

# **INFLUENCE OF PSYCHOPEDAGOGIC FACTORS ON STUDENTS' MATHEMATICS ACHIEVEMENT IN SECONDARY SCHOOLS IN THE SOUTH WEST REGION OF CAMEROON**

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**Abstract**

The study sets out to investigate the influence of psychopedagogic factors on students' Mathematics achievement in Secondary schools in the South West Region of Cameroon. The specific objectives were to find out the influence of teacher's knowledge, and motivation on students' mathematics achievement in secondary schools. The study was a descriptive cross-sectional survey which utilized a sample of 64 mathematics teachers and 384 form 5 students drawn randomly from 53 purposively selected Government, Denominational and Lay Private Secondary Schools in Fako, Meme, Ndian and Kupe-Muanenguba Divisions. The study utilized two, 4-point Likert scale instruments (Mathematics Achievement Teacher's Opinion Questionnaire- MATOQ and Mathematics Achievement Student's Opinion Sheet- MASOS). The validity of the instruments was done by administering 10 copies of MATOQ to 10 mathematics teachers and 15 copies of MASOS to 15 form 5 students who formed part of the population but were not included in the sample. The reliability of both instruments stood at 0.86 for MATOQ and 0.77 for MASOS calculated using Chronbach  $\alpha$  test and read at  $\alpha < 0.05$  level of significance. For MATOQ data were analyzed inferentially using one sample t - test analysis while for MASOS descriptive statistics made use of Mean response scores (MRS) and standard deviations (S). Both tools utilized the SPSS for data analysis. When the objectives were tested, teacher's knowledge was found to have a higher influence on students' Mathematics achievement when compared to student's motivation. The findings were that Psychopedagogic factors have a high influence on students' Mathematics achievement in secondary schools. When the hypotheses were tested, it was found that, there is a more significant influence of motivation on students' Mathematics Achievement when compared to teacher's knowledge. The general findings were that, there is a significant influence of psychopedagogic factors on students' Mathematics achievement in Secondary Schools in the South West Region. The study recommended that: mathematics teachers should regularly update their knowledge, at least once yearly, in order to keep pace with the exigencies in content and pedagogy; Government should organize more of these seminars regularly to equip teachers with requisite knowledge and skills. Teachers should intensify the use of both intrinsic and extrinsic motivation techniques in Mathematics classrooms so as to make the learning of the subject attractive to learners. Government should provide more of these facilities in schools, and so on.

**Keywords** Influence, Psychopedagogic Factors, Achievement.

**INTRODUCTION**

Achievement is the driving force behind every endeavour in life. No human being has ever dared to venture into a task in order to fail. All human effort in our walk in life is geared towards achievement in one way or the other. Within the years, achievement in Mathematics in secondary schools in the South West has been observed to be low compared to other compulsory subjects, English Language and French. Top Hat (2024), describes academic achievement as academic outcomes that indicate the extent to which a student has achieved their learning goals. Or it is the extent to which a student or institution has achieved either short or long term goals, measured through student's grade point average or the institution's graduation rates. Webster (2024) views achievement as the act of achieving something, a result gained by effort, the quantity

and quality of a student's work.

Chakravarthi (2020) views Mathematical Achievement as the outcome or performance of students in mathematics. It is measured using tools like the Achievement Test in mathematics (ATM) developed for this purpose. According to Tafuzie (2023), Mathematic achievement refers to the level of success in Maths skill. It is influenced by factors such as self-efficacy, parental support, and school status but not by ability grouping. Bapes (2014) views it as the competence of the student in mathematics at the end of a school year, aimed at achieving three main competencies: student's mathematics competency, display a logical reasoning and communicate using Mathematical Language. It is also viewed as the Student's mathematics performance/score/grade; interest

in Mathematics, and so on (OECD-PISA: Organization of Economic Cooperation and Development -Program for International Student Assessment, 2018).

Mathematics is the science and study of quality, structure, space and change. Mathematicians seek out patterns, formulate new conjectures, and establish truth by rigorous deduction from appropriately chosen axioms and definitions. The best definition states that mathematics is the science of structure, order, and relation that has evolved from elemental practices of counting, measuring, and describing the shapes of objects (Tennessee Tech University, 2022). It is also defined as the science of numbers and how they are related to each other and to the real world. Mathematics is as important as language. In fact, people sometimes describe Mathematics as a kind of language (Esu, 2015).

