

PROBLEMS FACED BY SECONDARY SCHOOL STUDENTS IN LEARNING MATHEMATICS: A CASE STUDY

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ABSTRACT

The purpose of this study is to see if secondary school students have any problems with learning mathematics and, if so, what the causes are. A total of 150 students were involved in the study, which was a descriptive case study based on qualitative understanding from three selected secondary schools, of which 50 were from St. Andrew's School, 50 from St. Christopher's School, and 50 from St. Mathew's School. About 14% of the participants said they had no problems with learning mathematics, whereas 86 % said they had faced problems in learning the subject. The content analysis method was used to determine the causes of their learning problems, taking into account the type of problems they faced and the type of secondary school they attended. The findings suggested that the problems faced by the participants in learning mathematics were due to the teachers and the content. The students of St. Andrew's school and St. Christopher's school lamented that their learning problems were mainly teacher-based, while the students of St. Mathew's school attributed their learning problems to content-based. The findings of this study are expected to lessen the difficulties that secondary school pupils confront in their academic journey of learning mathematics.

KEYWORDS: *Problems, secondary school students, learning mathematics*

Introduction

Mathematics is an important subject, and the "Education Commission" (1966–66), recognising its importance, suggested it as a compulsory subject for pupils at the secondary level (National Policy of Education, 1986). Mathematics is a subject that is necessary for the intellectual development of students as well as the success of society. It is essential to understand the arithmetic operations and their features since all mathematical operations are interconnected (Tabak, 2019). Mathematics is also related to so many other disciplines and sciences and has received considerable emphasis in education (Rameli, 2018). Furthermore, in many nations, pupils' mathematics achievement has been a priority and is viewed as a crucial concern (Rameli, 2018). Mathematics, a science of computation and reasoning, is taught by all schools as a basic curriculum. However, students are not interested in this subject (Jaggi, 2017). Further, learning mathematics is seen as a difficult task and is disliked by many students as if it were a genetic condition (Ali, 2011; Michael, 2015; Rameli, 2018). Mathematics is more than a subject we learn in school and is at the core of everything we do because every breath we take in every second of the day, from the moment we wake up in the morning, is mathematics (Jaggi, 2017).

The study's Requirement

Although mathematics is an important subject in the secondary school curriculum, it is perceived as a difficult subject by many secondary school students. This is a false belief, but our society seems to have accepted the notion that mathematics is only for intellectual students (Chabulembwa, 2014; Willingham, 2009). However, the importance of mathematics remains relevant for all ages and continues to be taught at all levels of education (Chabulembwa, 2014). Therefore, mathematics should be taught to young learners, especially to secondary school students, even though many individuals roll their eyes when they hear the word mathematics (Mutawah, 2015). This will help them to comprehend numerical data and conduct simple and difficult calculations in everyday situations. Mathematics is important to secondary school students in particular and to all people to improve their quality of life. Hence, this study is important to understand how mathematics can impact the students' perception, motivation, and attitude towards learning mathematics. It will help us understand how mathematics connects to university education across the board (Aguilar, 2021; Chabulembwa, 2014).

The Significance of the Study

Many studies report that what teachers know and believe about mathematics is directly connected to their instructional choices and procedures (Jaggi, 2017). The teachers of the 21st century need a paradigm shift to move from rote learning to student-centred learning. It is hoped that this study will assist mathematics teachers, curriculum planners, and textbook authors to overcome the problems faced by secondary school students in learning mathematics. This can enhance students' confidence and improve their performance in the mathematics subject (Ramli, 2013; Mulwa, 2015). Since students' learning and success in education are complex and depend on many other factors, educators can look at multiple aspects. The researcher thinks that the findings of this study will help instructors create learner-friendly curriculum and foster favourable learning environments in which students can enjoy mathematics and achieve better results.

Methodology

This study was a qualitative case study, as case studies focus on describing the activities of a specific group and the shared patterns of behaviour that the group develops over time (Gay, 2012). A fundamental case study is a detailed and intense consideration of a specific subject, aimed at identifying the problems faced by secondary school students from SAS, SCS, and SMS, as well as their perspectives on the causes of these issues and concerns. This is of paramount importance because, through ethnographic research, a researcher can better focus and identify the problems faced by secondary school students in learning mathematics (Gay, 2012). The goal of this study was to explain the problems secondary school students had in mathematics, as well as their opinions on the causes of those problems. In this study, the problems refer to the difficulties and struggle the learners experienced while learning mathematics. They were 45 minutes to write their solutions to the questions after being seated at a sufficient distance to avoid debate and ensure unfettered expression and flow of thinking.

