



# Effects of Remedial Activities on Students' Competences in Mathematics Subjects in Public Secondary Schools in Rwanda: A Case of Ngororero District

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## Abstract:

This study aimed to assess the impact of remedial activities on students' mathematics competences in public secondary schools in Ngororero District, Rwanda. This study aimed to assess the impact of remedial activities on students' mathematics competences in public secondary schools in Ngororero District, Rwanda. The research used both quantitative and qualitative approaches, with 117 respondents, including students, teachers, the dean of study, and head teachers. The study used purposive sampling and simple random sampling to select teachers and students. Data collection methods include questionnaires and interviews. Instruments used to collect data were questionnaires and interviews. Quantitative data was analyzed using statistical methods such as SPSS 2021 and Microsoft Excel. Therefore, tabulation with frequency tables, graphs, and percentages was adopted. The findings indicate that digital numeracy is the most commonly used remedial activity by teachers in Ngororero District, Rwanda. A majority of respondents agree that digital numeracy is used to develop competencies such as critical thinking. Additionally, the study identifies the level of students' competences required in mathematics in Ngororero District, Rwanda, which includes creativity, innovation, critical thinking, problem-solving, and cooperation and collaboration. The study also highlights the importance of cooperation and life skills in the teaching and learning process. Teachers use digital numeracy to provide learners with access to graphs, tables, and charts related to their mathematical course. Collaboration and life skills are also used to facilitate learners' discovery in the mathematics subject. The researcher recommends implementing remedial activities that are suitable for the learners, ensuring that the remedial activities are suitable for their needs.

**Keywords:** Remedial activities, Students' competences, Mathematics subjects, Rwanda

## 1. Introduction

Remedial activities are designed with the aim of closing the gap between what a student knows and what he/she is expected to know. They aim to provide additional support to students who, for one reason or another, are lagging behind the rest of the class in some subjects. Thus, they learn to the best of their abilities and ultimately return

to mainstream classes. Such students are usually known as low learners or low achievers. Remedial classes seek to reinforce the “supply side” of education by offering additional opportunities to learn and thereby strengthening education (Schwartz, 2013). Pupils’ Academic Performance is the basis on how teachers start remediation activities to their pupils through interventions and strategized methods of increasing student retention of learning. Jackson (2016) found out that instructors who conducted remediation used instructional techniques that matched effective practices found in the current research literature. Everyone opt for teachers to give remediation until such time that learners are back on track. As Capuyan *et al.* (2019) revealed, there is a positive relationship between the previous and the current grade levels’ grades of pupils attending remediation lessons. In relation, Tseng *et al.* (2016) also mentioned that remedial interventions by teaching advisors showed a great impact on students’ improvement of final grades. Everybody rendezvous schools for learning and experience both for teachers and learners. Each of them goes to school every day for the best learning experience to happen.

Learning and teaching programme designed to bring learners who are lagging behind up to the level of achievement realized by their peers (Smith & Wallace, 2016). Remedial education is necessary where the learner is cognitively average or above average in intellectual ability and is therefore able to quickly assimilate the missed concept and relate it to the rest of the topic or area of study (Chakuchichi & Badza, 2014). The remedial programme acknowledges the shortcomings that any educational system is bound to have, considering the human weaknesses and therefore attempts to save pupils who might not otherwise achieve their full potential if there is no early detection and intervention (Chireshe&Mapfumo,2002). Globally, remedial learning has been going on not only in primary schools but also in secondary schools and tertiary colleges (Eldah, 2015).

In USA and Canada According to Rowntree (2015), Diagnostic evaluation is equally useful as formative and summative evaluations. Diagnostic evaluation attempts to carefully analyze the course of learning problems so that proper remediation can be applied (Sheridan *et al.*, 2006; Grubb, 2016). It is aimed to determine the best possible instructional situation for students in terms of their present learning status. Teachers should realize that the members of the group they are teaching do not have the same abilities (De Jong & Harper, 2015; Hiebert *et al.*, 2020). Some of them are not growing well scholastically, and causes must be found, and remedies applied. If a school is to reach its educational objectives, each teacher must recognize and understand the

complex aspects of behavioral changes. The teacher sees each within the group as having different problems and that he or she must determine the stages of their development and their peculiar learning difficulties.

