

# Student Attitude and Behaviour in The Implementation of Dual Language Programme for Science Subjects in Primary Schools

Nurul Hafizhah Mohd Zulfakhar, Nurfaradilla Mohamad Nasri

Faculty of Education, National University of Malaysia

Email: p121257@siswa.ukm.edu.my, nurfaradilla@ukm.edu.my

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## Abstract

Dual Language Programme (DLP) is under the Malaysian Education Ministry's 'Memartabatkan Bahasa Malaysia, Memperkukuhkan Bahasa Inggeris' (MBMMBI) Policy. In 2016, it was implemented as a pilot program involving 300 schools in primary and secondary schools. Research on student attitudes and behavior toward science subjects in dual language programs is significant for understanding the effectiveness of such programs in promoting science learning among bilingual students. This study aimed to identify the level of attitude and behavior of DLP primary school students towards science subjects and to examine gender differences in the attitude and behavior of DLP students towards science subjects. A quantitative approach is used with a survey design. A total of 259 respondents answered this questionnaire. The respondents were year five students in the Seremban district of Negeri Sembilan. The study was analyzed using IBM SPSS Statistics 27.0 software. Descriptive analysis tests were used to examine the level of attitude and behavior of DLP students toward science subjects, and an Independent Samples t-test was used to investigate gender differences. The data showed that the minimum score for DLP students' attitudes toward science subjects was average, and the minimum score for DLP students' behavior toward science subjects was average. The findings of the t-test analysis showed no significant difference between male and female scores in the attitude and behavior constructs of students toward science subjects. All parties need to unite, contribute ideas, and work together to support the government's efforts in realizing the DLP program to produce students with various skills and competitiveness on a global level. The results are important for the stakeholders to provide intervention and improve programs to support students to undergo the program. Further research is needed to explore how different instructional approaches, curriculum designs, and contextual factors influence students' experiences and outcomes in dual language programs.

**Keywords:** Dual Language Programme (DLP), Student Attitude and Behavior, Science

## Introduction

Currently, English proficiency is highly emphasized among people in most developed countries. English has long been recognized as the language of knowledge and is one of the most widely spoken languages by humans in the world, including Malaysia. In our country,

English is generally regarded as the second language after Malay in primary and secondary schools. When Malaysia was under the leadership of Prime Minister Tun Dr. Mahathir bin Mohamad, he realized the importance of English proficiency among the people so that the people in this country would be included, especially in exploring knowledge involving Science and technology. Thus, he launched a policy in 2003 known as the Teaching and Learning of Science and Mathematics in English (PPSMI). PPSMI was implemented by the Malaysian Education Ministry in stages, starting in 2003. A pilot program was implemented for Year 1 students in primary schools, Form 1 and Form 6 for secondary schools. The full implementation of the PPSMI policy was in 2008. This policy aimed to improve English language skills as well as proficiency in Science and mathematics among students in Malaysia.

However, PPSMI lasted only briefly because some Malaysians viewed the policy negatively and opposed it. Opposition to the policy also involved politicians, national writers' associations, scientists, legal practitioners, and national literary figures. The often expressed concern was that PPSMI would threaten the use of Malay as the national language, which contradicts Article 152 of the Malaysian Constitution. PPSMI was abolished through the Cabinet Meeting decision on 8 July 2009. Therefore, PPSMI was abolished by the government in 2012, and Science and Mathematics subjects were taught again using the Malay language. At the same meeting, the government agreed to establish a new policy to replace PPSMI. Thus, the new policy called the '*Memartabatkan Bahasa Malaysia, Memperkukuhkan Bahasa Inggeris*' (MBMMBI) was introduced. This policy was created to strengthen the mastery of Malay and English among Malaysians (KPM, 2015).

In Malaysia, the Malaysian Education Ministry has formulated a long-term plan known as the Malaysia Education Development Plan (PPPM) 2013-2025 as the direction of the national education system. Based on this KPM long-term plan, the PPPM, which began in 2013 until 2025, is implemented through three main phases known as waves. To provide a deeper English-language environment, KPM has designed three waves: Wave 1 (2013-2015): Strengthen the existing system; Wave 2 (2016-2020): Introduce structural changes; and Wave 3 (2021-2025): Expand the structural changes. As stated in the PPPM, the DLP was piloted in 300 schools in 2016 and was aimed to produce students with various skills and competitiveness on a global level.