Participants

The participants were selected from St. Andrew's School (SAS), St. Christopher's School (SCS), and St. Mathew's School (SMS) in the district of Kangpokpi, Manipur. The secondary school students were selected from different social and economic backgrounds to facilitate better participation and healthy diversity. The participants of the study were composed of 150 students, of which 33.33% were from SAS, SCS, and SMS, respectively. Of these total participants, 75 (50%) were male and the other 75 (50%) were female secondary school students. The parents of 13 students (8.5%) have university degrees; the parents of 80 students (53.3%) have pre-university graduate degrees; and the parents of 35 students (23.3%) are matriculated, while the parents of 22 students (14.5%) are illiterate.

Data Collection Tool

The researcher constructed a data collection tool that had two sections. The first section was intended to gather demographic information from the students by asking them questions about their gender, high school attended, grade level, and parents' educational levels. The second section was comprised of open-ended questions aimed at eliciting the participants' experiences with mathematics and their perspectives on those issues. A data-gathering tool was

constructed, and two experts in mathematics education were approached for their input. The data collection tool developed with the help of experts' opinions was tried with 30 students from a secondary school that was not selected to participate in the study. The open-ended questions were designed to allow participants to freely express their opinions with an additional note, "*Kindly write down any problems you come across while learning mathematics and what the causes of those problems are.*"

Data Collection

Data collection was done for the academic session 2020–2022. The technique for collecting data was implemented during the elective classes. The students were surveyed in each classroom where the data-gathering instrument was employed. At the outset, the students were briefed on the study, and it was explained to them that their participation in the study was entirely voluntary. Hence, those who refused to participate were not obligated to take part in the study. Then, the participants were ensured that the information shared with them was confidential and would be used solely for research purposes.

Analysis of Data

The researcher verified the data collection tool was responded to by 180 secondary school students who agreed to participate in the study, of which 20 forms with incomplete personal information were removed. The obtained data were then reviewed for replies to the open-ended question. Four forms with open-ended inquiries that were left blank and six forms that did not contain any answer connected to the enquiry were removed during this reading. As a consequence, 150 data gathering tools were numbered 1 through 150, and demographic data were uploaded to the SPSS programme. During the examination of the open-ended question, the data was analyzed using the content analysis method. The information gathered during the content analysis was organized into topics and sub-topics. Initially, the researcher and an expert in qualitative research developed the initial draft of the conceptual categories by reading the responses to the open-ended question in the data set. Then, after working on both manuscripts, a consensus on conceptual categories was obtained. The topics were designated as (I) Content-based problems, (II) teacher-based problems, and (III) student-based problems as the outcome of the expert and researcher's collaboration. The sub-topics of (I) Content-based problems consist of: mathematics is more abstract than other subjects; difficult to understand the concepts; many rules and formulae to memorize; geometry theorems are difficult and lengthy, and too many exercises and problems to solve. (II) The sub-topics of teacher-based problems consist of: s/he rushes to cover the syllabus; s/he has a rote-learning educational method; s/he has poor classroom management; s/he makes learning difficult; s/he complicates mathematics with poor teaching tactics. (III) The sub-topics of teacher-based problems consist of: I hate math subject; I cannot do homework; I do not study daily; Self-study is difficult, and Constant failure are some of the sub-topics of student-based difficulties.

Reliability and Validity

The researcher and the expert compared the results by matching the responses in data collection tools to conceptual categories. After the first comparison, 14 answers were found to be divided into several groups. A re-evaluation of the various outcomes was carried out, and it was observed that the sentences of some participants were worded in such a way that they could be scored in more than one category. Finally, it was sorted out into nine different solutions. Miles and Huberman's (1994) approach was used to get the reliability coefficient with the formula: $\text{Reliability} = \frac{\text{Number of agreements}}{\text{total number of agreements+disagreements}}$ and the calculated result was 95.63 per cent. Then, in the findings section, those examples that are deemed to represent each conceptual category with better clarity are given without altering the statements given by the students. Hence, the result of the study was validated based on the responses of the secondary school students as received in the data collection tool.