In Malaysia, The Remedial Education Program is an instructional program designed for children who have identified deficiencies in reading, writing and mathematics (Richards, 2015). Remedial Instruction equips teachers with in-demand skills and addresses a very deep need within our education system. The remedial instruction activities are simple, yet significant and do not require an excessive amount of preparation. Furthermore, the approaches, pedagogies and activities that are related to remedial instruction are suitable for the level of the remedial students. Among the teaching theories incorporated in remedial instruction are Stephen Krashen's (2000) Affective Filter Hypothesis, Howard Gardner's (2020) Multiple Intelligence, Total Physical Response (Asher, 2020), Task-Based Approach and maths Experience Approach (Ellis, 2014). Among the more distinct Multiple Intelligences incorporated in the remedial instruction course are interpersonal, musical and bodily kinesthetic skills. As for Task-Based Approach, students are grouped in the four to carry out most of tasks in the remedial instruction course. Each member will have a role, be it the scripter or the leader. Teacher brings students out of the classroom to experience the fun of learning mathematics through the experience Approach. Students are able to relate their daily occurrence to mathematics in real situation.

In Africa, Governments and some NGOs in low income countries have established some form of remedial education programs to help students catch up with reading or math in the early grades, many starting as small pilots. It is not uncommon for remedial interventions, such as in the format of teacher training to improve the quality of early literacy instruction, to be delivered to entire classrooms or schools where baseline assessment results indicate very low levels of literacy for a majority of assessed students. Training teachers to teach the national curriculum with emphasis on reading (Save the Children, 2010), including scripted lesson plans, together with ongoing support to apply research based strategies to help low performers is one approach shown to be effective. However, it is often the case in low income contexts that not all teachers are able to reach all students due to large classrooms and short school days.

In Rwanda, Remedial activities for learners at risk of repetition and dropping out due to Covid-19 consequences. It is expected to provide technical and financial support to 2,520 primary and lower secondary schools countrywide. The number of learners to be supported will be determined based on the test results: when schools reopen, a revision

period of one week will be reserved to learners before they do an assessment prepared at school level. Remedial program is designed to close the gap between what a learner knows and what he/she is expected to know and do. They often target basic skills such as reading, writing, basic mathematical skills or some basic scientific skills. In many cases, learners are removed from their regular classroom and taught in another setting. It is to be noted that Remedial program are not the same thing as Special education which is designed to meet the ongoing needs of learners with disabilities to help them make progress in school. Like a remedy, remedial classes are supposed to improve learning, specifically in school subjects where they have scored zero or close to zero.

In order to implement the remedial and catch up program at classroom level, the Rwanda Education Board has developed 5 subject based teachers' guides as follows: Mathematics, Physics, Biology, Chemistry and English for lower Secondary. Each of these guides was specifically designed to help selected learners in need of remedial learning program. It is not meant to replace the existing Competence-based Curriculum Physics syllabus. Rather, it is a tool that teachers shall use to fill in the gaps identified in low performing learners. Remedial programs offer the possibility of teachers providing extra attention to those learners who are lagging behind and to make it easier to teach them at the levels that are appropriate to their current abilities. (REB, 2020).

In Ngororero district, the use remedial activities in lower secondary schools as a guide of Rwanda Education Board where Remedial activities was started from the fifth week of school reopening (on 30th November 2020) after identification of learners to be enrolled in the remedial program. The schools was selected based on the number of learners who demonstrated low performance during the assessment ending the first term, 2020 – 2021. The Remedial program will be conducted from primary one to secondary three. There are two models used for remedial classes are proposed: weekday model, and weekend model. For the weekday model, on a weekly basis, the schools was reserve the first period for a particular subject in a particular classroom, for Remedial activities. It can be in the Morning or Afternoon, depending on the school time table. In this case, all learners (those who need remedial attention and those who perform well) was attend the class at the same time, but the teacher was given special attention to low performing learners, giving them remedial activities. This was done for all grades, from S1 to S3. For the weekend model, only low performing learners for S3 students only was come to school on Saturday or Sundays for further Remedial

instruction. The remedial teaching was done in the morning, and will last 4 periods (starting from 8:00AM to 10:40AM). (Ngororero, 2021).