In line with the matter, the National Economic Council Meeting No. 21/2015 on 13 October 2015 approved the implementation of DLP (MoE, 2015). As a result of the meeting results, MoE implemented DLP in 2018 at the national level. The implementation of this DLP is in line with the goal of the second wave, which is to introduce changes to the existing structure. Based on the Special Circular Letter (SPI) of the Ministry of Education Malaysia Number 8 of 2018, DLP was presented to support English language skills among students in this country. Using English in Science and Mathematics subjects allows students to deepen their understanding of terms commonly used in Science and Technology (MoE, 2018). Accordingly, the purpose of DLP is also to provide opportunities for students to increase access to and explore various fields of knowledge. Apart from that, it also aims to ensure that they can compete at the world level, stimulate students' interest in continuing their studies in mathematics and Science at an international level, and strengthen their future employment opportunities. (Norhisham et al., 2018).

Determination of DLP subjects according to SPI MoE No. 8 2018 is for Science and Mathematics subjects at primary and secondary school levels. For the upper secondary level, the implementation of DLP involves science and mathematics subjects and includes the subjects of additional Science, chemistry, physics, biology, and additional mathematics.

Nevertheless, implementing DLP at the national level is optional for the school. Instead, the State Education Department (JPN), the District Education Office (PPD), and the school have the option to implement it according to the conditions set (MoE, 2018).

Based on research that has been done in previous studies, several researchers have conducted research on the implementation of DLP in schools throughout Malaysia. For example, (Bryan and Aishah, 2022) conducted a study in primary schools related to the level of readiness of teachers to implement DLP in primary schools. In the same study, the researchers also identified the level of English proficiency in the DLP class for Science and Mathematics subjects. The study's findings show that the teachers' readiness in this study is still at a medium-low level. In addition, the findings of this study also show that the level of English use by teachers in PdPc DLP Science and Mathematics classes is only moderate. Findings like this are feared to impact students' understanding and ultimately cause the implementation of DLP to fail to achieve its intended objectives, as with the study of (Norhisham et al., 2018) about the readiness of primary school science teachers towards implementing DLP. The study's findings show that the teacher's readiness for skills, i.e., mastery of English and Science terms in implementing DLP, is moderate. Meanwhile, it was found that science subject teachers have a high level of readiness regarding the implementation of DLP. The results of his study also found that the level of willingness of teachers to implement DLP is moderate.

In terms of student academic achievement, (Natalie et al., 2015; Ashairi et al., 2018; Ramasamy & Marzita, 2018; Nor Hasikin, 2019) stated that this program had a positive impact that helps students in their understanding, encourages active involvement in the learning process, increases student motivation to learn, and improves understanding them as well as the achievement of good student performance in Mathematics, Science, and STEM subjects in the DLP program. However, research by Teo and Roslinda (2017) shows a moderate level of overall student performance due to a need for more skills in English and moderate teaching factors among rural students. This is further confirmed by a study by (Ashairi et al., 2017) and (Ashairi et al., 2017b). They found that the language skills and confidence of the respondents were at a moderate level, although they were aware of the importance of this program. For Ashairi et al. (2018), the confusion and uncertainty shown by the respondents when answering the questionnaire proves that their level of readiness and self-confidence is at a moderate level, and the lack of skills in the English language causes them to feel less confident.

Ismail and Yusoff (2020) have studied DLP's effectiveness in mathematics students' knowledge, attitude, and behavior in a primary school in the State of Selangor. The study results show that the respondents' performance in the Mathematics subject is at a level that shows mastery, based on the percentage of written test scores for the knowledge items that have been tested. The findings also show that the mean value and standard deviation show that students who do not use English have a higher performance than those who use English in Mathematics subjects. Researchers believe this program is a very positive initiative in the government's efforts to produce students proficient in bilingualism, have substantial human capital, and have high competitiveness in language proficiency. They also think that excellent English language skills among students are a significant factor in the effort to change the country's education system, which can increase their employment opportunities and allow them to maximize their career potential, not only in the country but also in the global job market. Findings from a study conducted by Mohammed & Mckenny (2017) found that bilingual education promotes interaction between students and supports them in

participating in the learning process better, which ultimately helps improve their achievement. In addition, teachers who can implement bilingual education will also have the potential to improve students' cognitive skills, and the involvement of parents can also provide support and encouragement to students to work hard in their learning and achieve better academic performance.

