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Gleaning into Students' Perspectives in Learning Science and Mathematics Using the English Language

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Abstract

Even before the call of Fourth Industrial Revolution (4IR), the Ministry of Education Malaysia has realised the needs for Science and Mathematics to be taught in English. Indubitably, learning Science and Mathematics via the English language may pose some trials and obstacles to the students. Thus, this study aims to identify the students' language capabilities and attitudes towards learning Science and Mathematics in English and the difference in the constructs between the students. In addition, it also discovers challenges in learning the subjects using the English language. 195 form two and form three students participated in this study. This study employed five-point Likert scale questionnaire and interview as the research instruments. Based on the findings, the respondents were found to be positive in their language capabilities and attitudes to learn both subjects in English. The t-test results also revealed the findings further. In greater details, the interview sessions unravelled hindrances faced by the participants. To sum up, the aim to valorise the standard of English among the students via the learning of Science and Mathematics is highly propitious. Hence, more support and assistance should be given to the students to ease their learning process.

Keywords: English language; Education; Readiness; Confidence; Science and mathematics learning.

1. Introduction

In the era of globalisation, the knowledge of Science and Mathematics is crucially in demand. The focus has been emphasised to nurture the interest in Science, Technology, Engineering and Mathematics (STEM) field. The education system has revamped their curriculum to be in line with the rapid growth of STEM. As of now, it has become more promising since the world is moving towards the Fourth Industrial Revolution (4IR) 4.0 that is often understood as the application of the generic concept of cyber physical systems (Waris *et al.*, 2018). As argued by Collier *et al.* (2016), the centrality of science, technology, engineering and mathematics achievement to the future growth and development of the economy has been broadly acknowledged. In fact, localising into the Malaysian context, Nyet *et al.* (2016) contended that the demand for a science, technology, engineering and mathematics driven workforce in Malaysia has become a burgeoning need as the economy has evolved from a production-based economy to knowledge-based economy. Hence, the association between STEM education and the country's growth is undeniably indispensable.

Similarly, we cannot deny the fact that the knowledge of English is significant in this era. English plays the role as the language to unite people from different regions and countries with one common means of communication. Thirusanku and Yunus (2014) affirmed that in recent years, the English language has been viewed as an asset to achieve development and to acquire knowledge. On top of that, Waterworth (2016) put forward that English forms a compulsory part of the core of the curriculum in both primary and secondary schools. English is perceived to be the language that can be used across cultures and nations, presumed to be the global language understood and used by a big number of people across the globe. Soler *et al.* (2018) claimed that the status of English has been a subject of intense debate among applied linguists and political economists because of its economic and political implications. This is further reinforced by Turhan and Kirkgoz (2018), the excessive use of English can be listed under some categories such as economic developments, scientific improvements, the growth of communication tools and the desire for being more advanced in technology. Thus, the needs to use and master the English language is inevitable as the result of its potential influence.

The practice of integrating Science and Mathematics teaching and learning in other languages besides the national language is commonly executed. This is associated to the concept of Content and Language Integrated Learning (CLIL), as elucidated by Marsh (2002), an additional language is used as a medium in teaching and learning non-language content. CLIL is an educational approach employing an additional language as the means of instruction in teaching non-language subjects to students in the mainstream education Coyle *et al.* (2010); Dalton-Puffer *et al.* (2010). This approach is seen as the avenue for the learners to fully utilise the target language in their

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lives particularly for the disadvantaged group of learners pertaining to the exposure and chances to immerse with the language. Similarly, it benefits the teachers as well in the aspect of nurturing language proficiency and competency.

Teaching and learning Science and Mathematics in English is practised in several countries around the globe. As contended by Dearden (2014), English as a medium of instruction is becoming a global phenomenon as it is being adapted by all levels of schools around the world. Irrefutably, it is implemented in countries with English as a second or even foreign language. Kershaw (2018) affirmed that many Mathematics expressions are very similar in Swedish making it easy for Swedish students to comprehend Mathematics vocabulary in the English context. The African region has also revealed that the subjects are taught in English via studies by Mahlasela (2017); Mthiyane (2016) Probyn (2015); Mokiwa and Msila (2013). Furthermore, it is also applicable in Poland as denoted by Otwinowska and Foryś (2015) who studied 140 Polish students learning these two subjects in English.

