

The Difficulties Bilingual Prep-Year Saudi Students Face to Learning Mathematics in English

Reem Abdulaziz Al Johani *

Department of Applied Linguistics, Yanbu University College, Yanbu Al Sinaiyah

Abstract

The main objective of this study was to investigate the difficulties that Saudi learners faced in learning math in English. The current study aimed at bilingual Saudi learners in foundation year who were learning English as a foreign language and at the same time learning math in English as the language of instruction or as widely known the Lingua Franca. The participants of this study were foundation year Saudi female students at Yanbu University College in Yanbu Alsinaiyah, and male participants from another university in western Saudi Arabia. To collect data, the researcher used a quantitative approach where a questionnaire was used to attain students' opinions about the difficulties, they faced in learning math in English. The findings showed that students indicated to some difficulties they faced in learning math in English. Some of the difficulties were: math terminology, English language, and solving math exams. In the end, based on the findings of the research, a series of recommendations were set.

Keywords: language mathematics, bilingual, learning math

INTRODUCTION

Currently, English language is becoming dominantly the of language education in many parts of the world. This led to the need to having a good command of the English language not only as second language learners (ESL) in English classes, but as well as in math classes. Learning math is one of the most important subjects in our schools and universities. Math has been defined as “the science of logical study of numbers, shape, arrangement, quantity, measure and many related concepts” (James, 2007, p. 23). Bilingualism is defined as “knowing” two languages (Valdez & Figueora, 1994). According to Ellerton and Clarkson (1996), many students are currently learning math in their second or third language. Saudi students learn math during their 12 years of education (K-12) in their mother tongue language, which is Arabic. However, when they enter college, as undergraduate students, they start to learn math courses in the English language that could pose many challenges. As mentioned by Yushau (2009), the trend now at many universities that the English language is being adopted as the language of instruction. It is clear that Arabic differs from English in many aspects, and the probability is high that these differences will have an impact on the teaching and learning of math.

Besides, most of the prep year students are English beginners, and they are learning math in English for the first time.

Statement of the Problem

Saudi EFL students face difficulties in learning math in English. Some of the reasons are the complex mathematical terminology, lack of proficiency in the new language of instruction, multiple usages of words, words shared between English and math that have different meanings, and that math questions are often difficult to comprehend. Understanding this problem help teachers in teaching math in English. Therefore, helping learners to overcome these difficulties.

Purpose of the Study

The purpose of this study was to investigate the difficulties that Saudi EFL learners faced in learning math in English.

Research Question

This study answered the following research question:

- What are the difficulties that bilingual prep-year Saudi students face to learning mathematics in English?

LITERATURE REVIEW

Bilingual

Researchers had defined bilingual as mastering two languages fluently. According to Grosjean and Li (2013):

The known definition of bilingual is a misconception. Most of the bilinguals acquired their other languages when they were adults, so the majority of bilinguals do not have equal fluency in their languages, many have an accent in at least one of their languages. Bilinguals use their languages for different purposes, in different domains of life, to accomplish different things. Their level of fluency in a language depends on their need for that language. Hence, many bilinguals are more fluent in a given language, and some cannot read or write one of their languages. (p.7)

Moreover, most bilinguals are facing difficulties in understanding, listening, or reading in their second or third language as Grosjean (2013, p.7) indicated. Sometimes, bilinguals may face difficulty in comprehending a question or a lesson in class because of the instructor's accent in the second language, which implies that bilinguals might lack fluency in their second or third language. According to Dawe (1983), bilingualism has been thought of as an obstruction concerning the general cognitive functions by several educationists.