### **Purpose of The Study**

This study aims to examine the extent of the influence of DLP implementation on students' attitudes and behavior toward Science subjects in primary schools. Year 5 students were selected to evaluate their attitudes and behavior toward Science subjects.

### **Research Objective**

The objectives of this study are

1. Identifying DLP's effectiveness on primary school students' attitudes toward Science subjects.
2. Identifying the effectiveness of DLP on the behavior of primary school students for Science subjects.
3. To study gender differences in the attitude and behavior of DLP students towards Science subjects.

### **Research Questions**

1. What is the level of attitude of DLP students towards Science subjects?
2. What is the level of behavior of DLP students towards Science subjects?
3. Is there a gender difference in the attitude level of DLP students towards Science subjects?
4. Is there a gender difference in the level of behavior of DLP students towards Science subjects?

For the third and fourth objectives, two hypotheses have been set to get an overview of the level of attitude and behavior of DLP students towards science subjects based on gender differences. The null hypothesis of the study is as follows:

Ho1 : There is no significant difference between the level of attitude of DLP students towards Science subjects based on gender.

Ho2 : There is no significant difference between the level of behavior of DLP students towards Science subjects based on gender.

### **Statement of Problem**

The DLP implementation model in Malaysia is to use 100% English in PdPC. Therefore, this situation negatively impacts school students' interests, attitudes, and behaviors when the teacher conducts the PdPC process. This situation causes students' self-confidence to be low, and they want to refrain from asking the teacher questions and refuse to interact using English during the PdPC process in class. According to (Idris et al., 2017), the main challenge for teachers in implementing DLP is dealing with students who need more competent skills in English subjects. Students need to improve in using English to understand the learning standards presented by their teachers. The study by Ashairi et al (2017b) showed that limited English language skills among students made them feel less self-confident and unconfident in speaking the language. However, the teacher's ability to use English and Malay well can improve students' cognitive skills.

Ismail and Yusof (2020) stated that bilingual learning support materials and reference books still need to be included and are challenging to find in the market. This situation causes students to need more reference materials to support their learning. The findings of the study by Suliman et al (2018) showed that students who follow the DLP program have a high level of desire to learn English but are at a moderate level in terms of self-confidence. When the teacher teaches using English, students will feel unsure whether they can follow the learning well or not. Students realize the importance of exploring various knowledge related to Science and technology in English. The results of this study also prove that students who are less proficient in English need help in being actively involved in PdPC sessions, causing them to need more confidence in their abilities.

## Methodology

### Research Design

A quantitative approach is used with a survey design to describe the attitude and behavior of DLP students toward Science subjects. The study uses a questionnaire instrument to measure primary school students' attitudes and behavior towards science subjects. The questionnaire for student attitude and behavior items contains 20 questions using a three-point Likert scale. The questionnaire process is done online. The questionnaire method was chosen because it is practical and saves time (Creswell, 2012). The questionnaire instrument was adapted from the study of Ismail Mat Hassan (2020), which contains three main parts, as shown in Table 1.

Table 1

#### *Questionnaire Instrument*

Item Section	Items
A. Demographics of respondent	1- 2
B. Student attitude items	1- 10
C. Student behavior items	1- 10
Number of items	22

The researcher used a 3-point Likert scale to measure constructs B and C, as shown in Table 2.

Table 2

#### *Item Measurement Using Likert Scale*

Parts	Likert Scale
B. Student attitude items	1: Disagree
C. Student behavior items	2: Agree
	3: Strongly agree

### Sample Study

The population of this study involved 743 year five DLP students in the Seremban district. The Sample Size Determination Table Krejcie & Morgan (1970) is the basis for determining the minimum sample that should be calculated from the population. Based on Krejcie and Morgan's Sample Size Determination Table (1970), the minimum number of samples required for the population of 743 year five DLP students is 254. The study respondents comprised 259 year 5 DLP students, exceeding the minimum suggested number. They were year five students in Seremban district, Negeri Sembilan. Simple random sampling refers to selecting a sample

from a population from an extensive list. This technique ensures that each individual has an equal opportunity in the selection process (Najib, 2003). In this study, the researcher has used a simple random sampling design. Table 3 shows the number of respondents by gender.