Data Presentation

The responses of the students were assigned to the various conceptual categories based on the type of secondary school attended by them. Then, frequency tables were created for the responses received from the participants. This was followed by assigning the genders as M = Male and F = Female. The types of schools were assigned as St. Andrew's School = SAS, St. Christopher's School = SCS, and St. Mathew's School = SMS).

Findings

The perspectives of secondary school students on whether they faced any problems in learning mathematics were collected and analyzed. Accordingly, the views of the participants were examined, and the results are given in the figure below.

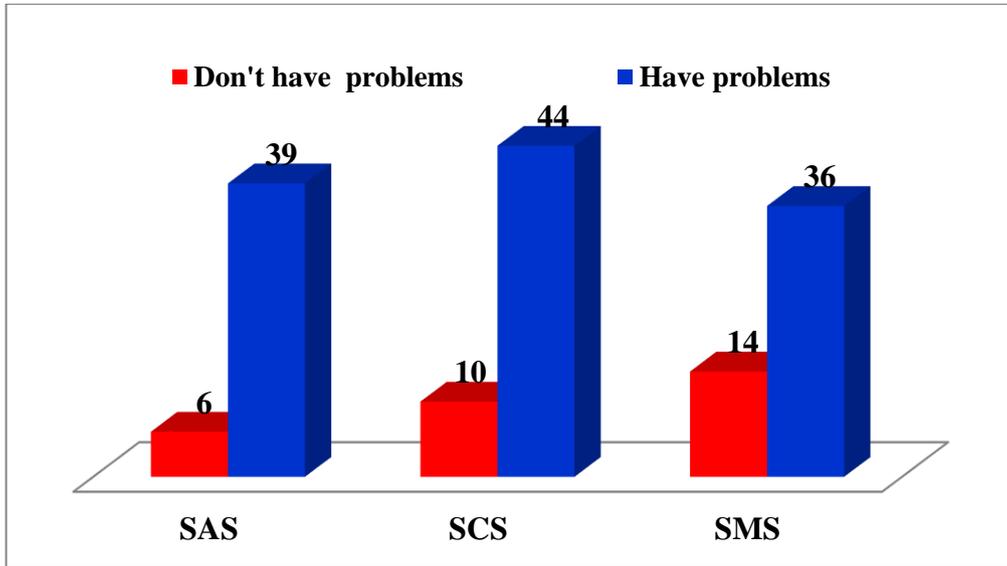
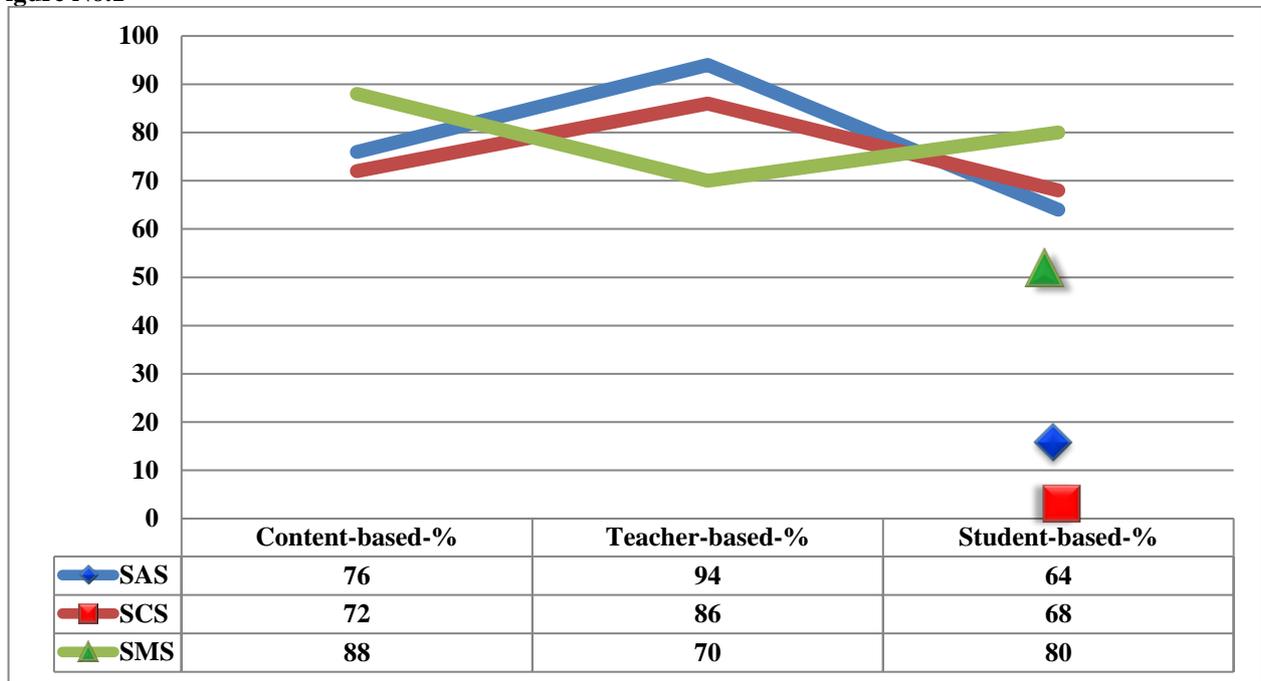


