INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN PROGRESSIVE EDUCATION & DEVELOPMENT

OPEN ACCESS JOURNAL

Vol 14, Issue 3, (2025) E-ISSN: 2226-6348

Science and Mathematics Teacher Readiness for Dual Language Implementation in Secondary Schools in Simunjan Distrct, Sarawak

Emillia Anak Rose, Prof. Madya Dr. Nurfaradilla Mohd Nasri

Fakulti Pendidikan, Universiti Kebangsaan Malaysia, Bangi, Malaysia

Email: P145121@siswa.edu.ukm.my

DOI Link: http://dx.doi.org/10.6007/IJARPED/v14-i3/26328

Published Online: 08 September 2025

Abstract

The purpose of this study was to examine the readiness of Mathematics and Science teachers in implementing the Dual Language Programme (DLP) in teaching these subjects in secondary schools in Simunjan District, Sarawak. The aspects of readiness studied included knowledge, ability, interest, and challenges faced by teachers in DLP implementation. DLP is an important initiative by the Ministry of Education Malaysia (MOE) aimed at improving students' English language proficiency. Therefore, teacher readiness is a critical factor for its success. This study involved 25 Science and Mathematics teachers from secondary schools in Simunjan District as respondents. Data was collected through questionnaires containing variables such as knowledge, skills, interest, and challenges. To determine the level of readiness in each aspect, descriptive data analysis was performed using statistics such as mean, standard deviation, and percentage. The results of the study show that teachers have a moderate level of knowledge, their English language skills still require improvement and teachers have a positive interest. The study also found several obstacles, including teacher workload, students' English language proficiency levels, and a lack of training support for DLP teachers. This study is important to help the MOE, Sarawak State Education Department (JPN Sarawak), and schools create more effective interventions and professional development programs. Recommendations are provided to enhance teacher readiness and strengthen DLP implementation.

Keywords: Dual Language Programme (DLP), Teacher Readiness, Science and Mathematics, Bilingual Education, Education Implementation, English Language, Malay Language

Introduction

Research Background

The Dual Language Programme (DLP) is an initiative by the Ministry of Education Malaysia (MOE) officially implemented in 2016 under the policy of Upholding the Malay Language and Strengthening the English Language (MBMMBI). English will be used as the medium of instruction for Science and Mathematics subjects in selected schools through this program. DLP implementation is optional and subject to certain conditions, including parental support, availability of competent teachers, and sufficient learning resources.

According to MOE (2016), the primary goal of DLP is to enhance students' proficiency in English, aligning with the Malaysia Education Blueprint (MEB) 2013–2025, which stipulates that bilingual skills are one of the six student aspirations. With strong English language proficiency, students are believed to be ready to compete globally. At the national level, DLP is expected to increase the global competitiveness of Malaysian students, given that English proficiency is crucial in the era of globalization (Rahman & Tan, 2019).

DLP provides an opportunity for students to master English within the context of 21st-century subjects, through its implementation as the medium of instruction in Mathematics and Science. This step aligns with the need to produce human capital that is not only academically excellent but also competitive and fluent in English, which is the primary language in Science, Technology, Engineering, and Mathematics (STEM) fields within the national education context. The implementation of DLP aims to strengthen students' English language skills, in line with Malaysia's aspiration to become a high-income nation and compete globally (Subramanian Ramatha & Jukka Tulivouri, Feb 24, 2024).

In Sarawak, DLP implementation is also seen as a relevant strategic move, given the state's active pursuit of digital development and a knowledge-based economy. English proficiency is crucial in ensuring that Sarawakian students are not left behind in the globalized world, while also strengthening their involvement in higher education and career opportunities. According to the Sarawak Post-COVID-19 Development Strategy 2030 Report (Sarawak Government, 2021), human capital development through quality education is among the state government's key focuses. Given the ethnic and linguistic diversity in Sarawak, DLP is seen as a way to provide students with the English language skills needed for broader educational and employment opportunities, in line with the state's aspiration for inclusive socio-economic development (Sarawak Education Department, 2020).

Science and Mathematics subjects are pillars of national development based on technological advancement and innovation. These two fields are fundamental to progress in various sectors, including technology, engineering, medicine, and economics (Abdullah et al., 2022). Knowledge in Science helps students understand natural phenomena and solve problems scientifically, while Mathematics hones logical, analytical, and systematic thinking skills. Both fields are complementary in producing competent and competitive students in STEM fields.

According to the National STEM Movement Malaysia (2020), the emphasis on Science and Mathematics at the school level is critical for equipping students with future skills and supporting workforce needs in high-tech sectors. Therefore, mastering these subjects, including through instruction in English, is essential for increasing students' access to international reference materials and understanding global concepts. This step is seen as an effort to enhance students' English language proficiency and their understanding of Science and Mathematics, which will drive national technological advancement and innovation (National Education Blueprint 2013–2025).

This study focuses on DLP implementation in secondary schools, specifically from the aspect of educators' readiness for its implementation. This includes examining the extent to

which students and parents accept this approach, the challenges faced by teachers when using English to teach, and the impact of DLP on student achievement in Science.