Table 3

*Number of respondents by gender*

Gender	Frequency( N)	Percentage (%)
Boys	89	34.4
Girls	170	65.6
Total	259	100

**Analysis Data**

Before conducting the actual study, the researcher conducted a pilot study to test the validity and reliability of the instrument used. Thirty-five respondents with characteristics similar to those of the study sample participated in this pilot study. The findings were analyzed using IBM SPSS Statistics 27.0 software to examine Cronbach's alpha reliability coefficient. The Cronbach's alpha value obtained was 0.80. According to Hair et al. (2018), a composite reliability value exceeding 0.70 but not exceeding 0.95 indicates that all survey items have high validity and reliability for the actual study. The researcher distributed the survey link as a Google Form through teachers to be filled out by students. The data from this study were descriptively analyzed using IBM SPSS Statistics 27.0 software. Respondents' scores (259 individuals) who answered the questionnaire were converted into score data and frequencies. Descriptive analysis was conducted to obtain percentage values, frequencies, minimum scores, and standard deviations for all items in constructs B and C. The level of attitude and behavior of DLP students interpreted based on the minimum score interpretation table adapted from the study by Ismail et al (2021) was utilized. Table 4 shows the interpretation of minimum scores.

Table 4

*Interpretation of Mean Score*

Stage	Min score
Low	1 – 1.67
Medium	1.68 – 2.34
High	2.35 – 3.00

**Findings**

The level of attitude of DLP students towards Science subjects. Table 5 shows the results of the overall analysis of students' attitudes towards Science subjects. Overall, the average mean score of DLP students' attitude towards science subjects is moderate ( $M = 2.32$   $SP = 0.60$ ). Based on the mean score generated, the score of item no. 7 shows the highest reading, 2.52, with a standard deviation 0.57. This shows that students feel motivated when they can help their friends solve science questions. The lowest mean value is item no. 5, which is 2.06, and a deviation value of 0.63.

Table 5

*Level of the attitude of DLP students towards Science subjects*

No.	Items	Frequency & Percentage			Mean	Standard Deviation	Interpretation
		Disagree	Agree	Strongly Agree			
1.	I like attending Science class.	43 16.6%	128 49.4%	88 34%	2.17	0.69	Medium
2.	I enjoy studying Science subjects.	14 5.5%	138 53.3%	107 41.3%	2.36	0.58	High
3.	I always do Science subject exercises.	22 8.5%	155 59.8%	82 31.7%	2.23	0.59	Medium
4.	I enjoy completing Science subject exercises	11 4.2%	133 51.4%	115 44.4%	2.40	0.57	High
5.	I constantly revise Science subjects.	44 17%	155 59.8%	60 23.2	2.06	0.63	Medium
6.	I feel happy when I can solve Science questions.	13 5%	116 44.8%	130 50.2%	2.45	0.59	High
7.	I feel happy when I can help my friends solve Science questions.	9 3.5%	107 41.3%	143 55.3%	2.52	0.57	High
8.	I am always enthusiastic during Science class.	20 7.7%	148 57.1%	91 35.1%	2.27	0.60	Medium
9.	I want to attend the Science class.	12 4.6%	117 45.2%	130 51.2%	2.46	0.59	High
10.	I always enjoy doing Science exercises.	21 8.1%	143 55.2%	95 36.7%	2.29	0.61	Medium
<b>Overall</b>					<b>2.32</b>	<b>0.60</b>	<b>Medium</b>

**The level of behavior of DLP students towards Science subjects**

Table 6 shows the results of the overall analysis of student behavior items towards Science subjects. Overall, the average mean score for student behavior is moderate, with a mean value of 2.12 and a standard deviation of 0.67. Based on the score obtained, item 6 shows the highest mean value of 2.35 with a standard deviation of 0.65. This shows that students need family support to complete Science subject assignments.