In tandem, this practise is also inevitable in the Asian region. In Thailand for instance, the demand for English has been increasing rapidly in the last ten years because of the globalization that influences the economy (Tachaiyaphum and Sukying, 2017). To further support this practise, Hu and Gao (2018) disclosed that many Hong Kong secondary schools use English as the medium of instruction for the teaching and learning of science-related subjects. In addition, Vizconde (2006) believed that as a second language in the Philippines, English takes the central role of bridging knowledge and skills in Mathematics and Science to learner competency in these areas. Hasanuddin (2017) also confirmed that teachers of Science and Mathematics have already used English as a medium of classroom interaction in the teaching and learning process in Indonesia. The trend of teaching and learning Science and Mathematics has also affected Malaysia and due to that, this study comes in purpose. This study is outlined by the following objectives:

1. To identify students' language capabilities in learning Science and Mathematics in English
2. To identify students' attitudes towards learning Science and Mathematics in English
3. To determine the difference in students' language capabilities based on class
4. To determine the difference in students' attitudes based on class
5. To discover the challenges faced in learning Science and Mathematics in English

2. Literature Review

One has to acknowledge the role of language in the learning of Science and Mathematics when they are integrated via CLIL. This is in line with Hand *et al.* (2016), science cannot exist without some form of language, describing that it is difficult to explain old or construct new science discovery without language. Language serves as the avenue for understanding the concept taught in the content subjects. As posed by Ambarini *et al.* (2018), learners gain knowledge of the curriculum subject while simultaneously learning and using the foreign language that is English. This indicates that learners will develop their language skills while at the same time engage with the content lessons. However, it poses challenges when the learners are not armed with the expected language skills in learning the content subject. As affirmed by Domingo (2016), a certain mastery of the English language has to precede the understanding of the subject. On top of that Racca and Lasaten (2016), argued that students need to be proficient in English for a better grasp of knowledge in Technology, Science and Mathematics. The mastery of the target language seems to be prevalent since it functions as the crucial element in the learning of Science and Mathematics in English.

In discussing the role of language in learning Science and Mathematics, it is imperative to note the four language skills involved. Additionally, we have to acknowledge the role of grammar and vocabulary skills in strengthening the linguistic repertoire of the learners. All of these language skills play a pivotal role in assisting the students' learning process. Racca and Lasaten (2016) described students with high English language proficiency tend to perform well in Science, Mathematics and English subjects. Similar to learning English, writing and speaking skills are deemed essential as it involves students to produce outcomes based on their capabilities as a means to test their understanding. Indubitably, receptive skills (listening and reading) are also important as defined by Ministry of Education (2015), language proficiency involves both comprehension and production which come together in interaction although comprehension abilities tend to precede and exceed productive abilities. To illustrate further, English proficiency is important when learning Mathematics in English thus the inability to comprehend instruction can create confusion on the content (Teo and Rosli, 2017). In addition, is a child feels that he cannot cope in terms of language, he is much less likely to grasp the content dimension of CLIL classes (Otwinowska and Foryś, 2015).

Speaking skill is regarded as the most difficult skill to acquire in language learning as it requires quick production and takes a great deal of time and effort in mastering it (Anderson, 2015); (Metruk, 2018). As a productive skill, learners need to master this skill in order for them the express their understandings and uncertainties on the lesson learnt. Similarly, this reiterates the needs to master writing skill. Students would have to write and respond to questions posed to indicate their engagement with the lessons. Mifsud and Farrugia (2016) ascertained that poor performance in Mathematics was a result of lacking in English understanding and this was due to difficulty in understanding and translating to the mathematical language. Should the students be unable to produce their understanding in the spoken and written form, this may defeat the purpose of learning the subjects in English. They need both skills as they would deal a lot with using these skills in their learning process. Having said that, reading and listening skills should also be mastered by students as these two also contribute to their learning process. This is even mentioned by Riccomini *et al.* (2015), in which mathematical proficiency includes the ability to communicate and reason through written and spoken language.

Vocabulary and grammar skills also play a major role in the students' learning process. As enlightened by Lou (2014), one can master the grammar of the target language in the limited time while one cannot grasp the vast

vocabulary of one's native or a foreign language. In addition, Riccomini *et al.* (2015) affirmed that vocabulary understanding is a major contributor to overall comprehension in many content areas, including Mathematics. Furthermore, they ascertained that students' mathematical vocabulary learning is a very important part of language development and ultimately mathematical proficiency. Students needs to have a wide range of vocabularies especially in learning Science as the terminologies are more technical as compared to learning Mathematics. The words and terminologies used in Science and Mathematics usually differ from what is commonly uttered in daily conversation. The academic English vocabulary pertaining to Science is highly abstract and decontextualized. In nature, students' cognitive abilities play a major role in the successful acquisition of a science language in English (Kershaw, 2018). As for grammar skill, students should have been armed with the basic grammar skill as it is nurtured and developed since they start learning the target language. The significance of grammar mastery in indispensable as it is related to the language learning on the whole. Celce-Murcia (1991) believed that grammar is a tool or resource to be used in the comprehension and creation of oral and written discourse rather than something to be learned as an end in itself. Hence, it implies the connection between all language skills affecting one and another as well as contributing to the learning process of the students.