This study will specifically focus on DLP implementation at the secondary school level. Before pursuing higher education or entering the workforce, secondary schools play a critical role in shaping students' understanding and interest in Mathematics and Science subjects. Therefore, gaining a deep understanding of DLP implementation and its effectiveness at this level is crucial. By understanding DLP implementation in secondary schools more thoroughly, stakeholders can plan interventions and provide more targeted support to ensure the program's objectives are effectively achieved.

Problem Statement

As acknowledged, the implementation of the Dual Language Programme (DLP) possesses a clear objective: to enhance students' English language proficiency while fortifying Malay as the national language. However, this initiative has engendered a myriad of challenges for educators during the teaching and learning (PdP) process within the classroom. A significant hurdle is that not all instructors responsible for teaching Science and Mathematics exhibit proficient command of the English language, which stands as one of the primary obstacles faced by those engaged in the DLP's execution. According to a study conducted by Chew and Nor Aisyah Ahmad (2022), the questionnaire item "I find it difficult to explain daily examples related to the taught topic using English" recorded the highest mean value of 3.29. The findings of this research indicate that a substantial proportion of respondents encountered greater difficulties when instructing Mathematics and Science in English compared to delivering PdP in Malay.

Moreover, the readiness of educators to adapt their teaching methodologies within a second language further complicates the DLP's implementation. For those accustomed to instructing Science and Mathematics in Malay, transitioning to the distinct requirements of English instruction may prove challenging. As articulated by Ashairi Suliman, Mohamed Yusoff, and Melor (2020), the level of preparedness among teachers is a pivotal factor in ensuring they are genuinely capable of fulfilling their responsibilities effectively within the DLP framework. A heightened degree of readiness can facilitate educators in adjusting their pedagogical strategies more adeptly and bolster their self-confidence when teaching in English. Nevertheless, a study by Siti Huzaimah Abdullah and Zaimuariffudin Shukri (2023) revealed that 38.8% of teacher respondents expressed a lack of confidence in utilizing English to teach Science and Mathematics. This insufficient level of teacher readiness is likely to adversely affect the effective execution of the DLP, as educator confidence is an essential component in delivering successful PdP.

The DLP's implementation also encounters challenges when non-specialist Science or Mathematics teachers are mandated to instruct these subjects in English. This predicament arises from a scarcity of teaching personnel who genuinely meet the qualifications or possess the requisite expertise in the domain and medium of instruction stipulated by the DLP within a particular school. Non-specialist teachers, lacking specialized backgrounds in the pertinent subjects or pedagogical training in English, frequently struggle with material preparation, content delivery, and accurate conceptual comprehension in the second language. A study by Juliana Othman et al. (2020) highlighted that 43.7% of the respondents were trained

educators without a background in Science and Mathematics options yet were involved in DLP implementation in schools. Concurrently, research by Hafizati et al. (2021) found that non-specialist teachers are compelled to shoulder a disproportionate workload, particularly concerning content mastery, compared to their professionally qualified counterparts. Non-specialist educators were found to be less informed about the most effective teaching methodologies for delivering specific topics, presenting a significant challenge to the effective implementation of the DLP.

In addition to the challenges posed by educators, students' proficiency in English emerges as a critical factor influencing the efficacy of DLP implementation. Teachers have reported encountering difficulties in teaching Science and Mathematics in English due to students' lack of comprehension, as English is predominantly a second language for the majority of Malaysian students. A study by Siti H.A. and Zaimuariffudin S. (2023) indicated that 89.6% of teachers believed that students' deficiencies in understanding English constituted a major obstacle in ensuring the effectiveness of teaching and learning under the DLP. This predicament hampers students' ability to grasp essential concepts in the subjects taught and disrupts the overall learning trajectory. Consequently, to more effectively realize the original objectives of the DLP, it is imperative to devote serious attention to enhancing students' English language proficiency.

Challenges regarding parental acceptance of the program also warrant consideration. While some parents advocate for the DLP, believing it to be beneficial for their children's English language acquisition, others express concerns that their children may struggle with comprehending topics taught in English, particularly those from non-bilingual backgrounds. Parental perceptions and support can significantly influence the success of DLP implementation, as student motivation is often contingent upon the acceptance and encouragement provided by their families. Findings from Siti Huzaimah Abdullah and Zaimuariffudin Shukri (2023) revealed that 38.8% of respondents identified a lack of parental support and encouragement as a challenge in DLP implementation. Therefore, the effectiveness of DLP is not solely reliant on teachers and students but is also shaped by the collaboration and acceptance of parents. All stakeholders must offer mutual support to ensure the successful execution of the DLP.

The potential for inadequate teacher readiness in implementing the DLP can have profound implications for the overall effectiveness of the program and, by extension, student achievement. If educators are not equipped with the requisite knowledge, language skills, and pedagogical strategies, the quality of Science and Mathematics PdP in English may be compromised. This inadequacy may lead to students encountering difficulties in understanding concepts, diminished motivation to learn, and ultimately, a detrimental impact on their academic performance (Cummins, 2017). Furthermore, inadequately prepared teachers may experience heightened stress and diminished self-confidence, which can adversely affect the classroom atmosphere and interactions with students. Therefore, ensuring teacher readiness is paramount to guaranteeing the success of the DLP and its beneficial impact on student educational development.