Figure No.1



Topics	Sub-topics	SAS		SCS		SMS		Total	
		f	%	f	%	f	%	f	%
Content-based Learning Problems	Math is more abstract than other subjects.	2	1.71	4	3.57	8	6.72	14	4.02
	Difficult to understand the concepts.	5	4.27	8	7.14	10	8.40	23	6.61
	Many rules and formulae to memorize.	9	7.69	4	3.57	5	4.20	18	5.17
	Geometry theorems are difficult and lengthy.	12	10.25	9	8.03	9	7.56	30	8.62
	Too many exercises and problems to solve.	10	8.55	10	8.93	12	10.08	32	9.19
	Total	38	32.47	35	31.25	44	36.97	117	33.62
Teacher-based Learning Problems	S/he rushes to cover the syllabus.	14	11.97	12	10.71	10	8.40	36	10.34
	S/he has a rote-learning educational method.	11	9.40	11	9.82	8	6.72	30	8.62
	S/he has poor	9	7.69	8	7.14	6	5.04	23	6.61

	classroom management.								
	S/he makes learning difficult	7	5.98	7	6.25	7	5.88	16	4.59
	S/he complicates Mathematics with poor teaching tactics.	6	5.13	5	4.46	4	3.36	21	6.03
	Total	47	40.17	43	38.39	35	29.41	125	35.92
Student-based	I hate Math subject	9	7.69	8	7.14	11	9.24	28	8.04
	I cannot do homework	5	4.27	5	4.46	7	5.88	17	4.88
	I do not study daily	6	5.13	7	6.25	5	4.20	18	5.17
Learning Problems	Self-study is difficult	7	5.96	6	5.36	8	6.72	21	6.03
	Constant failure	5	4.27	8	7.14	9	7.56	22	6.32
	Total	32	27.35	34	30.35	40	33.61	106	30.46
Grand total		117	33.62	112	32.18	119	34.20	348	100

Table No.1: Allocation of topics and sub-topics of the problems faced by secondary school students in learning mathematics from three types of schools.

Teacher-based Problems

According to the participants, the main problem faced by secondary school students in learning mathematics is teacher-related. As far as the teacher’s role in promoting student in-depth learning is concerned, first of all, they need to carefully prepare lesson plans, student worksheets, blackboard work, home assignments, and assessment tasks, in order to be able to think about and convey the subject matter in different ways (Ali, 2011; (Mulwa, 2015). Teacher-based problems had five sub-topics, of which "s/he rushes to cover the syllabus" was the first sub-topic. The participants expressed that the main cause of all their mathematical troubles is their teachers. Their goal is to complete the syllabus rather than provide them with guidance. On this topic, a participant (42, M, V) stated, *“It is because of the mathematics teachers that we struggle with mathematics. They are more interested in completing the syllabus and feeling they have done their duty. Unlike other subjects, to learn mathematics, students need more help and explanation as it is tougher.”* Another participant (98, D, G) expressed similar sentiments: *“The teacher rushes through the lessons unnecessarily, and then moves on to a new lesson before we have fully grasped the prior ones. I am not sure if finishing the lessons is the main issue,”* and she attributed her difficulties to the teachers’ concentration on completing the subjects rather than ensuring that they learn. Another participant (34, L, M) expressed himself as follows: *“Our teacher rushes through math classes in order to finish all the lessons.” This is a terrible situation for me. If I don’t understand the formula and method of solving the problems of the current lesson, I won’t be able to comprehend the other questions in the next lesson.”* This implies that the teachers’ anxiety about finishing the lesson makes their learning harder.