In a study conducted by Kim and Yoon (2018) in Korea, they compared between the English-medium instruction and Korean-medium instruction students in the learning of Science and engineering subjects. It was found that Korean-medium instruction students showed higher level of satisfaction and performed better in class than their counterparts. In further details, majority of the respondents judged their English ability to be in the lowest, basic or intermediate levels. To reaffirm, English Placement Test administered categorised 77% of them to be in the low-advanced or advanced level, as opposed to their own self-evaluation results. On another instance, Pablo and Jimenez (2018) who studied the affective factor and its relation to language attainment among CLIL students in Spain, revealed that CLIL primary education students had lower effect on receptive skills (listening and reading) as compared to the productive skills (speaking and writing). Moreover, the study asserted that the confluence of motivational variables affects the language attainment and motivation plays an essential function in the CLIL context.

Situating the Indonesian context, Manafe (2018) attempted to discover the students' progress in learning Mathematics via the English language. By embedding pre-test and post-test as well as focused group interview, the study disclosed that students were progressing better in their content subject as compared to the language proficiency development. It was also found from the interview session that students' failure to progress in both subjects was due to the incompetent English mastery which then led to the rise in anxiety level to accomplish the test. Localizing to the state of Malaysia, Zanzali and Mohamad (2010) in their study involving 149 students in a rural area found that students used the English language moderately in their learning process. Then, they also acknowledged that students had problems in understanding the questions leading them to reread the questions for a few times as only 12% claimed to be competent in English. It was also affirmed that students hardly understood the Mathematics lesson in English due to language incompetency.

In 2017, Teo and Rosli investigated the students' perceptions in learning Mathematics using English. With 120 students from the rural area selected as the respondents, the study revealed that only 4 respondents claimed that they understood the lessons taught in English. The number of respondents agreeing remained the same when asked if they could cope and keep up with the lessons effectively as well as if they could memorise the formula and terminologies effectively. In addition, between 56% to 68% respondents admitted that they could not grasp the English basic, write and speak well in English. Similarly, Suliman *et al.* (2017) studied the students' perceptions of learning Science and Mathematics in English among 145 students. By investigating the students' readiness and confidence level, it was elucidated that language mastery serves as a major trial for the students in their learning process. In greater details, the study revealed that less than half of the respondents agreed they master the foundation in English. Reiterating Teo and Rosli (2017), the speaking and writing skills seemed to be prevalent issue in this study. All these studies have implied that language proficiency may impede the students' learning process if it is not enhanced and nurtured beforehand.

In another point of view, attitude is another critical element to consider in the learning of content subjects using another language, different from the mother tongue. Papaja (2012) defined attitude as a set of beliefs developed in a due course of time in a given sociocultural setting. To accentuate, Rice *et al.* (2013) revealed that students generally have more negative attitudes toward math and science as compared to other academic areas. This seems to be alarming as students should possess positive attitudes in their learning process, regardless of the difficulties faced. Knowing these two subjects are very technical and challenging at the same time, it entails for supports and provisions which will assist students in their learning process. Students should be rendered motivation and aid to boost their confidence level which makes them comfortable with the learning process. Marsh (2000) cited in Lasagabaster and Sierra (2009) highlighted that CLIL programmes can nurture a feel good attitude among students as the higher proficiency level achieved may have a positive effect on their desire to learn and develop their language competence.

In addition, motivation somehow influences one's attitude in the learning process. According to Papaja (2012), attitude is strongly linked to motivation which can be defined as the driving force in any situation. For instance, when students are actively engaged in learning photosynthesis process via the English language, they would develop and enhance their motivation towards learning the content subject when they feel positive about the learning. As for the content subject which is delivered in English, this may pose linguistic benefits to the students. This initially leads to the positive attitude possessed by the students in their learning process. However, positive attitude is deemed necessary as affirmed by Sunyoung (2017), fewer students are choosing STEM due to the decline of students'

interest in Mathematics and Science as well as the increase in negative attitudes towards learning. This clearly demonstrates how attitude influences motivation in the learning process. One element to consider is the importance of future in influencing motivation and attitude. How students perceive the needs of learning may indirectly affect their attitude. This is concurrent to Pramila *et al.* (2018) stating that students' future ambition and their highest education goal motivate them to study hard and ultimately opens up to better career prospects.