Research Question

Research question directly pertinent to this study: -

To what extent is the readiness of Science and Mathematics teachers in secondary schools towards the concept and implementation of DLP?

Research Objective

Here are the objectives of this study:-

To ascertain the proficiency level of Science teachers concerning their skills and scientific terminology in English for the implementation of DLP.

To evaluate the extent of knowledge possessed by Science teachers regarding DLP implementation.

To gauge the degree of interest exhibited by Science teachers in relation to DLP implementation.

To assess the preparedness of Science teachers in confronting challenges associated with DLP implementation.

Literature Review

In Malaysia, the DLP was instituted with the objective of enhancing students' proficiency in English through the instruction of Science and Mathematics subjects (Ministry of Education Malaysia, 2016). The efficacy of this initiative is profoundly contingent upon the preparedness of the participating educators, encompassing not merely their command of the English language but also their pedagogical acumen and self-assurance, as evidenced by a study conducted by Goh and Silver (2017).

Prior investigations and scholarly research have afforded deeper insights into various dimensions of dual language program implementation in a comprehensive manner. A study by Baker (2013) asserted that the pivotal role of institutional support and resources in ensuring the success of dual language programs is indisputable. Within the Malaysian context, research by Yunus et al. (2013) scrutinized educators' perceptions regarding the implementation of Science and Mathematics instruction in English prior to the formal introduction of DLP, thereby providing significant background on prospective challenges that might arise.

Subsequent to the implementation of DLP, scholarly attention shifted towards the experiences and preparedness of educators. Aziz and Ahmad (2018), in their investigation, elucidated the correlation between teacher self-confidence and the challenges encountered in executing DLP. Their findings indicated that educators with diminished confidence in their English language abilities tended to confront greater difficulties in facilitating teaching and learning. Correspondingly, a study by Lee and Tan (2019) concentrating on Science and Mathematics educators in Penang uncovered that mastery of technical terminology in English and the capacity to adapt instructional materials were essential components of teacher readiness.

Moreover, a study by Hashim et al. (2020) explored the specific professional development requirements for DLP educators. Their research underscored the necessity for training that not only hones language proficiency but also encompasses effective bilingual teaching strategies and assessment techniques. According to Borg (2015), although his study was more

broadly focused on language teacher development, it remains pertinent in the DLP context as it underscores the significance of self-reflection and peer support in augmenting teaching efficacy.

In more contemporary developments, a study by Abdullah et al. (2022) investigated the impact of DLP on the motivation of Science and Mathematics educators.
The findings revealed that teachers who perceived themselves as adequately prepared and who received sufficient support exhibited heightened motivation in implementing the program. Additionally, a systematic literature review by Rahman and Devi (2023) encapsulated various factors influencing DLP teacher readiness in Southeast Asia, identifying language proficiency, pedagogical competencies, resource availability, and administrative backing as predominant themes.

In reference to ongoing research aimed at comprehending the dynamics of DLP implementation, a case study by Tan et al. (2024) meticulously examined the experiences of Science educators in a secondary institution that has long embraced DLP, offering insights into adaptation strategies and enduring challenges encountered. Meanwhile, a quantitative analysis by Lim and Wong (2025) investigated the correlation between educators' educational backgrounds, teaching experience, and their levels of preparedness for DLP nationwide.

In summary, the literature review of preceding studies has elucidated that the readiness of Science and Mathematics educators constitutes a critical element in the success of DLP within secondary schools. These investigations accentuate the significance of English language proficiency (including technical terminology), pedagogical skills within a bilingual framework, teacher self-confidence, resource accessibility, administrative support, and the effectiveness of professional development programs. Ongoing research is imperative to attain a more profound understanding of these factors and their interplay within the Malaysian educational landscape.

Conceptual Framework

This research employs Wallace's (1991) reflective model theory, which posits that educators typically possess a wealth of knowledge and experience pertinent to their current roles. Received knowledge and experiential knowledge represent two pivotal sources of understanding within professional training. According to Wallace, these two forms of knowledge are interdependent, thereby equipping educators to more effectively fulfill their responsibilities as teaching professionals.

