal, with only a one-point increase and a non-significant p-value, indicating the need for more nuanced strategies when implementing bilingual instruction in subjects that are more language-intensive and reliant on abstract discussion.

Additionally, the study highlights the critical role of four key factors influencing the success of the bilingual program: teacher role, student engagement, school support, and availability of learning resources. Among these, the role of the teacher emerged as the most influential, with students recognizing the importance of clear explanations, interactive classroom practices, and appropriate scaffolding in the second language. Student engagement followed closely, showing that active participation in English-speaking environments both inside and outside the classroom is essential for effective language acquisition and content mastery. While school support was moderately effective, improvements in vocabulary instruction and consistent language usage could further strengthen the program. Learning resources, although utilized, were the least impactful due to limitations in variety and depth. Thus, for bilingual programs to achieve their full potential, it is vital to invest in teacher training, enhance instructional materials, and provide structured language support to meet the diverse needs of learners.

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