Racca and Lasaten (2016) conducted a study involving 216 students in Philippines with the aim to determine the relationship between English language proficiency and the academic performance. It was disclosed that students' academic performance in Science subject has significantly been impacted by their English language proficiency. Similarly, they ascertained that the trend was also reflected in Mathematics subject. It was concluded that the more proficient the student, the better they perform in the respective subjects. Rice *et al.* (2013) reported that students who perceived greater social support for Mathematics and Science from parents, teachers and friends indicated better attitudes and had higher perceptions on their abilities in Mathematics and Science. Additionally, the study which was undertaken in the United States also disclosed that students receiving supports in learning Mathematics and Science had more positive attitudes and higher sense of competence in the subjects.

In another instance, Otwinowska and Foryś (2015) studied 140 Polish students on their attitudes in learning Science and Mathematics in English revealed that students felt both positive and negative about the learning process. However, the negativity seemed to be more prevailing. To accentuate, more than half of the respondents claimed that the challenge stemmed from dealing with the English mastery, specifically in relation to remembering vocabularies. Other studies Vizconde (2006); Lasagabaster and Sierra (2009); Papaja (2012); Winter *et al.* (2017) have also revealed the influence of attitude in the CLIL teaching and learning process. It was generally assumed that these studies have indicated positive outcomes in relation to the integrating content and language learning. In fact, Papaja (2012) believed that attitude is one of the central elements along with motivation and language aptitude in determining success in learning subjects through another language. In encapsulation, language competency and proficiency as well as attitudes towards the learning process are essential to be studied based on the literature.

3. Methodology

This descriptive study is quantitative in nature. For the purpose of gathering data to answer the research questions posed, questionnaire and semi-structured interview were employed. The questionnaire is a five-point Likert-scale survey adapted and adopted from Ishak and Mohamed (2010). The questionnaire consists of three sections, demographic profile of the respondents, students' language capabilities and finally students' attitudes constructs. Demographic profile of the respondents inquires the respondents to state their class, gender, ethnicity and English grade in the national examination. The students' language capabilities construct has seven items whereas students' attitudes construct consists of eight items. In total, there are fifteen items in the questionnaire.

As for the interview questions, participants were asked three questions. These questions would be able to capture the respondents' opinions and then support the findings of the questionnaire. The questions posed are as followed:

1. Why do you think the subjects should be learnt in English?
2. What are among the challenges you face in learning those subjects in English?
3. Why do you want to learn Science and Mathematics in English?

There were 195 respondents of this study selected from one highly prestigious residential school in the east of Malaysia. They were form three and form two students, aged 14 and 15 years old, who have learnt Science and Mathematics in English since they began their secondary education. The respondents were selected based on purposive sampling technique. On the other hand, four students were chosen to be interviewed by the researcher. As for the data collection, the researcher distributed the questionnaires to the respondents and explained the requirements needed by the researcher. Then, the seven participants were called for the interview session.

The instruments were validated and reliability test was also conducted to ensure that the instrument is valid and reliable. Amendments were made to better the instrument. On top of that, some items were omitted to ensure the reliability of the instrument. The Alpha Cronbach value obtained was 0.78, which was considered to be reliable. The final version of the questionnaire only consists of fifteen items in total. The findings were later analysed using statistical software in order to generate descriptive statistics involving frequency, percentage and mean. Inferential statistics was also employed to determine the differences between variables via T-test. For the purpose of descriptive statistics, the mean score for each item was classified based on five categories as depicted in the following table. On the other hand, responses from the interview questions were analysed using content analysis approach. This would mean to support the earlier findings from the questionnaire. The findings will then be discussed in the following section.

Table-1. Classification of Mean Score

Mean Score	Classification
1.00 – 1.80	Low
1.81 – 2.60	Moderately Low
2.61 – 3.40	Moderate
3.41 – 4.20	Moderately High
4.21 – 5.00	High

Source: (Baba, 1999)

4. Findings

4.1. Demographic Profile of the Respondents

As mentioned earlier, there were 195 respondents in this study. The demographic profile is presented in the following table.

Table-2. Demographic Profile of the Respondents

Form	**Two** **Three**	**46.7%** **53.3%**
Gender	Male Female	35.9% 64.1%
Ethnicity	Malay Iban Bidayuh Others	48.2% 17.9% 25.1% 8.7%
English Grade	A B C	57.7% 36.1% 6.2%

From the table, majority of the respondents were form three students, female, Malay ethnicity and scored A in their national examination.

4.2. Respondents' Language Capabilities

Table 3 depicts the items concerning the respondents' language capabilities. As noted earlier, there are seven items related to this construct and each item will be interpreted based on the mean score generated.