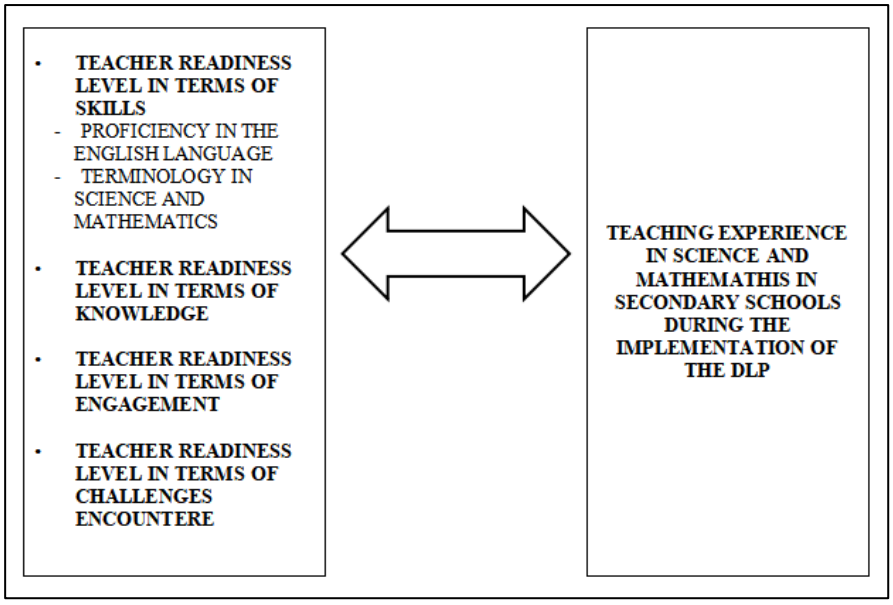

Figure 1: Wallace's Theory Conceptual Framework

Research Methadology

This quantitative investigation utilized a survey methodology. A meticulously crafted questionnaire instrument was employed to assess the preparedness of Mathematics and Science educators for the implementation of DLP. The questionnaire, which incorporated a 1–5 Likert Scale, was developed by adapting Norisah's (2016) instrument and subsequently refined by the researcher in alignment with the objectives of the study. The questionnaire was disseminated through Telegram and WhatsApp messaging applications to educators who fulfilled the study's criteria, utilizing the Google Form platform to facilitate accessibility and expedite the data collection process. Respondents were afforded ample opportunity to respond to the questions voluntarily and without constraint. Measures to ensure the confidentiality of respondent identities and systematic data monitoring were instituted to mitigate bias.

Research Design

This study employs a survey research design underpinned by a quantitative research methodology, concentrating on the examination of one or more cases within authentic real-world contexts, as articulated by Yin (2018). This particular design was selected due to its capacity to furnish the researcher with rich and nuanced data through the survey method, facilitating the collection of comprehensive narratives regarding participants' readiness in alignment with the study's objectives.

Sample and Population

This study encompasses 25 Science and Mathematics teachers currently engaged in secondary education within the Simunjan District of Sarawak, irrespective of their current or prior involvement in the Dual Language Programme (DLP). According to Creswell and Creswell (2018), the demographic in quantitative research should comprise individuals capable of furnishing data pertinent to the research issue at hand. Consequently, the selection of participants from the Mathematics and Science teaching cohort in secondary schools is imperative due to their pivotal role in the execution of the DLP policy. Furthermore, Gay, Mills, and Airasian (2012) assert that in quantitative inquiries, a sample representing at least

10% of the population suffices to yield reliable data in small-scale investigations. Therefore, the inclusion of 25 individuals is deemed adequate for garnering preliminary insights into teacher preparedness concerning DLP implementation.

This study employs a hybrid of sampling methodologies, purposive sampling and simple random sampling. Initially, purposive sampling was utilized to identify educators who instruct Mathematics and Science and are directly engaged in the DLP implementation. This approach ensures that only pertinent respondents with relevant DLP experience partake in this study. Upon delineation of the target population, simple random sampling was employed to select research participants. This method serves to mitigate research bias, as teachers within the identified group possess an equal opportunity of being chosen as part of the sample. As articulated by Etikan, Musa, and Alkassim (2016), purposive sampling is particularly advantageous for research necessitating the selection of respondents based on specific criteria pertinent to the investigation.

Research Validity and Instruments

To evaluate the readiness of Science and Mathematics teachers to implement the Dual Language Programme (DLP) in secondary schools within the Simunjan District, an online questionnaire was utilized as the research instrument. The adoption of an online questionnaire facilitates efficient data collection and enhances accessibility for respondents. This study employed a Likert-scale questionnaire ranging from 1 to 5, developed via the Google Forms platform. Google Forms was selected for its user-friendly features, including interactive functions and its capacity to automatically collect and organize data, thereby streamlining the data collection and analysis process.

Data directly pertinent to the study's objectives specifically, teacher readiness concerning skills, knowledge, interest, and the challenges encountered were amassed through the questionnaire. The contents of the questionnaire were delineated into five primary sections:

i. **Section A: Respondent Demographics**

This section gathered background information such as age, academic qualifications, and teaching experience. This data is vital to explore potential correlations between demographic factors and the level of teacher readiness.

ii. **Section B: Skills in Using Scientific and Mathematical Terminology in English**

This section concentrated on the teachers' proficiency in employing specific Science and Mathematics terminology during the teaching and learning process in English. The items in this section assessed teachers' confidence, frequency of terminology usage, and the challenges associated with mastering bilingual vocabulary.

iii. **Section C: Knowledge about DLP and the Curriculum**

This section gauged teachers' comprehension of the DLP concept, its objectives, and its integration into the Science and Mathematics curriculum. The questions were meticulously designed to evaluate teachers' familiarity with DLP policy, reference materials, and appropriate pedagogical strategies.

iv. **Section D: Interest and Motivation towards DLP**

This section investigated the affective dimensions of teachers, particularly their interest and motivation in implementing DLP. The items scrutinized teachers' perceptions of the

significance of DLP, their willingness to enhance their skills, and their enthusiasm in adapting to curriculum changes.

v. Section E: Challenges Faced in Implementing DLP

The final section aimed to elucidate the various challenges teachers encounter in adapting to and actualizing DLP in schools. The identified challenges encompassed issues related to teaching materials, administrative support, students' English proficiency, and teachers' workload.