In some school, remedial activities take place at three days in week; start at 7:30 up to 8:30 AM. Saturday remedial start at 8:00 to 11:00 AM. The learners joining a Remedial class are likely to have low self-esteem and lack of confidence which need to be addressed so that they feel encouraged and included. These techniques encourage more learners to regularly participate through thinking, active listening, giving answers to questions in words and in written forms, and finding ways to show what they have learned. The way a teacher delivers these techniques should be on the spot as it fits the moment in the classroom, and always convey that she/he is using this technique because it shows care for her/his learners' ideas, thinking, actions and answers. GS Rwili, GS Runayi, et al. (2021).

## 2. Statement of the Problem

In Rwanda, the teaching of mathematics and science subjects faces numerous challenges, including misconceptions and negative attitudes among students. Despite government efforts like education for all, school dropout, lack of competences, and enrollment retention are prevalent issues that degrade the morale and quality of educational gains in secondary schools. This has led to an investigation into the implementation of remedial activities to help learners understand and develop their competences in these subjects. However, early detection and assistance by remedial activities teachers are needed for these learners to reach their potential. Observations show a gradual increase in challenges faced by some teachers in implementing remedial activities. School administrators complain about a lack of expertise among teachers and a lack of resources for schools to assist learners with remedial lessons. Some teachers also show a negative attitude towards remediation implementation in schools. Parents, teachers, and other stakeholders continue to invest resources in remedial activities to improve students' competences in secondary schools, particularly in mathematics. However, the real value of these programs is not clearly known, especially in secondary schools in Ngororero District. The government acknowledges the value of remedial activities but discourages their commercialization due to a lack of information on their importance. This study aimed to investigate the effect of remedial activities on students' competences in mathematics subjects in public schools in Rwanda, particularly in Ngororero District.

## 2.1 Objectives of the Study

The study aimed to assess the effect of remedial activities on student's competences in mathematics subjects in secondary public schools in Rwanda.

## 3. Literature Review

### 3.1 Theoretical Literature

#### 3.1.1 Remedial Activities Used By Teachers in Mathematics

Educating pupils is the core reason for all teaching-learning processes which is undertaken in each classroom in the formal education platform. However, not all the students can accommodate the learning processes and this result with different outcomes. With this in mind, teachers need to create an intervention plan and not let these other students fall behind and still catch up with the lessons being discussed. A remedial class is always an impressive way to solve this common problem. That is why Thilges and Schmer (2020) provided a concept analysis of formal remediation wherein he established a framework for defining the concept, developing measurable outcomes, and describing when to implement the intervention. This is important so that there is a consistent and systematic way of delivering the remedial class. However, Caras (2019) states that there is still a need for direct instruction for students necessary to connect experiences knowing that they are learning. Students learn from various experiences that is why traditional teaching is still accepted and proven to be still effective through time. In this context, Mbwiri (2016) concluded that the constructivist approach was not superior to the traditional approach of instruction on a 10-week remedial class.

Remedial education is a part of education which is concerned with the prevention, investigation and treatment of learning difficulties from whatever source they may emanate and which hinder normal development of pupils (Eldah,2013). Remedial education is given to children who function at a lower than average level because of certain learning or behavioral problem, but it can also be offered to pupils who achieve at higher than average level. According to Sifafoos and Elkons (2015) pupils who need remediation portray several characteristics that guide the teacher in their intervention. Generally, learners who require remedial learning have poor memory, short attention span and are easily distracted by other things, have relatively poor comprehensive power, lack learning motivation and self-confidence and exhibit relatively slow self-expectation. They are also weak in problem solving, fail to grasp information quickly and mix things up easily. Others have difficulty in understanding abstract concepts and need more time to complete assignment or tasks.

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According to Okwach (2015), before preparing for remedial lessons, teachers should identify pupils' diverse learning needs so that they may design appropriate teaching plans to facilitate effective learning. Since pupils have different characteristics in learning, teachers must devise different learning activities.