Table-3. Respondents' Language Capabilities

No.	Item	Mean Score	Interpretation
1	I can master the English basic	3.90	Moderately High
2	I can read in English	4.24	High
3	I can write in English	3.87	Moderately High
4	I can understand the information in English	3.90	Moderately High
5	I can communicate in English	3.56	Moderately High
6	I can understand the textbook, notes or reference books in English	4.16	Moderately High
7	I can understand the exam instructions in English	4.09	Moderately High
TOTAL MEAN SCORE		**3.96**	**MODERATELY HIGH**

As illustrated in Table 3, the highest scoring mean came from item (2) 'I can read in English'. with 4.24 mean score. In greater details, about 92% respondents agreed to this item. This implies that the respondents in this study were very confident with their reading skill as compared to the other language skills. The respondents' capabilities in comprehending textbooks, exam instructions as well as information in the English language were prevalent as these three items were ranked second, third and fourth in terms of the mean score, with 4.16, 4.09 and 3.90 respectively. In regards to item (1) 'I can master the English basic' which scored 3.90, about 71% respondents admitted that they were. The two least scoring items which deal with the productive skills, 'I can write in English' and 'I can communicate in English' scored 3.87 and 3.56 respectively. To note, about 70% respondents agreed to item (3) whereas only 53% agreed to item (5). This implies that speaking skill is the least skill in which the respondents felt comfortable with. Overall, the total mean score for this construct is 3.96, which is considered to be moderately high.

4.3. Respondents' Attitudes Towards Learning Science and Mathematics in English

Table 4 depicts the items concerning the respondents' attitudes in learning Science and Mathematics in English. As described earlier, there are eight items related to this construct and each item will be interpreted based on the mean score generated.

Table-4. Respondents' Attitudes towards Learning Science and Mathematics in English

No.	Item	Mean Score	Interpretation
1	I will answer exam questions in English if I am given the choice	3.57	Moderately High
2	I try to answer the oral questions given by the teacher in English	3.96	Moderately High
3	I believe Science/Mathematics in English is needed for my career in future	4.59	High
4	I hope teacher can teach Science/Mathematics in English and Bahasa Malaysia	4.43	High
5	I always check my English pronunciation to increase my mastery	3.92	Moderately High
6	I like to communicate in English with my teachers and friends	3.31	Moderate
7	I like to read books or novels in English	3.78	Moderately High
8	I believe learning Science/Mathematics in English is easy	3.58	Moderately High
Total mean score		3.89	Moderately High

From the above table, respondents' overall attitudes were found to be moderately high, with the total mean score of 3.89. Respondents highest scoring item was found to be item (3) 'I believe Science/Mathematics in English is needed for my career in future', with 4.59. In addition, about 93% respondents agreed to this item. This is then followed by item (4) 'I hope teachers can teach Science/Mathematics in English and Bahasa Malaysia', with 4.43 mean score. This is surprising as it indicates underlying hope from the respondents in this context. In fact, only 4.6% respondents disagreed to this item. Even though item (2) 'I try to answer the oral questions given by the teacher in English' scored 3.96 and ranked third, another item which almost resembled item (2) denoted the opposite. Item (6) 'I like to communicate in English with my teachers and friends' had the lowest scoring mean, with 3.31. As this item replicated the lowest scoring item in the earlier construct, this serves to validate that finding. Other items like item (5) and (7) serve to cross check the previous items in language capabilities construct. On top of that, item (1) 'I will answer exam questions in English if I am given the choice' had about 53% agreement on this item. Finally, despite the fact that respondents claimed Science/Mathematics in English is needed for the future, only 56% respondents agreed that the learning process is easy as indicated by item (8), with 3.58 mean score. Hence, this proposes that respondents perceives the idea is appealing in general but not in practical.

4.4. Difference in Students' Language Capabilities and Attitudes Based on Class

Table 5 and 6 presents the T-test result in comparing the difference in students' language capabilities based on class as well as students' attitudes towards learning Science and Mathematics in English.

Table-5. T-test Result on Students' Language Capabilities between Form Two and Form Three Students

Scale	Class	N	Mean	Std. Deviation	t-Value	Sig.
Language Skills	Form Two	91	4.011	.556	1.198	.233
	Form Three	104	3.918	.532		

An independent samples t-test was conducted to compare the students' language capabilities between form two and form three students. It was found that there was no significant difference in the students' language capabilities between form two students (mean=4.011, s.d=.556) and form three students (mean=3.918, s.d=.532); (t=1.198, p=.233). However, form two students were found to be more positive than form three. Perhaps, form two students were still new in learning both subjects in English and thereby more enthusiastic in undergoing the journey as compared to form three students who have been undergoing it for more than two years.

Table-6. T-test Result on Students' Attitudes between Form Two and Form Three Students

Scale	Class	N	Mean	Std. Deviation	t-Value	Sig.
Attitudes	Form Two	91	3.975	.467	2.353	.020
	Form Three	104	3.820	.448		

Another independent samples t-test was conducted to compare the students' attitudes between form two and form three students. It was found that there was a significant difference in the students' language skills between form two students (mean=3.975, s.d=.467) and form three students (mean=3.820, s.d=.448); (t=2.353, p=.020). Form two students were found to be more positive in their attitudes as compared to form three students. This might be caused by the duration they have been learning the subjects in English leading to their attitudes.