The second sub-topic was, ‘s/he has a rote-learning educational method.’ It’s when they are motivated that the pupils’ interests will be aroused (Jaggi, 2017). So, encouraging students to think logically and learn more relationally is always challenging for both teachers and students (Ramli, 2013). A participant (15, D, G) said, *“I believe it would be far more rational if the teacher instead taught us the logic of the rules. As a result, rather than being a memorising society, we can be a “thinking society.”* Another participant (136, M, V) remarked, *“Arithmetic can be more engaging and beneficial if our teacher offers us an education that will prove useful in our lives instead of a rote-learning oriented Mathematics education.”*

The third sub-topic was titled: ‘S/he has poor classroom management’. Jaggi (2017) suggests that a topic should not be continued for too long a period of time and monotony should not be allowed to settle over the classroom atmosphere. A study by Ramli (2013) supports that mediocre teaching methods lead to poor learning. The following are samples of statements made by the students on this topic: The first participants (13, K, and S) stated, *“During mathematics, there is too much noise in the classroom.”* One participant stated (45, L, M), *“Because of boredom, the class is always out of control.”* While another (120, M, V) stated, *“The class is always out of control due to monotonous teachers.”* One participant observed, *“This is not due to the students; the instructor is unable to persuade them to listen to her” (38, T, T).*

The fourth sub-topic was titled, ‘s/he makes learning mathematics difficult’. Students perceive their teacher as someone who hampers their learning and makes learning mathematics difficult for them due to the vague and confusing delivery of mathematical lessons. A participant (64, M, V) stated, *“I believe there is nothing that cannot be learned in mathematics, but our teacher makes it difficult to learn,”* implying that the teacher makes it difficult for them to learn. Another participant (98, D, G) stated, *“I guess my issue is that I am constantly attempting to simultaneously note down and learn anything the teacher has written on the board.”*

In the fifth sub-topic, ‘s/he complicates math with poor teaching tactics,’ it is observed that the teacher is unable to relate each of the mathematics topics to daily life, and students lose interest in learning (Ramli, 2013). The students expressed their dissatisfaction with their teachers’ poor teaching tactics, thus making learning mathematics difficult for them. The following are examples of what the participants had to say about this topic: *“The mathematics is so boring and dry since teachers use only chalk and blackboard” (120, T, T).* This demonstrates the importance of motivating mathematics teachers to work harder and improve their teaching skills (Jaggi, 2017).

Content-based Problems

The curriculum plays an important role in how students learn and develop in school (Ali, 2011). Content-based challenges were one of the reasons for the participants' difficulty in mathematics. The reasons for difficulties in mathematics were all highlighted by the participants: too many rules and formulas, detailed syllabus, a large number of themes, and syllabus above the level of the students' expertise were all highlighted as reasons for difficulties in mathematics. The participants responded to the first sub-topic, "Math is more abstract than other subjects," by saying that mathematics is tough for them since it has too many rules and formulae that must be memorized. One participant (34) stated, "*There are too many rules and I can't keep them all in mind.*" Another (53, M, V) stated, "*How can I memorise them all when there are so many rules and so many formulas? It's impossible to learn mathematics,*" he said, despondently. One participant (76, D, G) expressed, "*I would like to know why the formulae exist, where they came from, and what perspective or notion the person who discovered the formula had when he created it.*" Another participant (54, T, T) sadly said, "*Even though I understand the origin of some formulas, I am not a genius, and I won't be able to comprehend them all on my own*".

The second sub-topic was 'Difficult to understand the concepts.' According to the participants, the mathematics discipline is redundant, making learning difficult. This is attested by the following examples: "*We are taught many comprehensive topics in the mathematics lesson that will never be used again in our lifetime. It is hard to comprehend, learn, and apply all of them in a short period of time*" (32/L, M), and "*there are so many lessons that I can't cope with my studies.*" (38, M, V). The mathematics subject, according to the participants, is exceedingly detailed. The following examples demonstrate this: "*In mathematics class, we are taught numerous topics that we will never use again in our lives.*" (32, L, M). "*It is difficult to comprehend, learn, and supply all of them in such a short amount of time. There are so many lessons that I can't keep up with my studies.*" (38, M, V).