Language and learning mathematics

James (2007, p. 23), refers to learning math as “the science of logical study of numbers, shape, arrangement, quantity, measure and many related concepts.” Halliday and Martin

(1993) point out “mathematical language can be defined as a specific register of English that has developed over several hundred years of the discipline of mathematics.” The learning of math in multilingual classes depends to a huge degree on the mastery of English as a second or third language. This interdependency of the learning of ESL and math thusly permits certain math acquisition processes to occur simultaneously (Ledibane, Kaiser, & Van der Walt, 2018). Besides, acquiring the second language in the first stages allows students to understand both the language and math concepts. The important role of language in math learning is defined by Harrison (2014, p. 2) where he stated that “language is the cement that allows us to build upon prior knowledge learning. If language is weak, so too is the ability to learn.” When students and teacher's first language is the same, this helps students for a better understanding and learning for the familiarity of the teacher's accent. However, in some cases, the teacher's accent is not clear which can cause hindrances for students as argued by Harrison. Yeh (2017) argued about the importance of language in math education and stresses that: Simultaneously learning a second language and math is cognitively demanding and can slow down the process of math learning. Language demands, and even the absence of a common language, can generate tensions and impact who is (and is not) participating in classroom interactions. (p. 108)

Moreover, some students are excellent in math in their 1st language, but when they are studying math courses in another language, this may be difficult for them. A study by Riordain and O'Donoghue (2009), claims that English language students experience a disadvantage of up to 15% in math because of language issues. Also, those bilingual or multilingual students who are not fluent in either of the two or more languages tend to have trouble in math (Ellerton & Clarkson, 1996). On the other hand, Slavik and Ernst-Slavik (2007, p.4) notice, “conversation in math classrooms can be a barrier to understanding the subject for English Language Learners.” Therefore, the majority of ESL learners face difficulties in understanding math concepts and math language.

Previous studies in the literature

Yushau and Hafidz (2015) conducted a study to examine students' perceptions about the lack of proficiency in English in relation to their math understanding and performance. The purpose of this study was to investigate the relationship between language proficiency and math performance among bilingual Arab university students. The study was conducted to include all students admitted to KFUPM with more than three thousand students at KFUPM in Saudi Arabia. The participants were male students aged between 18-20 years old, and their first language was Arabic. To investigate the relationship between student proficiency level in English language and math achievement, the chi-square contingency test procedure was utilized as the research tool. The researchers used the number of students in each category below to compare their test results. TOEFL results of all the entry-level prep year students in the terms 101 and 111 were obtained. Similarly, the results of Math 001 of all prep-year students in the terms 101 and 111 were obtained. Grades of all students in English courses for terms 101 and 111 were also obtained. Different chi-square contingency statistical techniques were used to analyze and compare the data to see if there was any relationship between (1) and (2), then

between (2) and (3) terms results in different courses. Also, a survey was given to prep-year students to measure their perceptions of their understanding and performance in math in English. The survey was given to the students in both Arabic and English. The results showed that the student's proficiency level in English affected their performance in math. However, multiple responses showed a negative impact of the language of instruction used in math classes on students' math understanding and performance. For example, the students did not agree that they face difficulty in learning math in English and learn better in Arabic. Because the results revealed that the students were not aware of the disadvantage of their language deficiency, and so did not seem to think that this deficiency has any effect on their math understanding and performance.

Palans and Setati (2009) carried out a study to examine how immigrant bilingual students use their language in the learning of math. This study aimed to investigate the differences in the ways that the Spanish bilingual students use their two languages during their engagement in mathematical activities. The study was conducted on a Catalan-Spanish bilingual group of 24 secondary level students at secondary school in Barcelona, Spain. The participants were aged between 12-14 years old and were taught by a bilingual Catalan native speaker teacher. The study examined five lessons of 50 minutes duration where the lessons were planned to let students work in small groups. The teacher of the class encouraged the use of the first language by distributing students in groups according to their dominant language. Eight students from South America were Spanish-dominant bilingual, whereas 16 students from Catalonia, mostly from Barcelona, were Catalan-dominant bilingual, except for one, who was a second-generation immigrant who came from a Colombian family. The research focused on the nine students who spoke Spanish at home. The five lessons were recorded and filmed. The researchers studied the transcripts of the Spanish and Catalan utterances and examined language shifts. The findings showed that students shift from Catalan to Spanish, and from Spanish to Catalan for various purposes depending on the complexity of the mathematical practices, and the different environment of the social settings in the classroom. For example, when the time for the whole group discussion began, they participated only when they were directly prompted by the teacher, and when this happened, they used Catalan.