4.5. Challenges in Learning Science and Mathematics in English

As indicated earlier, an interview session was conducted with seven participants to further verify the questionnaire findings. Three questions were asked in order to capture the unheard voices of the students in learning Science and Mathematics in English.

Questions 1: Why do you think the subjects should be learnt in English?

The first question serves as the opening questions to probe participants' perceptions and views in using the English language in learning the aforementioned subjects. From the interview session, it can be ascertained that the participants perceived English as a global language, used by a big number of people around the World. They believed that English is a language spoken by everyone and via learning the subjects in English, it can ease the communication aspect. Excepts like *'English can help us to communicate with others when go to other country', 'We are going to use it in future and it is easy to communicate with outsider', 'English is the official world's language and it is for communication with people in the world' and 'English is the language used worldwide and interacting with one another would be easier.* These excerpts have clearly indicated English functions as a language that unite people of different cultures and background via one means of communication. It also emphasises the role played by English to ease the communication aspect. In addition, participants have also elucidated that English is used for the sake of future, focusing on the aspect of employment. Participants claimed that *'English is important because in future there are many jobs need English', 'Since my ambition is to be a doctor, I think English is the best language to achieve my ambition', 'English is applied in our daily* lives *and many people use English in works', With English, I want to become a surgeon in future', and 'English opens door to countless advantages'.* The participants have acknowledged that English would be very useful if they were to find their dreamt career. They ascertained that English is the language that could assist them to seek employment in the field they are interested in. On top of that, some participants suggested that English makes Science and Mathematics learning more meaningful. They explained that English would benefit them in the future education and with English, the learning process would be at ease and smooth. Excerpts from the participants are *'Some Science words cannot be translated into Malay and this makes it better to study in English', 'It is difficult to study in BM and that will make it harder to understand in university, 'Technology is in English' and 'I can understand the subjects better in English'.* To simplify, participants perceived using English in the learning of Science and Mathematics would ease themselves in their daily lives and for future purpose.

Question 2: What are among the challenges you face in learning those subjects in English?

The second question serves as the fifth research question of this study. It is very evident to discover what kind of challenges faced by the participants in learning Science and Mathematics via English. From the interview sessions, it can be concluded that there was one major challenge confronting the participants in their learning process. Language seems to be a big hurdle that may impede participants' learning process. Participants have revealed that they had major issues with vocabularies and understanding. This is demonstrated via their responses such as *'I don't understand new words', 'I am confused with the spelling and hard to memorise it', 'There are some words that I don't really understand', 'We are introduced to new words we are not familiar with', 'I find difficult to translate the words we don't know in English', 'Some new words that I never knew about before', 'I don't understand the meaning of the words' and 'I can't remember the meaning'.* This might be related to item (4), (6) and (7) in the language capabilities construct. Ironically, these three items recorded to be among the highest scoring mean and yet, the interview session revealed that vocabulary and understanding issue serve as the major hindrance impeding their learning process. Perhaps, these four participants were among those who chose disagree for these items. The utmost importance to discuss is how language mastery contributes to be the major challenge in the learning of Science and Mathematics. This shall be discussed further in the following section.

Question 3: Why do you want to learn Science and Mathematics in English?

The final question may somehow resemble the first question of the interview session. However, it differs in the sense that it drives participants to respond based on their own experience, instead of using general opinions. The participants have responded that *'I am used to English since I learnt from primary one till now', 'I am fonder of English as I was raised in an English speaking environment', 'I am used to English and I have better understanding in English', 'I want to improve my English and it is easier to find work', 'The explanation in English is more simple and direct', 'English will make me confident to communicate to people' and 'English is for my future.* Though the responses replicate some of the answers in the first question, it is irrefutable that some participants have been well-versed with learning the subjects in English due to their upbringing or it has even become a practise to them. Furthermore, it was clarified that participants viewed English as beneficial to their personal lives. This asserts that though participants might encounter some challenges in their learning process, it does not hamper their intention to learn upon realising the benefits gained.

5. Discussions and Conclusion

The findings have revealed that although respondents' language capabilities and attitudes were found to be moderately high, there are some items which need to be discussed further for the betterment of the learning process. In assessing respondents' language capabilities, the highest scoring mean was found from the reading skill. This indicates that the respondents were very comfortable with their reading skill as compared to other language skills. This seems to defeat the finding from Pablo and Jimenez (2018) laiming that CLIL primary education students had lower effect on receptive skills (listening and reading) as compared to the productive skills (speaking and writing). On another point of view, this finding is in line to what Suliman *et al.* (2017) discovered in their study. It describes that reading skill seems to be the most comfortable skill that the respondents acquire. This may be due to the fact that

it is a receptive skill, unlike productive skill which requires respondents to produce outcome. Ministry of Education (2015) affirmed that reading was perceived as the skill mostly required by undergraduates. Indirectly, this is the continuation from primary and secondary education level as it develops over the time. When they have developed the skill for a certain period of time, the skill will improve.