The third sub-topic is 'Many rules and formulae to memorize.' Regarding this sub-topic, a participant (27, M, V) expressed, "*the formulas and steps in mathematics are too many and long.*" The participants also believe that the levels of mathematics disciplines are higher than their own mathematics knowledge. "*I believe we are taught arithmetic concepts that are too detailed for our age,*" said one participant (53, M.H). One person remarked, "*Mathematics has too many formulas to memorize.*" While another (65, K, S) said, "*I have problems with learning because I get confused with the rules and formulas.*"

The fourth sub-topic, "Geometry theorems are difficult and lengthy." A participant (52, D, G) said, "*We prefer to avoid the geometry part even in exams.*" Again (60, D.G) shared, "*The theorems are too lengthy to memorise.*" *I find no meaning in the geometry section; it is too difficult to understand.*"

The fifth sub-topic is "Too many exercises and problems to solve." A student participant of SAS (72, D, G) said, "I am fed up with the problems and exercises." This is affirmed by a participant who said, "*There are many questions to solve at the end of each chapter, and these are taxing*" (38, T, T). "*The exercises and problems attached after each lesson are mental harassment*" (104, M, V). Another student (58, L, M) expressed, "*I am too bored and tired with mathematics.*"

Learner-based Problems

Learner-based problems were the final explanation for the participants' difficulties in learning mathematics. It is quite common to find that students of different grades have a negative attitude towards mathematics (Aguilar, 2021). Mathematics education necessitates highly motivated students because it necessitates reasoning, interpretation, and problem solving based on mathematical issues and concepts (Jaggi, 2017). Students also pointed out that they faced difficulty in learning geometry, arithmetic, and algebra (Ijaz Ahmed Tatlah, 2017). The secondary school students who participated in the study are convinced that mathematics demands constant review. This means a specific time should be set aside for it daily, unlike other subjects. "We can't just say I learned mathematics and be done with it," one participant (72, M, V) said. "We need to digest it, reflect on it, and make an effort on it." *However, students are dealing with many other subjects, like mathematics. That is why I don't have enough time for mathematics.*" Another (50, L, M) stated, "*Mathematics is a very demanding subject and it is difficult to meet such demands with my studies.*"

The first sub-topic under learner-based problems was 'I hate mathematics'. It is not a surprise that students from different grade levels demonstrate a dislike or negative attitude toward mathematics (Aguilar, 2021). One of the participants stated, "*Math is not my cup of tea*" (53, L, M). "*Mathematics classes suffocate me.*" (62, D, G). These statements indicate that the problems faced by secondary school students in learning mathematics stem from their aversion. Their hatred for it impedes their progress and causes their learning difficulties.

The second sub-topic is, 'I cannot do my homework'. In the process of learning mathematics, homework is indispensable since it is a continuation of classroom teaching and learning. Homework facilitates practise and revision for whatever has been taught and learnt in the classroom. Therefore, those students who cannot do their homework by themselves often lag behind the rest of their classmates. The following are some of the participants' excellent views: "*I find it difficult to do my homework alone*" (25, M, V). "*I usually copy the answers from my friends before the teacher comes to the class*" (71, T, T). "*When I have homework problems at home, I have no one to turn to for assistance.*" (63, K, S). Rusli (2017) asserts that parents' education level plays an important role in educating children. Parents'

educational levels can affect children's learning and achievement (Jaggi, 2017). In relation to parents' education level, mathematics learning and achievement are paramount (Rusli, 2017).

The third sub-topic reads, 'I do not study daily'. Learning mathematics does not come as naturally as learning to speak (Willingham, 2009). So, in the learning process, students' readiness to learn is very necessary. The challenges of mathematics education require disciplined study, concentration, and motivation (Jaggi, 2017). However, the individuals cited a lack of regular study habits as a source of the difficulty. This issue can be proven by the words of a participant (39, L, M) who said the following: *"The problem I have is completely my fault."*

The next sub-topic titled, 'Self-study is difficult,' explains how secondary school students need someone who can give easy methods of learning, help them relate to daily life, and instil an interest and love for mathematics. Their desperate need for support and guidance is elucidated as follows. *"I find it difficult to learn mathematics by myself"* (48, D, G). Further, a participant (25, D, G) remarked, "I am afraid and feel shy to go and ask my questions because I always fail my class tests and exams." For the fifth sub-topic, 'Constant Failure,' one of the participants (57, K, S) responded, *"I don't understand and I forget the formulae, the steps, etc. when I try to work out the exercises."* *"Keeping mathematics as a compulsory subject is a headache for me."* (93, T, T).