Table 6

*Level of behavior of DLP students towards Science subjects*

No	Items	Frequency & Percentage			Mean	Standard Deviation	Interpretation
		Disagree	Agree	Strongly Agree			
1.	I always participate in the Science program at school	61 23.6%	143 55.2%	55 21.2%	1.98	0.67	Medium
2.	I participated in the Science quiz program at school.	67 25.9%	123 47.5%	69 26.6%	2.01	0.73	Medium
3.	I apply science knowledge in life wisely.	45 17.4%	157 60.6%	57 22.0%	2.05	0.63	Medium
4.	I learned Science in the science and mathematics club/association at school	56 21.6%	140 54.1%	63 24.3%	2.03	0.68	Medium
5.	I consult the teacher if there is a problem with the Science subject	36 13.9%	132 51.0%	91 35.1%	2.21	0.67	Medium
6.	I consult far members if there is a problem with subject of Science.	25 9.7%	118 45.6%	116 44.8%	2.35	0.65	High
7.	I increase my knowledge about Science subjects by reading on my own	40 15.4%	139 53.7%	80 30.9%	2.15	0.66	Medium
8.	I always volunteer to help the teacher if it is related to Science subjects.	61 23.6%	131 50.6%	67 25.9%	2.02	0.70	Medium
9.	I always relate scientific knowledge to my daily life.	13 15.1%	154 59.5%	66 25.5%	2.10	0.63	Medium
10.	I distribute or paste any information	28 10.8%	129 49.8%	102 39.4%	2.29	0.65	Medium



related to Science  
to friends.

**Overall** **2.12** **0.67** **Medium**

### The level of attitude and behavior of DLP students towards Science subjects based on gender

In this study, t-test analysis was used to assess whether there was a difference in the level of attitude and behavior of DLP students towards Science subjects based on gender. Based on Table 7, the findings of the study show that there is no significant difference between the gender of male students (M= 2.29, SP = 0.34) and female students (M = 2.34, SP = 0.33) with the level of attitude of DLP students towards Science subjects,  $t(257) = -1.12$ ,  $p = 0.263$ . Therefore, the null hypothesis failed to be rejected. This shows that gender does not affect the level of attitude of DLP students towards Science subjects.

Table 7

*t-test for the mean difference in students' attitudes towards Science subjects for DLP students based on gender*

Gender	Mean	Standard Deviation	t- value	Significance
Boys	2.29	0.34	-1.11	0.263
Girls	2.34	0.33		

Likewise, the results for the mean behavior of DLP students towards science subjects are based on gender. Table 8 shows that there is no significant difference between the gender of male (M = 2.12, SP = 0.37) and female (M = 2.11, SP = 0.39) students in the aspect of the behavior of DLP students towards Science subjects,  $t(257) = 0.11$ ,  $p = 0.914$ . Based on these results, the null hypothesis failed to be rejected. This proves that there is no gender-related difference in the mean behavior of DLP students towards Science subjects.

Table 8

*t-test for the mean difference in student behavior towards Science subjects for DLP students based on gender*

Gender	Mean	Standard Deviation	t-value	Significance
Boys	2.12	0.37	0.11	0.914
Girls	2.11	0.39		

### Discussion

A survey was conducted on 259 year five students in Seremban district, Negeri Sembilan primary schools. The data collection process was done using instruments such as questionnaires. The questionnaire instrument is divided into three parts: parts A, B, and C. Part A collects the background information of the respondent. In contrast, parts B and C include questions about the attitude and behavior of the respondent, each containing ten items. All items in this research instrument have been reviewed and validated by experts before use. In general, the conclusion of the study results shows that students' attitudes toward science subjects in the DLP program are moderate. The questionnaire also found that the highest percentage of respondents feel happy when they can help their friends solve

Science questions, which is 55.3% (143 people). Students are motivated when they can help their peers solve Science questions. A positive attitude significantly influences students' cognitive, affective, and psychomotor aspects (Zanaton et al., 2006; Kamisah et al., 2007). A positive attitude causes students to like all activities related to the subject. The results from the questionnaire study for the item on the respondent's behavior towards the Science subject showed that if there is a problem related to the Science subject, the respondent will consult their family members for help or advice, with the highest percentage of 44.8% (116 people). This shows that students need strong support from family members in their learning process. Parents play a significant role in helping these DLP students learn, especially in helping them complete their assignments (Lilia et al., 2018). The results of the study based on gender differences between men and women show that there is no significant difference in the construction of attitudes and behavior of DLP students towards Science subjects. Both show a moderate level of attitude and behavior towards Science subjects.