Smith (2017) conducted research to study the impact of the language of instruction used on math teaching and learning. The objective of this study was to allocate the effect of the language of instruction on students' performance in a math course. The study was conducted on 40 freshmen level students where 20 of them were taught in a Jamaican dialect, and the rest were taught in Standard English. The instructional language at University College of Science and Education (UCSE) which is located in suburban Jamaica is Standard English (SE) whereas the students' first language was Jamaican dialect. A quantitative method was selected where a pre-test and a post-test were used to collect data. The pre-test was administered in the beginning, and the post-test was administered at the end of the semester. The researcher used a quasi-experimental design to track the changes between the tests of the treatment group who were taught using Jamaican dialect and the control group who were taught using Standard English. The independent sample test results showed that the difference in the mathematic diagnostic test was significant.

The Jamaican dialect students did better in the test and, so they had a higher improvement score.

Yashau and Bokhari (2005) conducted research to determine the crucial role of language in the teaching and learning of math. This study aimed to investigate the outcome of an experiment that attempted to address the language barrier of preparatory year math students, who were learning English as a new language of instruction. The study was conducted on 381 prep-year students who took Math 001 course at King Fahd University of Petroleum & Minerals, Saudi Arabia. The researchers used a mixed-method approach. Data were gathered through surveys, tests, and interviews. The quantitative data were collected from both teachers' questionnaire responses and students' performance in their exams. Whereas the qualitative data was collected using informal interviews with teachers and students. Additionally, during the time of the trial, the course educators consistently met to screen the advancement of the experiment. In the gatherings, instructors uninhibitedly communicated their perspectives and those of their students about the test. The results indicated that there were increment of class interactivity in this approach. Considering the way that most of the subjects in the analysis were academically weak, the researchers reasoned that a general execution of the students in the tests was encouraging. Both students and teachers replied positively to the method embraced in the trial and they concurred that this approach did minimize the language barrier in the classroom. Moreover, teachers have changed the teaching method, so it encouraged the students to read the textbook as well. It is to be noted that English was strictly maintained as the language of instruction throughout the experiment.

This research focuses on the difficulties that face bilingual Saudi EFL learners to learning math in English. This research is different from the previous studies because it investigates Prep-year students' difficulties in learning math in English from learners' opinion. The participants' age is between 19 – 20 years.

METHOD

This research follows a quantitative approach. According to Creswell (2009):

Data differs in terms of open-ended versus closed-ended responses. Some forms of data, such as interviews and observations, can be either quantitative or qualitative depending on how open (qualitative) or closed (quantitative) the response options might be in an interview or a checklist for an observation. (p.199)

Research Tool

Questionnaire

An online questionnaire was given to the participants to collect information and opinions about the difficulties they encountered in learning math in English. The questionnaire was written in both Arabic and English. It consisted of 12 close-ended statements and used a 5-point Likert Scale to indicate if the students "strongly disagree, disagree, neutral, agree, or strongly agree." A semi open-ended question was also given in the questionnaire

to provide students an opportunity to express their opinions. Google Forms was the medium used to make the questionnaire (see Appendix).

Participants of the Research

The participants of this study were 82 female and 54 male students studying prep-year at Yanbu University College in Yanbu Alsinaiyah, and another University in western Saudi Arabia. The participants' age between 19-20 years old. The participants' mother language is Arabic. They are studying math 002 courses during the second semester of the 2020-2021 academic year.