The formulation of the questionnaire items commenced with a comprehensive literature review on DLP and teacher readiness. The items were crafted in alignment with the research objectives to ensure their measurability.

Content validity was assured through the construction of the questionnaire, focusing on the appropriateness of the items, clarity of language, coverage of the measured aspects, and relevance of the items to the study objectives. The questionnaire underwent meticulous refinement prior to distribution to respondents. Through a rigorous development and validation process, the research instrument is believed to be capable of collecting valid and reliable data to fulfill the research objectives concerning the readiness of Science and Mathematics teachers in implementing DLP.

Data Collection Procedure

To ensure adherence to research ethics, the principle of informed consent was meticulously implemented. At the outset of the questionnaire, a consent statement was incorporated to apprise respondents of the study's purpose, the confidentiality of the information provided, and the absence of coercion in their participation. Essentially, participation was entirely voluntary, and they retained the right to withdraw from the study at any moment without facing any repercussions.

The confidentiality and privacy of respondents were unequivocally assured. Within this questionnaire, no personal information such as identification card numbers or email addresses was solicited. The data collected would be utilized exclusively for academic research purposes. All information would be analyzed in aggregate form, ensuring that no specific individuals could be identified.

The data collection period was delineated as one week. The questionnaire was disseminated to respondents during the initial week of April 2025, granting them a seven-day window to submit their responses. Following the deadline, the data from the Google Form would be downloaded and systematically organized for subsequent analysis.

Data Analysis

The data obtained from the questionnaire were subjected to rigorous analysis through descriptive statistics. This methodology afforded a lucid and succinct overview of the preparedness of Science and Mathematics teachers to implement the DLP in secondary schools within the Simunjan District, Sarawak. The descriptive statistical techniques utilized encompassed:

i. **Frequency and Percentage:** These metrics were employed to delineate the demographic distribution of respondents such as age, highest academic qualification and teaching experience in this research, as well as to ascertain the frequency and proportion of responses for each item on the questionnaire. This analysis elucidates the dimensions of teacher readiness.
ii. **Mean:** This statistic gauged the average readiness score for teachers across various dimensions such as pedagogical readiness, content readiness and management readiness in addition to the overall score. The mean serves to indicate the central tendency of the data.
iii. **Standard Deviation:** This measure assessed the dispersion or variability of teacher readiness scores relative to the mean. A minimal standard deviation signifies more uniform responses, while a substantial standard deviation suggests a broader spectrum of perspectives among the teachers.

The application of descriptive statistics is paramount in this investigation, as it enables the researcher to articulate the characteristics of the sample and the phenomenon under examination without extrapolating to a larger population, as articulated by Creswell and Creswell (2018). Furthermore, Hair et al. (2019) underscore that this approach is particularly apt for studies aimed at examining and articulating the current status or condition of a phenomenon, such as the level of teacher readiness. Through the descriptive analysis of the data, salient patterns and trends regarding the preparedness of Science and Mathematics educators for DLP can be distinctly discerned.

Reseach Finding

Respondent Demographics

Table 1 below shows the background analysis of the respondents by percentage and frequency.

Table 1

Respondents background analysis by percentage and frequency.

	Variable	Frequency	Percentage (%)
Age	21–30 years	7	28
	31–40 years	8	32
	41–50 years	5	20
	> 50 years	5	20
Highest Academic Qualification	Bachelor's Degree	22	88
	Master's Degree	3	12
Teaching Experience	Less than 5 years	12	48
	6–10 years	2	8
	10–20 years	4	16
	More than 20 years	7	28

Descriptive Analysis

The preparedness of Science and Mathematics teachers for the implementation of the DLP with regard to their skills , knowledge, interest and the challenges encountered in secondary schools within the Simunjan district of Sarawak was evaluated through descriptive analysis. This assessment of teacher readiness encompassing competencies, knowledge, enthusiasm, and challenges is depicted in Table 2, utilizing Means and Standard Deviations.

Table 2

Teacher readiness encompassing Skills, Knowledge, Interest and Challenges by Mean and Standard Deviation

Variable	Mean	Standard Deviation
Skills	3.34	1.06
Knowledge	3.58	0.94
Interest	3.46	1.13
Challenges	3.66	0.95

Table 2 presents the comprehensive data values for the variables in terms of Mean and Standard Deviation. The variable pertaining to teachers' competencies reveals a mean value of 3.34 accompanied by a standard deviation of 1.06, signifying that the respondents' preparedness in terms of skills is at a moderate level. Nevertheless, there exists a pronounced consensus among respondents regarding the execution of DLP.

The variable concerning teachers' knowledge demonstrates a mean value of 3.58 and a standard deviation of 0.94, implying that the respondents' knowledge readiness is likewise at a moderate level for DLP implementation. In contrast, the variable associated with teachers' interest indicates a mean value of 3.46 and a standard deviation of 1.13, reflecting a moderate level of interest readiness among respondents, with a distinct consensus observed among them regarding DLP implementation.

Subsequently, the variable addressing challenges encountered by teachers reveals a mean value of 3.66 and a standard deviation of 0.95, indicating a moderate level of preparedness in confronting challenges during DLP implementation.

Overall, the variables assessing teachers' readiness for implementing DLP suggest a moderate level of preparedness. The data presented in Table 3, Table 4, Table 5, and Table 6 elucidate the dependent variables employed in this study.