As documented in previous studies, many programs equivalent to DLP have been implemented abroad, especially in European countries. In addition to DLP, other names are used in foreign countries for such programs, such as dual immersion programs, two-way bilingual programs, bilingual education programs, heritage language programs, and many more. Most foreign countries implementing similar programs have adopted the 50/50 and 90/10 model of using English throughout the program. This approach is considered more positive in influencing student achievement in the program because it is easier to adapt to students and does not put excessive pressure on students and the implementing group (Nor Hasikin, 2019). In Malaysia, the DLP program is conducted entirely in English on PdPc. This has hurt primary school students, especially their interests, attitudes, and behavior during the PdPc process. Students are reluctant to communicate with each other and the teacher in English while in class, and they also feel less self-confident and shy about asking the teacher (Nohrisham et al., 2018). In addition, the lack of availability of teaching aids and bilingual references becomes a challenge for students and the implementation group to implement this DLP program.

## **Conclusion**

This study examines the effect of implementing a 'dual language program' on student attitudes and behavior for primary school science subjects. At the primary school level, Science is a core subject that every student must master. Teacher skills in this subject also play an essential role, especially in this era of technology and globalization. The teachers need to be prepared with sufficient skills, including good English language skills and accurate and correct use of Science terms in English. Through the skills of these teachers, we can shape a highly competitive generation on the international stage.

Students are the leading group that the implementation of this DLP will impact. All parties, starting with the students and teachers as implementers, up to the policymakers and the community, need to unite in energy and effort, give ideas, and provide full support to help the government make this program a success. Therefore, actions must be taken to increase students' knowledge and interest in Science for DLP to be implemented successfully. Overall, this program is very positive in the government's efforts to produce students who are proficient in bilingualism, have a strong foundation of soft skills, and master the language with high competence, which is an essential element in the transformation process of the education system in this country. This will increase their employment opportunities and enable them to take advantage of career opportunities in the global job market. To realize

this change, it is essential to conduct primary research on a routine basis, and a consistent evaluation process will allow stakeholders to continue to improve this program from time to time.

## Reference

- Ashairi, S., Yusoff, M. N., & Melor, M. Y. (2017a). Dual-Language Programme in Malaysian Secondary Schools: Are You Ready? Paper presented at Seminar Serantau. Malaysia: Universiti Kebangsaan Malaysia, September.
- Ashairi, S., Yusoff, M. N., & Melor, M. Y. (2017b). Dual-language program in Malaysian secondary schools: Glancing through the students' readiness and unraveling the unheard voices. *GEMA Online Journal of Language Studies*. Volume 17(4)<https://doi.org/10.17576/gema-2017-1704-09>
- Ashairi, S., Yusoff, M. N., & Melor, M. Y. (2018). Sustaining the Implementation of Dual-Language Programmes ( DLP ) in Malaysian Secondary Schools. *Global J. Bus. Soc. Sci. Review* 7(1), 91–97
- Chew Ching Gee, Bryan; Aisyah Binti Ahmad, Nor.(2022). Tahap Kesiapan Guru Terhadap
- Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research (4th ed.)*. Boston, MA: Pearson.
- Mohammed, F. A., & Mckenny, J. (2017). A Study Of The Application Of Bilingual Education In A Kindergarten Based In Abu Dhabi. [ Master's thesis ]. The British University in Dubai
- Guncheng anak Banter . (2010). Persepsi Guru-guru sekolah Rendah Terhadap Pengajaran dan Pembelajaran Sains dan Matematik Dalam Bahasa Inggeris di Daerah Serian, Sarawak. UUM
- Hair, J.F., Sarstedt, M., Ringle, C.M. and Gudergan, S.P. (2018). *Advanced Issues in Partial Least Squares Structural Equation Modeling (PLS-SEM)*, Sage, Thousand Oaks, CA
- Idris, N., Chum, U.P., Fadzil, N. S., & Rahman, A. N. H. (2017). Kajian pelaksanaan Dual Language Programme (DLP) dan Highly Immersive Programme (HIP). Unit Penyelidikan Makro Sektor Penyelidikan dan Penilaian: KPM.
- Iksan, Z., Halim, L. , & Osman, K. (2006). Sikap Terhadap Sains dalam Kalangan Pelajar Sains di Peringkat Menengah dan Matrikulasi. *Pertanika Journal Social Science and Human*,14(2), 131-147.
- Devi, K. (2016). *Penerimaan Guru Sains Terhadap Pelaksanaan Kemahiran Berfikir Aras Tinggi (KBAT) di Sekolah Rendah*. Universiti Pendidikan Sultan Idris.
- Kamisah, O., Zanaton, H. I., & Lilia, H. (2007). Sikap terhadap sains dan sikap saintifik di kalangan pelajar sains. *Jurnal Pendidikan*, 32, 39-60
- Krejcie, R.V., & Morgan, D.W., (1970). Determining Sample Size for Research Activities. *Educational and Psychological Measurement*.
- Hasan, M. I., & Daud, M. Y. (2020). Keberkesanan Dual Language Program (DLP) terhadap pengetahuan, sikap dan tingkah laku pelajar matematik. *Jurnal Dunia Pendidikan*, 2(1), 31-39.
- Ministry of Education. (2015). Surat Pekeliling Ikhtisas Kementerian Pendidikan Malaysia Bilangan 8 Tahun 2018: Garis Panduan Pelaksanaan Dual Language Programme (DLP). Kementerian Pendidikan Malaysia.
- Ministry of Education. (2018). Laporan tahunan 2018 : Pelan Pembangunan Pendidikan Malaysia 2013-2025.
- Najib, M. A. G. (2003). *Reka bentuk tinjauan soal selidik pendidikan*. Universiti Teknologi Malaysia.