Data Collection Procedure

First, the researcher designed and prepared the questionnaire to collect participants' feedback. Second, the link of the questionnaire was sent to participants. The questionnaire's statements can be found in (Appendix). The questionnaire was given to 136 students, both female and male. A short description of the study objectives and purpose was written at the beginning of the questionnaire form. The participants were instructed to read the statement and respond to each statement to know their responses about the difficulties that faced them to learning math in English.

RESULTS AND DISCUSSION

This section presents the discussion and analysis of the results of the study. The data of this study was mainly collected from the questionnaires to examine the difficulties that face bilingual Saudi EFL prep-year learners in learning math in English.

Questionnaire

The questionnaire was given to the participants to find out students' responses to the research question of this study, which was: "What are the difficulties that bilingual prep-year Saudi students face in learning mathematics in English? " The responses to the questionnaire were collected, and presented in distributions and Tables below.

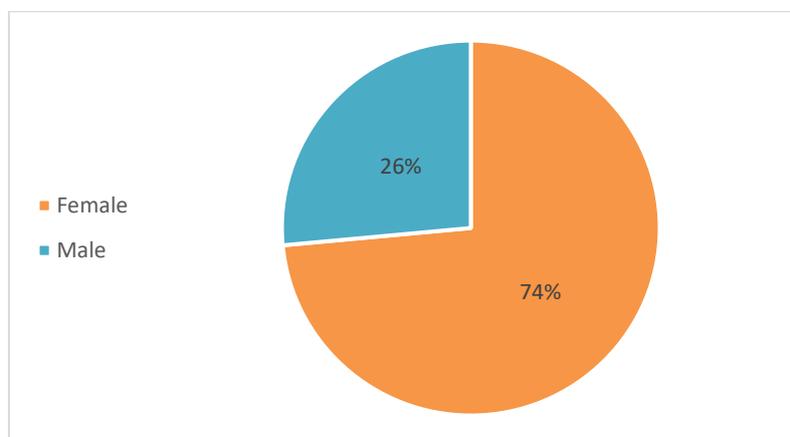


Figure 1. Distribution of the gender of the participants of the study.

Figure 1 shows the gender of the participants where 74% were female. The female participants were all from Yanbu University College and the number can be explained due

to sharing the link of the questionnaire by the Prep-year administration which it seemed encouraged more students to participate.

Table 1. Response frequencies for questionnaire items about math comprehension

Statements	SA	A	N	SD	D	Mean Response
1. I find difficulties to understand math lesson in English. أجد صعوبة في فهم الرياضيات عندما تكون باللغة الإنجليزية.	46	38	32	10	10	3.92
2. I face difficulties to understand mathematical terminology. أواجه صعوبة في فهم مصطلحات الرياضيات.	60	42	27	2	5	4.1
3. I often find mathematics difficult when taught in English. تدريسها باللغة غالبًا ما أجد صعوبة في الرياضيات عندما يتم الإنجليزية	56	42	19	13	14	3.77
4. Learning mathematics in English affect my performance. الدراسي يؤثر تعلمي للرياضيات باللغة الإنجليزية على أدائي في مادة الرياضيات	62	37	16	8	13	3.93
5. I can't express my mathematical knowledge because of the English language. لست قادرًا على إظهار بسبب اللغة الإنجليزية معرفتي في مادة الرياضيات والتعبير عنها جيدًا	59	40	16	9	12	3.91
6. I switch from English to Arabic to explain an idea. أحيانًا لشرح فكرة ما أقوم بالتبديل من الإنجليزية إلى العربية	86	30	13	4	3	4.41

Table 1 shows students' opinions about the difficulties that they faced while learning math in English. First, the mean of the responses to statement 1 is (3.92). It shows that the majority of the students agreed that they experienced difficulties to understand math lessons using English as the language of instruction. For the second statement, the mean response which is (4.1) shows that most of the students did not understand the mathematical terminologies in English language, and they faced difficulty in memorizing them. Also, the mean response for statement 3 is (3.77) which demonstrated that most students "strongly agreed" and "agreed" that math is difficult when taught in English language for the lack of prior experience in learning math in English. Also, the mean response for statement 4 is (3.93) which shows that the majority of the students "strongly agreed" that their performance was affected when they were learning math in English. Furthermore, the mean response for statement 5 is (3.91). It demonstrated that most students were not able to participate in class because of the difficulty of English language. Some of the beginner or intermediate level students were shy to use the language or to make mistakes. The mean response of statement 6 is (4.41) which shows that the participants were "strongly agreed" and "agreed" about the technique of code-switching between Arabic and English to explain a mathematical concept or a lesson.