Another issue that needs to be highlighted is the respondents' speaking skill. Being one of the productive skills, only 53% admitted that they could communicate well in English. It is further affirmed by item (6) in the later construct which also happened to score the lowest mean. The finding replicated what have been discovered by Teo and Rosli (2017) as well as Suliman *et al.* (2017). This is a critical issue to be addressed. Communication and being able to converse in English is deemed crucial in the learning process, especially in this case. Students would have to dare themselves to communicate in the target language, offer their opinions and respond to the questions in class. However, item (2) in the second construct indicated that the respondents would attempt to respond orally to the questions given in English, which seems to be promising for the success of the learning process. Prior to that, students should not feel inferior to speak using the English language. As proposed by Anderson (2015); Al-Esaifer and Alshareef (2018); Metruk (2018), speaking skill is regarded as the most difficult skill to acquire in language learning as it requires quick production, encompasses individual's opinions and takes a great deal of time and effort in mastering it. Teachers should render support and assistance in encouraging students to voice out their opinions and practise continuous effort in communicating. This is also brought up by Nair (2000) in which students should be made to feel that learning to speak English could be fun. In fact, Brown and Yule (2001) contended that the ability to speak is the most essential and important feature of studying a foreign language and the success is measured by the capacity of carrying out a conversation and exchange of information in that language.

In discussing the attitudes possessed by the respondents of this study, it was found that the respondents were positive about learning Science and Mathematics in English. Even though Rice *et al.* (2013) revealed that students generally have more negative attitudes towards math and science as compared to other academic areas, it seems impractical in the context of this study. As affirmed by the responses of the first interview question, respondents understood the need to learn for the purpose of future. They contended that being the global language, it is deemed crucial for the learning process to be conducted in the English language. In addition, they denoted that English is widely used around the globe and having to learn in English will benefit them in the long run. This is even suggested by Turhan and Kirkgoz (2018) in which the reasons behind the excessive use of English can be listed under some categories such as economic developments, scientific improvements, growth of communication and desire for being more advanced in technology. On top of that, Thirusanku and Yunus (2014) also affirmed that in recent years, the English language has been viewed as an asset to achieve development and to acquire knowledge. This has led the respondents to perceive English as the language to be used as the means of teaching and learning process. However, their opinion of English was not described practically. Only 56% respondents claimed it is easy to learn the subjects in English. This indicates that the learning process is dampened due to some factors, perhaps language mastery as indicated in the interview session. It somehow resembles the findings from past studies as illustrated in Manafe (2018); Tachaiyaphum and Sukying (2017); Otwinowska and Foryś (2015); Zanzali and Mohamad (2010). Ironically, this is in line to the proverb 'easier said than done'.

Another interesting point to ponder in the attitudes construct deals with item (4). This item serves as the underlying hope by the respondents for the teaching of Science and Mathematics to be done bilingually, integrating English and the national language (Bahasa Melayu). With only 5% respondents disagreed to this item, this puts a heavy emphasis for the lessons to be taught bilingually. This supports Ambarini *et al.* (2018) believing that students will get lots of advantages by learning Mathematics bilingually. This is a critical issue that needs to be considered as it may affect the students' learning process. In the context of English as a second or foreign language, the assistance by the national language may be deemed necessary to ease the learning process. This issue is prevalent in other countries too in which English is not the official language such as in Vizconde (2006); Mahlasela (2017); Probyn (2015); Mthiyane (2016); Domingo (2016); Hasanuddin (2017); Suliman *et al.* (2017). This is a very prevalent issue occurring in countries practising the teaching of Science and Mathematics in the English language. It requires for the teachers to revise their teaching approaches and methodologies so as to employ bilingual strategy or not. As lamented by Mifsud and Farrugia (2016), bilingualism may be considered to have begun when a speaker of one language can understand some utterances in the other language. Hence, it is suggested that bilingual strategy may be employed in certain circumstances, depending on the needs.

Based on the comparison between the classes with regard to the two constructs, only respondents' attitudes towards learning denoted significant difference. The younger group of respondents were found to be more positive in their attitudes as compared to their counterparts. Presumably, this may be influenced by the duration they have been engaged in the learning process leads to this difference. As the younger group has been learning for about more than a year, they were still new and faced less challenges as compared to the other group. As Papaja (2012) claimed, attitude as a set of beliefs developed in a due course of time in a given sociocultural setting. This may have contributed to the difference in the respondents' attitudes as the duration of time prevails. Future research may delve deeper into this matter, in exploring the factors leading to the younger possessing more positive attitudes than the older group of students.