Table 3
Teachers' Skills in Implementing DLP

No.	Statement	Mean (SD)	Standard Deviation
1	I can speak English with correct pronunciation.	3.64	0.95
2	I can explain scientific processes and mathematical procedures well in English.	3.44	0.95
3	When I receive reference materials in English, I read them repeatedly to understand.	3.68	0.95
4	I can ask questions in English effectively.	3.72	0.78
5	I always use English when discussing with students.	2.92	1.22
6	I find it easier to express opinions in Bahasa Malaysia than in English.	3.88	1.10
7	I lack confidence in explaining in English.	3.16	1.05
8	I feel uncomfortable when asked questions in English.	3.16	1.34
9	I don't need to refer to science books in English as those in Malay are easier to obtain.	3.28	1.10
10	I am used to using English with my colleagues.	3.12	1.09
	Overall Mean = 3.58 (Moderate)		

Table 4
Teachers' Knowledge of DLP Implementation

No.	Statement	Mean (SD)	Standard Deviation
1	The concept of DLP is very easy to understand.	3.48	1.05
2	The exposure I have received is sufficient.	3.08	1.20
3	My experience with PPSMI helps me implement DLP.	3.04	0.93
4	I can master DLP quickly and easily.	3.32	0.90
5	The DLP guidebook helps me learn the system.	3.72	0.89
6	The DLP guidebook should be distributed to every school.	4.20	1.00
7	There is still a lot I need to learn about DLP.	4.16	0.94
8	I know how to record student work under DLP.	3.60	0.95
9	DLP increases my knowledge for teaching Science/Mathematics.	3.64	0.75
10	DLP reference materials are easy to understand.	3.56	0.75
	Overall Mean = 3.58 (Moderate)		

Table 5
Teachers' Interest in DLP

No.	Statement	Mean	Standard Deviation
1	I am ready to implement DLP in school.	3.52	1.08
2	I support the implementation of DLP in school.	3.76	1.25
3	I am ready to assess students under DLP.	3.64	1.02
4	DLP should be continued.	3.76	1.16
5	DLP increases my workload.	3.36	1.04
6	I have to work extra hours to implement DLP.	3.68	1.36
7	The exposure I received is sufficient.	2.96	1.36
8	I am confident in conducting training for others regarding DLP.	3.20	1.08
9	DLP is more effective than teaching fully in Bahasa Melayu.	3.36	1.12
10	I can master DLP easily and quickly.	3.32	0.85
Overall Mean = 3.46 (Moderate)			

Table 6
Teachers' Challenges in Implementing DLP

No.	Statement	Mean	Standard Deviation
1	Poor English proficiency among students is a significant challenge in implementing DLP.	4.12	0.81
2	Availability of sufficient English-language teaching and learning materials is a challenge.	3.76	1.10
3	DLP has significantly increased my workload.	3.48	1.00
4	I find it difficult to adapt my teaching methods to deliver content in English.	3.28	1.16
5	I am not confident in using technical terms in English while teaching.	3.28	1.08
6	Lack of support or adequate training hinders effective DLP implementation.	3.40	0.95
7	Ensuring all students understand content taught in English is a challenge.	4.12	0.83
8	Assessing students' understanding in subjects taught in English is a challenge.	4.12	0.60
9	Time constraints for planning and preparing quality DLP materials are a challenge.	3.64	0.86
10	I feel significant pressure to ensure the success of DLP in school.	3.44	1.15
Overall Mean = 3.66 (Moderate)			

Discussion

This study scrutinized the preparedness of Science and Mathematics educators in executing the Dual Language Programme (DLP) within secondary schools in the Simunjan district of Sarawak. Based on the mean and standard deviation values obtained, it can be inferred that the teachers' readiness in terms of skills, knowledge, and interest is at a moderate level. This suggests that while educators possess a fundamental understanding and willingness to implement DLP, there remains significant scope for enhancement in these domains. The findings also indicate the presence of challenges such as insufficient support materials or time constraints; however, these issues are not substantial enough to impede the implementation of DLP. This moderate readiness underscores the necessity for meticulously planned and ongoing interventions to ensure the successful execution of DLP within the district.

Further research could be pursued to deepen the comprehension of DLP and teacher readiness, such as investigating the impact of professional development initiatives on educators' preparedness. This could be achieved through intervention studies aimed at evaluating the efficacy of specifically tailored professional development programmes designed to augment teachers' skills, knowledge, and enthusiasm for DLP. Such research would facilitate the identification of the most effective training programmes. Moreover, it is imperative to examine students' perceptions and readiness regarding the teaching and learning of Science and Mathematics within the DLP framework to attain a comprehensive understanding of DLP implementation. Longitudinal studies addressing factors such as teacher retention in DLP, job satisfaction, workload, and career advancement opportunities are also essential.

The findings of this study hold the potential to serve as a valuable framework for stakeholders in devising more effective strategies to bolster teacher readiness and ensure the successful implementation of DLP. At the Ministry of Education Malaysia (MOE) level, the findings can empower the MOE to develop more targeted and adaptable professional development programme, not only to enhance teachers' English proficiency and pedagogical content knowledge (PCK) in the context of DLP but also to underscore aspects such as teacher motivation and engagement. These programme should consider the diverse levels of readiness and requirements of teachers across various locales, including rural areas like Simunjan, potentially through online modules or regionally tailored training.