According to the results, it can be concluded that when students are learning math in English while their mastery of English language is not yet achieved, their performance in math courses will be affected. Also, students tend to shift from English to Arabic due to the lack of English language proficiency which affects their understanding of certain math topics and concepts. It seems that their level of English varies between beginner and intermediate. Furthermore, a communication barrier is noticed between teachers and students where some of the students find it difficult to ask or to answer questions as a result of their weak English mastery.

Table 2. Response frequencies for questionnaire items about the English language

Statements	SA	A	N	SD	D	Mean Response
1. I think mathematics is easy but because books are in English, I find it difficult to follow. أعتقد أن مادة الرياضيات سهلة الفهم، ولكن لان الكتب الدراسية باللغة الإنجليزية أجد صعوبة في الفهم.	68	28	18	9	13	3.94
2. I face difficulty reading the mathematical text because of the English language. لا أستطيع قراءة نص الرياضيات بسبب اللغة الإنجليزية	51	31	27	12	15	3.66
3. Sometimes I translate words when I don't understand their meaning. أحياناً أترجم الكلمات إلى اللغة العربية عندما لا أفهم معنى الكلمة	81	37	8	4	6	4.34
4. I find it difficult to understand math questions. أواجه صعوبة في فهم أسئلة الرياضيات	55	40	19	7	15	3.83
5. I will do better if my mathematics exams are all in Arabic. باللغة العربية سيكون أدائي أفضل إذا كانت اختبارات الرياضيات	80	22	19	7	8	4.16
6. I watch videos in the Arabic language about the lesson to understand it more. أشاهد فيديوهات شرح للدرس باللغة العربية لأفهمه أكثر	77	26	12	8	13	4.07

From the above table, it can be seen that the majority of the students faced difficulties in learning math in English. The mean response of statement 7 is (3.94). It shows that the majority of the students considered math as an easy subject, however; the math textbooks were written in English and this led to difficulty to comprehend. Also, the mean response for statement 8 is (3.66). It demonstrated that more than half of the participants faced difficulty in reading mathematical texts because of the English language. Besides, the mean response of statement 9 is (4.34) where it shows that most of the students translated words into Arabic when they could not comprehend the meaning of the words. Furthermore, the mean response of statement 10 is (3.83). It reveals that the majority of the students faced difficulties to understand math questions for that their exams and assignments were negatively affected. The mean of statement 11 is (4.16). It demonstrated that almost all of the participants were “strongly agreed” and “agreed” about how their performance will be better if their math exams were written in Arabic. When the students' study for their exams they need to translate words to their L1 to understand the written text and only then to understand math concepts. The mean response of the last statement 12 is (4.07). It shows that many students prefer to watch videos explaining math in Arabic for better comprehension.

Based on the results, it seems that the language used in books is written for English native speakers not for EFL learners. So, students find it difficult to read because they could not understand the language. Also, there are some words used in mathematics which has different meanings in English. Most of the beginner students were confused between the different meanings of words so sometimes they need to translate the word to understand it. Students will do better if their exams are in Arabic because most of the math lessons students have in prep year, they had studied before in high school in the Arabic language.