### 3.1.2 The Level of Competences Applied in Mathematics

One curriculum implication that arises from these views is that children should be allowed to reach a certain level of competency with whole numbers before advancing to fractions. On the other hand, Siegler, Thompson, and Schneider (2014) argued that learning about fractions is part of a continuous process in numerical development, in which children need to learn about numerical magnitudes and the defining characteristics of each class of numbers. If this is the case, there seems to be no a priori reason for placing the teaching of whole numbers and fractions sequentially. Many curricula are arranged based on the belief that a foundation in arithmetic is required before the introduction of algebra. However, there is now a growing literature that shows that even learners in secondary school exhibit algebraic thoughts (Kaput, Carragher, & Blanton, 2008; Lee, Khng, Ng, & NgLan Kong, 2013) and can be successful in solving algebraic problems (Fuchs et al., 2018; Lee, Ng, & Ng, 2019). Indeed, there are suggestions that introducing tasks that require algebraic thinking early may overcome problems often encountered by children that learn algebra after a solid grounding in arithmetic (Kaput et al., 2018).

These observations suggest that amongst typically developing children at least, the relation between early acquired and later acquired, more complex mathematical skills may be weak and less hierarchical than previously thought. However, whether strict hierarchy or necessary prerequisites exist for certain domains of mathematics seem to be questions that can be answered empirically and thus are not entirely dependent on value judgments. In contrast, questions regarding timing of acquisition of specific skills, though possibly related to periods of sensitivity (as found in the acquisition of language), seem more dependent on societal expectations regarding the kind of problems children of particular ages can be expected to solve. Furthermore, the question of necessary skills and concepts is of particular importance for children with developmental difficulties. At present, diagnoses are often made on the basis of mathematical performance that is poorer than would be expected from the child's general intellectual abilities. However, even here, judgment of competence will likely be influenced by ideological beliefs regarding curricular orientation. As Geary (2014)

argued, systems that emphasize conceptual understanding tend to place less importance on procedural fluency, with deficits in arithmetic fact retrieval not considered a serious concern.

### 3.1.3 Effect of remedial on students' competences

An important contribution in this regard is given by the Jenkins, Zeidenberg, and Kienzl (2019) study conducted by the Community College Research Center (CCRC) at Teachers College, Columbia University, on the outcomes of the Integrated Basic Education and Skills Training programme (I-BEST). Under the I-BEST model, basic skills instructors and college-level career-technical faculty jointly design and teach college-level occupational courses for adult basic skills students. Instruction in basic skills is thereby integrated with instruction in college-level career-technical skills. The I-BEST model “challenges the conventional notion that basic skills instruction ought to be completed by students prior to starting college-level courses”. The approach thus offers the potential to accelerate the transition of adult basic skills students to college programmes. Complete College America (Center 2012) has also concluded that this is a promising approach; they suggest that students with few academic deficiencies should be placed in college-level courses with corequisite built-in supports such as just-in-time tutoring and required self-paced computer labs. 10 While Jenkins, Zeidenberg, and Kienzl (2019) find positive effects of the programme on educational outcomes (college credits, occupational certificates, basic skills), it should be borne in mind that the methodology (using observational approaches) does not necessarily allow for correction of potential selection bias caused by unobserved characteristics.

### 3.2 Empirical Literature

This parts related to review what other researchers said about what they found out in line with this research. Among the literary works reviewed include journals, books and theses. This research on one hand, tried to look at what others researcher identified and added some statements about the results of theirs researches. The researcher, on the other hand, referred to the documents research for instance; internet, resources books and others, in order to know really what was related to the study being conducted.

The study conducted by (Haskell, 2014) on effects of remedial activities on students competences , that remedial programme can only be successful if teachers are part of the team driving this process (Gallagher & Long, 2014).While some studies point out that teachers' attitude to remedial programme is typically positive (Avramidis, 2014)

other studies reveal that teachers' attitude may be influenced by the disquiet they experience regarding the impact such a process will have on their time and skills (Kuester,2000). Researchers note that teachers may resist remedial programme on account of inadequate training (Heinman, 2010). This may result into lowered teacher confidence as they plan for it. Teachers who have not undertaken training on remedial programs may exhibit negative attitude towards the program (Reusen, 2014) while increased training could be associated with more positive attitude towards remediating weak pupils.

Educating students is the core reason for all teaching-learning processes which is undertaken in each classroom in the formal education platform. However, not all the students can accommodate the learning processes and this result with different outcomes. With this in mind, teachers need to create an intervention plan and not let these other students fall behind and still catch up with the lessons being discussed. A remedial class is always an impressive way to solve this common problem. That is why Thilges and Schmer (2020) provided a concept analysis of formal remediation wherein he established a framework for defining the concept, developing measurable outcomes, and describing when to implement the intervention. This is important so that there is a consistent and systematic way of delivering the remedial class.