The MOE could also furnish comprehensive linguistic resources to guarantee the availability and accessibility of English learning materials specifically designed for Science and Mathematics teachers. This may encompass bilingual glossaries of scientific and mathematical terminology, as well as platforms for educators to continually refine their English language skills.

Stakeholders at the Sarawak State Education Department (JPN) level can contribute by conducting regular monitoring and providing ongoing guidance for schools implementing DLP, particularly in the Simunjan district. This may involve appointing dedicated desk officers or lead coaches for DLP who can deliver direct support at the school level, assist teachers in resolving practical challenges, and offer constructive feedback. Additionally, JPN Sarawak could establish DLP Professional Learning Communities (PLCs) to encourage the formation

and strengthening of PLCs specifically for DLP educators in each district. These PLCs could serve as platforms for teachers to exchange best practices, teaching strategies, and collaboratively address challenges, thereby cultivating a sense of community and support.

The findings of this study bear significant implications for DLP implementation in Malaysia, especially in rural areas such as Simunjan. The moderate level of teacher readiness indicates that intensified efforts are requisite to empower educators in terms of English language proficiency and confidence in delivering Science and Mathematics subjects in English. Neglecting to address these challenges could compromise the efficacy of DLP and ultimately affect students' academic performance in these pivotal subjects. Conversely, effective interventions could elevate the quality of teaching and learning, resulting in students who are more proficient in both languages, aligned with the nation's educational aspirations.

This study does present several limitations. Firstly, it solely involved Science and Mathematics teachers in secondary schools within the Simunjan district, Sarawak. Consequently, the findings may not be generalizable to other districts or to primary school levels. Secondly, this study employed a quantitative approach, which may not encapsulate the nuanced experiences and perceptions of teachers in depth.

Conclusion

This study adeptly evaluated the preparedness of Science and Mathematics teachers for the implementation of the DLP in secondary schools throughout Simunjan District, Sarawak. This evaluation encompassed various dimensions, including skills, knowledge, interest, and the obstacles encountered by teachers. In summation, it can be inferred that teacher readiness resides at a moderate level. This indicates that while educators possess the essential foundation requisite for instructing these subjects in English, there remains substantial scope for ongoing enhancement and support to ensure the comprehensive success of the DLP initiative.

These findings underscore the imperative for stakeholders, such as the Ministry of Education Malaysia (MOE), State Education Department (JPN), District Education Office (PPD), and school administration, to undertake proactive measures. Such measures should encompass the fortification of targeted training and professional development programs, the provision of adequate teaching and learning resources, and the cultivation of a conducive environment that empowers teachers to implement the DLP with confidence and efficacy.

The ramifications of this study are unequivocal. Without thorough and sustained support, the implementation of DLP may not attain its maximum potential. This shortfall could adversely impact students' academic performance in Science and Mathematics, as well as their bilingual competencies. Consequently, comprehending the extent of teacher readiness constitutes a pivotal first step in devising effective intervention strategies for the future.

List of Tables

List of Shortform

No.	Singkatan	Huraian Penuh
1	DLP	Dual Language Programme
2	KPM	Kementerian Pendidikan Malaysia
3	PLC	Profesional Learning Community
4	JPN	Jabatan Pendidikan Negeri
5	PPD	Pejabat Pendidikan Daerah
6	PDP	Pendajaran dan Pembelajaran
7	MBMMBI	Memartabatkan Bahasa Malaysia Memperkukuhkan Bahasa Inggeris
8	PPPM	Pelan Pembangunan Pendidikan Malaysia
9	COVID-19	Corona Virus Decease 19
10	STEM	Science Technology Engineering and Mathematics

References

Abdullah, M. R., Hassan, N. H., & Ismail, S. (2022). The role of STEM education in national development. *Journal of Science and Technology Studies, 5*(1), 45–58.

Abdullah, N. L., Daud, N. M., & Ismail, S. A. M. (2022). The impact of Dual Language Programme (DLP) on science and mathematics teachers' motivation. *Jurnal Pendidikan Malaysia, 47*(1), 15–28.

Aziz, N. A., & Ahmad, S. (2018). Teachers' self-efficacy and challenges in implementing the Dual Language Programme (DLP). *Malaysian Journal of Learning and Instruction, 15*(2), 1–24.

Aziz, N. A., & Kaur, S. (2018). Challenges in the implementation of the Dual Language Programme (DLP) in Malaysian primary schools: Teachers' perspectives. *Malaysian Journal of Learning and Instruction, 15*(2), 65–86.

Baker, C. (2013). *Foundations of bilingual education and bilingualism* (5th ed.). Multilingual Matters.

Borg, S. (2015). Teacher development in English language teaching: An analysis of the literature. *Language Teaching, 48*(4), 557–596.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101.

Chew, C. G. B., & Ahmad, N. A. (2022). Tahap kesediaan guru terhadap pelaksanaan Dual Language Programme (DLP) di sekolah-sekolah rendah Daro, Sarawak. *Jurnal Refleksi Kepemimpinan, 4*, 31–40.

Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.

Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry & research design: Choosing among five approaches* (4th ed.). SAGE Publications.

Cummins, J. (2017). *Reflections on language and education*. Multilingual Matters.

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics, 5*(1), 1–4. https://doi.org/10.11648/j.ajtas.20160501.11

Gay, L. R., Mills, G. E., & Airasian, P. (2012). *Educational research: Competencies for analysis and applications* (10th ed.). Pearson Education.

Genesee, F., & Lindholm-Leary, K. (2010). *Dual language education*. John Benjamins Publishing Company.

Goh, P. S., & Silver, R. E. (2017). Implementation of the Dual Language Programme (DLP) in Malaysia: Teachers' perspectives and challenges. *Asia Pacific Journal of Educators and Education, 32*(2), 101–115.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate data analysis* (8th ed.). Cengage Learning.

Ibrahim, H. H., & Mohamed, S. (2021). Kompetensi guru-guru bukan opsyen dalam pengajaran dan pembelajaran pendidikan prasekolah. *Jurnal Dunia Pendidikan, 3*(2), 377–385.

Hamid, H., & Jamaludin, K. (2024). Level of teachers' readiness towards the implementation of Dual Language Programme in Mathematics subjects in inland schools Sarawak. *International Journal of Academic Research in Progressive Education and Development, 13*(1), 1–12. https://hrmars.com/papers_submitted/19267

Hashim, H., Yunus, M. M., & Embi, M. A. (2020). Preparing teachers for Dual Language Programme (DLP): A case study in Malaysia. *Journal of Education and E-Learning Research, 7*(3), 256–265.

Othman, J., Saat, R. M., Senom, F., & Adli, D. S. H. (2020). Dual Language Programme: Teachers' beliefs and practices in teaching science through English. *Journal of Nusantara Studies, 5*(1), 255–269.

Kementerian Pendidikan Malaysia. (2016). *Garis panduan pelaksanaan Dual Language Programme (DLP)*. Bahagian Pembangunan Kurikulum.

Lee, L. H., & Tan, K. H. (2019). Science and mathematics teachers' readiness for bilingual education: A survey in Penang, Malaysia. *Journal of Science and Mathematics Education in Southeast Asia, 42*(1), 67–86.

Lim, H. M., Sidhu, G. K., & Chan, Y. F. (2020). Teacher preparedness for the implementation of the Dual Language Programme (DLP) in Malaysia. *Journal of Asia TEFL, 17*(1), 121–140.

Lim, S. Y., & Wong, C. L. (2025). Factors influencing science and mathematics teachers' readiness for the Dual Language Programme (DLP) in Malaysian secondary schools: A nationwide study. *Educational Research Journal, 12*(1), 45–62.

Mahamod, M. Z., & Razak, N. A. (2022). Teachers' knowledge and readiness in implementing Dual Language Programme (DLP) in Selangor secondary schools. *Journal of Language Studies, 22*(4), 34–47. https://journal.um.edu.my/index.php/JLS/article/view/24015

National Education Blueprint 2013–2025. (2013). Ministry of Education Malaysia.

Pallant, J. (2020). *SPSS survival manual: A step-by-step guide to data analysis using IBM SPSS* (7th ed.). Routledge.

Rahman, A. A., & Tan, S. H. (2019). English language proficiency and global competitiveness: A Malaysian perspective. *Journal of Language and Communication, 7*(2), 112–125.

Rahman, N. A., & Devi, S. (2023). Teachers' readiness for dual language programs in Southeast Asia: A systematic review. *International Journal of Multilingualism, 20*(3), 456–478.

Sarawak Education Department. (2020). *Education statistics of Sarawak*. Sarawak Education Department.

Subramanian, R., & Jukka, T. (2024, February 24). STEM education is vital to national development: Here's how we can support it. *Asia Development Blog*. https://blogs.adb.org/blog/stem-education-vital-national-development-heres-how-we-can-support-it

Tan, M. L., Lee, W. K., & Singh, P. (2024). Adapting to bilingual education: A case study of a science teacher's experience in implementing the Dual Language Programme (DLP). *Qualitative Research in Education, 13*(2), 189–205.

Yin, R. K. (2018). *Case study research and applications* (6th ed.). SAGE Publications.

Yunus, M. M., Salehi, H., & John, D. S. (2013). English language teaching in the Malaysian science and mathematics context: Teachers' perceptions and challenges. *English Language Teaching, 6*(7), 155–163.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101.

Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.

Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry & research design: Choosing among five approaches* (4th ed.). SAGE Publications.

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics, 5*(1), 1–4. https://doi.org/10.11648/j.ajtas.20160501.11

Gay, L. R., Mills, G. E., & Airasian, P. (2012). *Educational research: Competencies for analysis and applications* (10th ed.). Pearson Education.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate data analysis* (8th ed.). Cengage Learning.

Pallant, J. (2020). *SPSS survival manual: A step-by-step guide to data analysis using IBM SPSS* (7th ed.). Routledge.

Yin, R. K. (2018). *Case study research and applications* (6th ed.). SAGE Publications.

Yunus, M. M., Salehi, H., & John, D. S. (2013). English language teaching in the Malaysian science and mathematics context: Teachers' perceptions and challenges. *English Language Teaching, 6*(7), 155–163.