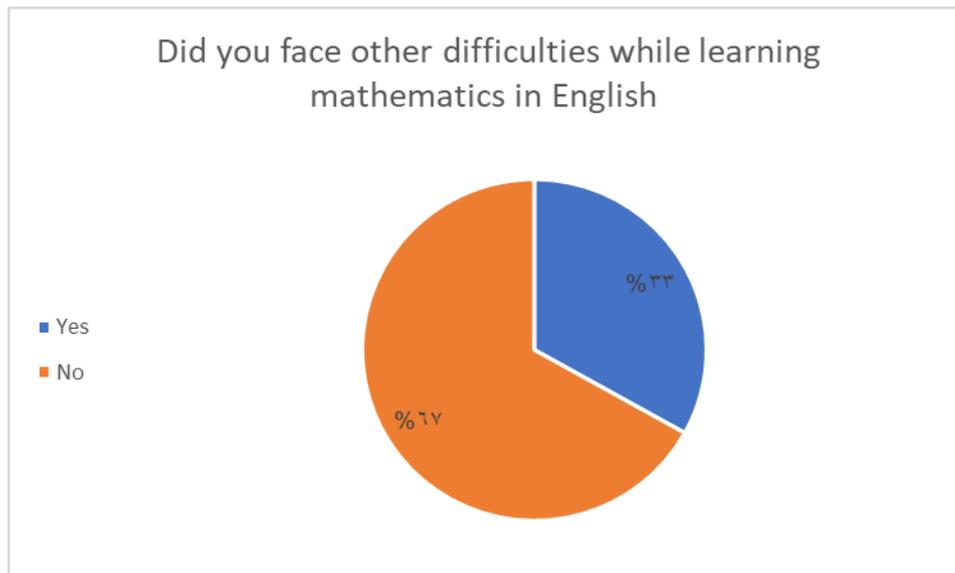


Figure 2. Distribution of the percentage of what they have faced other difficulties other than 12 items

Figure 2 shows the majority of the students did not face difficulties other than what the researcher mentioned in the questionnaire. Most of the preparatory students faced difficulties in the language itself. Also, the researcher asked the participants to write other difficulties they faced in learning math in English. The students' answers were almost the same. Some students indicated that they faced difficulties because of the teachers' accent since English is their second language. Also, some of the students agreed that the time of the exam was short, and they needed more time to do the questions. Students thought the examination time was short but actually, they took time to read and understand the questions because of the English language. Moreover, some teachers' first language corresponds to the students' L1, so they prefer to use the Arabic language to help students have a better understanding of concepts. Through this period, students did not acquire math terminology in English, and it affected students' performance because their exams were in English. Furthermore, the positive problems that students reported were mathematical terminology, English language, and solving math exams.

Based on the results of the questionnaire, this study answered the research question, which was "What are the difficulties that bilingual prep year Saudi students face to Learning mathematics in English?" The results showed that the majority of participants agreed on facing difficulties in learning math in the English language. Also, students seemed to have other mathematical obstacles which negatively affected their understanding and performance in math courses.

The findings of the current study (as in table 1 and 2) are in line with the findings of Yushau and Hafidz (2015) who claimed that the effect of language proficiency is found to be a factor in students' performance in math among bilingual Arab university students. Also, statement 6 (as in table 1) supported the result of the study conducted by Palans and Setati (2009) where the findings showed that students shift from Catalan to Spanish, and from Spanish to Catalan for various reasons depending on the complexity of the mathematical practices. Moreover, Smith (2017) provided some tests that showed

Jamaican students' dialect who learned math in their L1 did better in the test than Standard English students. This assimilates students' opinions on statement 11 (as in table 2) where they reported how they will do better if their math exams were written in Arabic.

CONCLUSION

In this paper, the researcher discussed the difficulties that bilingual Saudi students at Yanbu University College in Yanbu Alsinaiyah and another University in western Saudi Arabia faced in learning math in English. This study was quantitative research. After collecting responses, the results showed that the reasons behind students' difficulties in learning math in English are derived mainly from students' previous experience of learning math in Arabic for 12 years. Also, starting to learn English at an advanced level while learning math. There were other problems in math because of the new language used. Also, the difficulties the participants experienced while learning math were mathematical terminology, English language, and solving math exams. Consequently, these factors affected their performance in math exams.