For the fifth sub-topic, 'Constant Failure,' one of the participants (57, K, S) responded, *"I don't understand and I forget the formulae, the steps, etc. when I try to work out the exercises."* (103, S, and K) While another similarly expressed, *"However I try and put in my effort, I always fail for mathematics in every exam."* Another one expressed in similar lines, *"Many students who do well in other subjects also cannot get a rank since they fail only in mathematics"* (32, M, V). *"In all the tests and exams, the highest number of failures is mathematics,"* they said (140, D, G). It may be true that a student finds mathematics more difficult than other subjects, but with some persistence and hard work, the student can learn mathematics, and as he learns more, it will get easier (Willingham, 2009). The level of anxiety is the highest among those who perceive themselves as low achievers (Mutawah, 2015). Besides, a lack of mathematics skills caused difficulties, and many students struggled to learn mathematics (Tambychik, 2010).

Discussion

According to the findings, around 6 students (12%) of SAS indicated that mathematics was not a problem for them, but 39 students (78%) of SAS stated that mathematics was a problem for them. There were 10 students (20%) from SCS who said that they had no problems, while 44 (88%) of them had problems. Among the students of SMS, 14 (28%) had no problems, while 36 (72%) confessed that they do have problems with mathematics. The parents of 13 students (8.5%) out of 150 students have university degrees; the parents of 80 students (53.3%) have pre-university graduate degrees, and the parents of 35 students (23.3%) are matriculated while the parents of 22 students (14.5%) are illiterate. Rusli (2017) found that the educational levels of parents and their constant support have a beneficial impact on the mathematical achievement of children.

When problems and arithmetic difficulties faced by the students were separated into topics and sub-topics, the issues arising from the teachers came out to be 94%. Among the problems arising on account of teachers, the teacher's goal of completing the prescribed syllabus within the stipulated time rather than providing learning support to pupils led to the highest count. This was followed by the use of a rote-learning style and poor classroom management. This was in line with a study undertaken by Nardi (2003) who found that the use of the rote-learning method in mathematics education augments the learning problems of the learners. Other sub-topics were that he makes learning difficult and that he complicates mathematics with poor teaching tactics. This explains that teachers need to prepare their lessons well, use acceptable methods and procedures, and make effective use of technology to alleviate the problems faced by learners in learning mathematics.

Educational Implications

The findings from this study will be appropriate for administrators and educational planners to revise the mathematics curriculum, modify instructional strategies, and reduce the learning problems faced by the students. In the current study, some students blamed their teachers for their difficulty in mathematics. So, teachers of mathematics can benefit from in-service training and tools to help them improve their lesson plans, classroom management, and teaching methods. Apart from that, it will be useful to consider what has to be done to prepare potential teachers who have completed mathematics teaching programmes. School administrators can organize support sessions during the school year and during vacations to address learning problems faced by the students. A study on the problems that students encounter in mathematics can be undertaken based on the opinions of high school mathematics teachers. Hence, discrepancies and limitations in teaching and learning mathematics can be effectively addressed.

Conclusion

Despite the importance of mathematics education in determining a person's future, the study discovered that the participants were not satisfied with mathematics teaching. The percentage of students who believe that mathematics teachers are more concerned with completing the syllabus on time than teaching mathematics was much higher. Students, in particular, struggle with the teaching methods of secondary school mathematics teachers. They stated that their mathematics teachers do not encourage an interest in mathematics, nor do they instill in them a good attitude

towards it. The participants believed that mathematics is a subject that contains too many rules and formulae. They expressed that the subject content was difficult and abstract. They also confessed that they did not review mathematics on a regular basis, nor did they devote enough time to it.

Suggestions

From the study, it is evident that the majority of secondary school students face learning problems because they are not aware of the order of mathematical operations performed from left to right. Besides, those students who do not set aside enough time for learning mathematics every day tend to memorise the formulae without understanding the correct applications. Therefore, the teachers' intervention is highly recommended to lessen the problems faced by the secondary school students. Teachers are encouraged to instruct the students in the correct procedures and appropriate applications of the rules and formulae when they work with mathematical problems. According to NCTM (2006), technology is very necessary for effective teaching and learning in mathematics. Therefore, technology can be used to avoid boredom and arouse greater interest among students in learning mathematics.

The present study had only three schools and 150 students as a sample. Further studies can be undertaken with a bigger sample. Further studies can also be conducted with students studying different types of management and different geographical locations.

Limitations

The present study was limited to secondary school students who were selected from St. Andrew's School, St. Christopher School, and St. Mathew's School.

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