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#### 4. Methodology

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#### 5. Findings and Discussions

##### Use of Real Resources Motivate Me to Understand Mathematics in Real Life Situation

**Table 1.** Use of real resources motivate me to understand mathematics in real life situation

		Frequency	Valid Percent
Valid	Strongly Disagree	4	4.0
	Disagree	8	8.1
	Neutral	2	2.0
	Agree	27	27.3
	Strongly Agree	58	58.6
	Total	99	100.0

**Source: Primary data, 2023**

Also this table shows use of real resources to motivate learners, 4% disagree strongly with this statement, 8.1 % disagree with this statement, 2.0% are neutral about this statement, 27.3% agree with this statement, 58.6% agree strongly with this statement. As you see majority of respondents agree strongly with this statement which means that there use of real resources in learning as improvisation which read to creativity and innovation as competences.

### Use of Practical Motivate Me to Improve the Level of Competence in My Daily Life of Learning

**Table 2.** Use of practical motivate me to improve the level of competence in my daily life of learning

	Frequency	Valid Percent
Valid	Strongly Disagree	2
	Disagree	2
	Neutral	2
	Agree	46
	Strongly Agree	47
	Total	99
Total	100	100.0

**Source: Primary data, 2023**

This table shows how practical is used in teaching and learning process in terms of remedial activities. 2.0% disagree strongly with this statement, 2.0% disagree with this statement, 2.0% are neutral, 46.5% agree with this statement, 47.5% agree strongly. This means that practical is used in associating what learners learn with daily life of students which lead to development of problem solving as one of competences.

### Use Of Creative And Innovation Motivate Me To Apply Mathematics In Real Life Situation.

**Table 3** Use of creative and innovation motivate me to apply mathematics in real life situation.

	Frequency	Valid Percent
Valid	Strongly Disagree	8
	Disagree	15
	Neutral	2
	Agree	48
	Strongly Agree	26
	Total	99
Total	99	100.0

**Source: Primary data, 2023**

By considering this table, 8.1% disagree strongly with this statement, 15.2% disagree with this statement, 15.2% disagree, 2.0% are neutral, 48.5% agree, 26.3 agree strongly. Most of respondents agree with this statement at the rate of 48.5%. This means that by creativity and innovation lead to problem solving as competences.

**How remedial activities on schools’ students’ competences in mathematics at your school.**

**Table 4** How remedial activities on schools’ students’ competences in mathematics at your school

		Frequency	Valid Percent
Valid	Excellent	33	33.3
	Very good	41	41.4
	Good	14	14.1
	Fair	11	11.1
	Total	99	100.0
Total		100	

**Source: Primary data, 2023**

As this table shows how remedial activities on schools ‘students where 33.3% responded that they are used in excellent way, 41.4 % is used in very good manner, 14.1 % good, 11.1 % is used in good way. As it is indicated by this table most of respondents confirmed that remedial activities are used which lead to competences development.

**At your school remedial activities facilitate you to be creative in mathematics**

**Table 5.** At your school remedial activities facilitate you to be creative in mathematics

		Frequency	Valid Percent
Valid	Yes	99	100.0

**Source: Primary data, 2023**

With thanks to this tale as it shows how school remedial activities facilitate to be creative, all respondents at the rate of 100% agreed this statement this means that creativity as competence. This means that remedial activities facilitate creativity in mathematics.

**5.1 level of competences required in mathematics in public secondary schools and effects of remedial activities.**

**Table 6.** Use of Creative and innovation help me to improve students to be creative and innovators in daily learning mathematics

	Frequency	Valid Percent
Agree	5	35.7
Valid Strongly Agree	9	64.3
Total	14	100.0

Source: Primary data, 2023

Also with regard of this table, 35.7% of respondents agree that they use creative and innovation in teaching process while 64.3% agree strongly. This means that creative and innovative are developed due to remedial activities implemented by teacher.

**Table 7.** Use of cooperation facilitate me to collaborate with students and students between them in their learning mathematics

	Frequency	Valid Percent
Agree	6	42.9
Valid Strongly Agree	8	57.1
Total	14	100.0

Source: Primary data, 2023

Also this table shows how cooperation facilitates to collaborate with students, 42.9% of respondents agree with this statement, 57.1% disagree with this statement. Hence majority of respondents agreed strongly with this means that cooperation is used in remedial activities which lead to development cooperation competence.