Limitations of the Study

In this research, some limitations were found. The number of the participants was limited as the researcher was not able to distribute the questionnaire for a wider range. It would help to have a large number of students to get more valid results. Another limitation of the study was the time frame. Due to the recent changes of the mechanism for ending the semester early, the study was conducted in a shorter period than it was expected.

Recommendations

A set of recommendations is suggested based on the results of the study. Firstly, the researcher suggests a course for math terminology taken as a pre-course before math courses. The course can be for 2 weeks after students finished the 001 level. EFL teachers can help students to improve their language learning at the preparatory year to accommodate learning math in English. Also, the researcher recommends the teachers maximize the learning opportunities for students by including new techniques, and use smart devices in teaching. EFL teachers are recommended to maximize the exams time. Secondly, EFL students are recommended to practice and do more activities for any material in English because this makes them learn better. The bilingual Saudi students are recommended to learn more math terminology and improve their math skills. EFL teachers can help students with this by giving them some homework. This study is the first of its kind to look at Saudi EFL students' difficulties in learning math in English at Yanbu University College. Linguistic researchers should do more research on Arabic learners in general and gulf EFL learners in particular.

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APPENDIX

Questionnaire

1- Choose your gender please.

Female Male

2- Please state if you agree or disagree with the following:

	Statements	Strongly agree	Agree	Neutral	Strongly disagree	Disagree
1	I find difficulties to understand math lesson in English. أجد صعوبة في فهم الرياضيات عندما تكون باللغة الإنجليزية					
2	I can't express my mathematical knowledge because the English language is not a good medium for mathematical expression. بسبب اللغة الإنجليزية لست قادرًا على إظهار معرفتي في مادة الرياضيات والتعبير عنها جيدًا					
3	Learning mathematics in English affect my performance. تعلمي للرياضيات باللغة الانجليزية يؤثر على أدائي الدراسي في مادة الرياضيات					
4	Because of the English language I am not able to read mathematical text. لا أستطيع قراءة نص الرياضيات بسبب اللغة الإنجليزية					
5	I face difficulties to understand mathematical terminology. أواجه صعوبة في فهم المصطلحات الرياضية					
6	I switch from English to Arabic to provide an explanation. أحيانًا أقوم بالتبديل من الإنجليزية إلى العربية لشرح فكرة ما.					
7	I often find mathematics difficult when taught in English. غالبًا ما أجد صعوبة في الرياضيات عندما يتم تدريسها باللغة الإنجليزية					
8	I will do better if my mathematics exams are all in Arabic. سيكون أدائي أفضل إذا كانت جميع اختبارات الرياضيات الخاصة بي باللغة العربية					
9	I think mathematics is easy but when it is written in English on the textbook, I found it difficult to follow. أعتقد أن مادة الرياضيات سهلة الفهم ولكن لان الكتب الدراسية باللغة الإنجليزية أجد صعوبة في الفهم					
10	Sometimes I translate words when I don't understand their meaning .					

	أحياناً أترجم الكلمات إلى اللغة العربية عندما لا أفهم معنى الكلمة.					
11	I will do better if my mathematics exams are all in Arabic. سيكون أدائي باللغة أفضل إذا كانت اختبارات الرياضيات العربية					
12	I watch videos in Arabic language about the lesson to understand it more. أشاهد فيديوهات شرح للدرس باللغة لأفهمه أكثر العربية					

3- Did you face other difficulties while learning mathematics in English? هل تواجه صعوبات أخرى أثناء تعلم الرياضيات باللغة الإنجليزية؟

Yes No

4- If your answer is yes, What are the other difficulties that you face while learning mathematics in English? إذا كانت اجابتك بنعم ما هي الصعوبات الأخرى التي تواجهها أثناء تعلم الرياضيات باللغة الإنجليزية