The fifth research question of this study has revealed it has a strong connection with the first construct of the questionnaire. Language serves as a major challenge in the students' learning process. Since Science and Mathematics has different terminologies and jargons as compared to what is normally used in daily conversation, the issues of vocabularies and comprehending merge. This is parallel to Riccomini *et al.* (2015) who affirmed that vocabulary understanding is a major contributor to overall comprehension in many content areas, including

mathematics. Vocabulary skill is a major skill that student has to master in learning Science and Mathematics. Should they be unable to register the sets of vocabularies in their schemata, this may dampen their understanding of the lesson. Indubitably, learning vocabulary is challenging as posed by Lou (2014), one can master the grammar of the target language in the limited time while one cannot grasp the vast vocabulary of one's native or a foreign language. This requires the students to learn new words related to Science and Mathematics daily to enrich their vocabularies. Irrefutably, as cited from Olosson (2016) in Kershaw (2018), Swedish middle school students do not usually encounter academic English vocabulary outside school unless they watch or read scientific material in English. This suggests that students should have positive attitudes in finding ways to enrich their vocabularies either via watching television, reading, surfing the Internet or any other means that may assist. Hence, it implies that students should make their move to improve themselves as this would indirectly assist their learning process.

As a conclusion, this study has revealed that though language capabilities and attitudes are found to be positive, one cannot discard the fact that some elements in language skills may pose hindrances in the learning process. Vocabulary skill seems to be a distracting factor in students' learning Science and Mathematics in English. It is acknowledged that students may find some difficulties in understanding certain words and terminologies which are less used in daily conversation. This calls for more actions to be taken to enrich students' vocabulary skill, which may ultimately contribute to the ease of learning. Similarly, students' speaking and writing skills should also be polished as these are the vital skills involved in language learning. It is not only meant for this context, but it would benefit students a lot in the future especially when they have started working.

As a positive and promising move to valorise the students' English competency and proficiency via Science and Mathematics subjects, it is imperative for the policy makers to evaluate if bilingual strategy should be employed by the teachers. Numerous contexts around the globe have contended the same issue. If bilingual strategy is meant to be utilised, then there needs to be a proper division on how much target language and national language will be used in the teaching and learning process. There are various bilingual models that can be referred to fit the circumstance. Additionally, more actions and steps need to be taken in arming students with the expected language proficiency via the formal English language class. This is prominent in the case of content and language integrated learning. Both domains need to be developed and nurtured as to avoid one domain precedes the other. To accentuate, language proficiency may also be solidified first for it to lay the foundation in the content learning.

As for future research, more constructs may be integrated to explore this issue in a wider view. Motivation factor, support and provision as well readiness are among the variables that can be studied in future. To add, more respondents from different geographical locality, types of school and state may also be involved to cast light on the issue studied. In encapsulation, one has to agree that learning Science and Mathematics via the English language may benefit students in their linguistic repertoire while at the same time allowing students to learn the content knowledge. It requires for everyone, including teachers, peers and even families to render support and provision to the students so they will be motivated in the learning. At the end of the day, the students themselves will be responsible for their own learning. Hence, students need to arm themselves with the language skills and embed it with positive attitudes to ensure the learning process triumphs.

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Appendix (Research Instrument)

A. Demographic Profile of the Respondents

form	**( ) two**	**( ) three**
gender	( ) male	( ) female
ethnicity	( ) chinese	( ) malay ( ) iban ( ) bidayuh ( ) others: _____
english grade in the national examination		( ) a ( ) b ( ) c ( ) d

B. Language Capabilities

No	**Item**	**Strongly Disagree**	**Disagree**	**Unsure**	**Agree**	**Strongly Agree**
1	I can master the English basic					
2	I can read in English					
3	I can write in English					
4	I can understand the information in English					
5	I can communicate in English					
6	I can understand the textbook, notes or reference books in English					
7	I can understand the exam instructions in English					

C. Attitudes towards Learning Science and Mathematics in English

No	Item	Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
1	I will answer exam questions in English if I am given the choice					
2	I try to answer the oral questions given by the teacher in English					
3	I believe Science/Mathematics in English is needed for my career in future					
4	I hope the teacher can teach Science/Mathematics in English and Bahasa Malaysia					
5	I always check my English pronunciation to increase my mastery					
6	I like to communicate in English with my teachers and friends					
7	I like to read books or novels in English					
8	I believe learning Science/Mathematics in English is easy					