- Natalie, A. T., Sam, B., Mark, E., Armando, M.-C., & Jacqueline, C. (2015). The Effects Of Spanish English Dual Language Immersion On Student Achievement In Science And Mathematics. *EJournal of Education Policy*, 67(6), 1–21.
- Noorzelianna, I., Chum, U.P., Nor, S. F., & Nuzul, H. A. R. (2017). Kajian pelaksanaan Dual Language Programme (DLP) dan Highly Immersive Programme (HIP). Unit Penyelidikan Makro Sektor Penyelidikan dan Penilaian, KPM.
- Noorzelianna, I., Chum, U. P., Nor, S. F., & Nuzul, H. A. R. (2017). *Kajian pelaksanaan Dual Language Programme (DLP) dan Highly Immersive Programme (HIP)*. Unit Penyelidikan Makro Sektor Penyelidikan dan Penilaian, KPM.
- Hasikin, N. H. (2019). Pencapaian Dalam Pelaksanaan Dual Language Programme (DLP) Dalam Pengajaran Dan Pembelajaran Matematik. *Prosiding PASAK 4*, 92–101. [https://conference.uis.edu.my/pasak4/images/kk/116-KK\\_SISIPAN\\_NORHASIKIN\\_ETAL.pdf](https://conference.uis.edu.my/pasak4/images/kk/116-KK_SISIPAN_NORHASIKIN_ETAL.pdf)
- Norhisham, S., Norazilawati, A., & Noraini, M. N. (2018). Kesiediaan Guru Sains Sekolah Rendah Terhadap Pelaksanaan Dual Language Programme (DLP). *Jurnal Pendidikan Sains & Matematik Malaysia*, 8(1), 34–45.
- Ramasamy, R., & Marzita, P. (2018). Bar Model Method for Higher Order Thinking Skills Questions in Mathematics for Dual Language Program Pupils Bar Model Method for Higher Order Thinking Skills Questions in Mathematics for Dual Language Program Pupils. *International Journal Of Academic Research In Business & Social Sciences*, 8(9), 1456–1462. <https://doi.org/10.6007/IJARBS/v8-i9/4855>.
- Suliman, A., Nor, M. Y. M., & Yunus, M. M. (2018). Dual-language Programme (DLP) students' level of enthusiasm and confidence: A preliminary study. *Journal of Teaching & Learning English in Multicultural Contexts* 2(1), 35–44.
- Tan, M. (2011). Mathematics and Science teachers' beliefs and practices regarding the teaching of language in content learning. *Language Teaching Research*, 15(3), 325–342.
- Teo, W. L., & Roslinda, R. (2017). Rural School Student's Perception About Learning Mathematics In English Research. *Journal Of Applied Sciences*, pp. 148–156.
- Yunus, M. M., & Sukri, A. S. I. (2017). Using English in teaching Mathematics and Science: The PPSMI Policy vis-à-vis The DLP. *Advances in Language and Literary Studies*. 8. 133