**Table 8.** The use of Creative and innovation students to be creators in daily learning mathematics

	Frequency	Valid Percent
Agree	5	35.7
Valid Strongly Agree	9	64.3
Total	14	100.0

Source: Primary data, 2023

Also this table shows how creative and innovation is used in teaching process especially in remedial context, 35.7% agree with this and 64.3% agree strongly. this means that creativity and innovative are developed among learners due to remedial activities.

**Table 9 Use of realization resources facilitate me to improve students to use of real resources/improvisation**

	Frequency	Valid Percent
Neutral	1	7.1
Agree	11	78.6
Valid Strongly	2	14.3
Agree		
Total	14	100.0

Source: Primary data, 2023

Basing on this table which indicates, 7.1% are neutral, 78.6% agree while 14.3%. This means that real resources are used as improvisation which to creativity and innovation due to implementation of remedial program.

**Table 10 . Use of long life learning guide me to motivate learners to discovery new skills in daily learning**

	Frequency	Valid Percent
Strongly disagree	1	7.1
Disagree	1	7.1
Valid Neutral	1	7.1
Agree	6	42.9
Strongly Agree	5	35.7
Total	14	100.0

Source: Primary data, 2023

As this table shows how lifelong learning to motivate learners, 7.1% disagree strongly with this statement, 7.1% disagree, 7.1% are neutral, 42.9% agree, and 35.7% agree strongly. Many of respondents agree with this statement. This means that lifelong learning is used to update knowledge of students.

**Table 11.** Use of digital numeracy motivate me to facilitate learners to increase the level of competences.

	Frequency	Valid Percent
Neutral	1	7.1
Agree	9	64.3
Valid Strongly Agree	4	28.6
Total	14	100.0

**Source: Primary data, 2023**

By help of aforementioned table as it shows how digital numeracy is used by the teacher, 7.1% of respondents are neutral, 64.3% agree, 28.6% agree strongly. This indicates that digital numeracy is used to motivate learners.

## 5.2 Findings from interview

### **The remedial activities used by teachers in public secondary schools.**

Yes, teachers use digital numeracy is used by allowing learners to access graphs, table and charts in teaching and learning process to allow learners to obtain information related to mathematical course. Cooperation and life skills are used in our school to allow learners to share knowledge and experience which facilitate learners to discover in mathematics subject with help of that collaboration. At my school use of real resources or improvisation is used is used by taking local materials such as tree to make circle which helps learners to be creative and innovative. It means that local materials are used to make mathematics to be concrete instead of being abstract.

### **The level of competences are acquired in Mathematics**

By using improvisation, students complete their tasks because they are given time to bring that creativity and innovation. The students collaborate in their respective group as means of creating and improving their skills in mathematics subjects. In that collaboration they share ideas and relevant experience. Our school facilitate learners to be competitive and develop their competences by providing complex tasks which develop different competences. complex is not complicated task but is task which allow learners to develop different competences such as creativity, innovation , problem solving and critical thinking.

## The effect of remedial activities on student's competences in Mathematics

By use of real resources or improvisation motivate learners by being familiar with local materials as they see that it is normal because they always see those materials. Cooperation and life skills used to discover new skills by sharing ideas with their classmates hence they get new knowledge from each other. Another information from remedial activities we have learners come from far o their homes then it is difficult to attend remedial course some time they are not at the same with those who do it.

## 6. Conclusions

Finally, as we have seen above, remedial activities contribute to development of competences such as innovation, creativity, problem solving, cooperation and collaboration. Once remedial activities are applied in good way learners obtain adequate competences that should be applied in their daily life.

## 7. Recommendations

The findings of this study are recommending different organs the following:

**To Rwandan Education Board and school:** REB as well as school level are recommended school to use remedial activities and school level applies this program in order to facilitate learner to increase their achievement and encourage their learning.

**To teachers of mathematics:** Teachers should always make sure that students feel comfortable with the method they are using in teaching mathematics to facilitate learners to solve daily problems. Teachers should mobilize their students and teachers to attend remedial activities. Teachers give more exercises, practical activities, and home works. Teachers encourage students to learn and like Mathematics subjects as an important subject in daily life.

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