The knowledge of Trigonometry, Geometry and Calculus is fundamental to the study of Physics, and Engineering, Mathematics Language is crucial to the study of Economics; statistical Methods cannot be eluded from Social Science and management sciences, the use of Logic is important to the study of philosophy and law too. The use of sequence and series is fundamental to the study of music and Fine Art to name but a few. The aforementioned show that the acquisition of Mathematical knowledge is not for the sake of knowledge, but also in its application in other areas (Sidhu, 2008). The discipline of Mathematics as a school subject is known as the queen of the sciences due to the Mathematical tools used in other subjects. This is also evident in the transfer of knowledge in Mathematics to the solution of the problems of other subjects (Sidhu, 2008; Nekang, 2016).

The teaching of Mathematics as a school subject is very useful, and universal in nature. The subject inculcates some values like appreciation (in sets)

cooperation (algebra), accuracy (statistics, geometry, analysis), and logical reasoning (analysis be it analytical or geometrical) which are preserved for cultural advancements in Mathematics. Hence the purpose and functional nature of the knowledge of Mathematics justifies its existence as a discipline worthy of study (Esu, 2015).

In spite of these values enumerated above, many secondary school students are not achieving well in Mathematics. This is an age-old problem. There are many factors that account for this poor achievement in Mathematics. However, one factor that has not been paid much attention in research is psychopedagogic factors.

Psychopedagogy is a comprehensive discipline that combines psychology and pedagogy to identify, understand, and address learning and development difficulties in individuals. Its interdisciplinary approach makes it a key tool to promote the educational success of students at all levels. Its approach focuses on the individual as a unique being considering their peculiarities, potentialities, and specific needs. This allows for the design of personalized interventions that fit each case, promoting meaningful learning and favouring school success (El Bueno, 2023). Its importance lies in its usefulness in the educational field; evaluation and diagnosis, interdisciplinary collaboration, psychopedagogical interventions to individuals of any age is necessary in the treatment of learning problems that arise in their academic development and for their functional life (El Bueno, 2023).

The following are indicators of Psychopedagogy and their definitions: teaching methods (teaching methods in Mathematics), teacher's knowledge in mathematics ( that is, knowledge of subject matter, content knowledge, curricular knowledge, general pedagogic knowledge, and pedagogic content knowledge), social representations of

Mathematics, self-efficacy, motivation (choice, effort, persistence, and level of achievement, rewards, feedback, punishment, and so on) , evaluation and others (Geoff, 2004; Tambo, 2003; Nekang, 2016; Shulman, 1987; Farrant, 2009; Kweku, Quansah & Nugha, 2020; Gustavo, Valle, Crisologo & Tirado, 2016 and 2021 & Courtney, 2015). Amongst these factors, teacher's knowledge and student's motivation have attracted much attention to educators.

Teacher's knowledge is defined as the 'pedagogical knowledge base' of teachers and includes all the required cognitive knowledge for creating effective teaching learning environments (Hill, Rowan & Ball, 2004 & 2005). University of San Diego (2024) suggests that there are seven categories of knowledge bases (core types of teacher's knowledge): content knowledge; general pedagogic knowledge; curriculum knowledge; pedagogical content knowledge; knowledge of learners and their characteristics; knowledge of educational contexts; and knowledge of educational ends (Shulman, 1987).

Content knowledge refers to the body of knowledge, facts, theories, principles and ideas, vocabulary, which teachers must master to be effective (Cooper & Alvarado, 2006; Bold et al, 2017). Subject Matter in Mathematics or Mathematical subject matter refers to knowledge of the discipline's body of concepts, procedures, and processes of delivering results and warrants for these processes (Adler & Venkat, 2020). Esu (2015) defines curriculum content (knowledge) as the knowledge, skills, values and attitudes that the curriculum seeks to achieve in learners. The Flinders University (2014) describes curriculum content to involve the following, the knowledge (concepts, ideas, interpretations, applications) that could enable learners to achieve the intended outcomes; the generic process knowledge and skills the student could acquire; the balance of

content; depth/breadth, knowledge/skills and processes/values. Pedagogic Content knowledge is the knowledge which integrates the content knowledge of a specific subject and the pedagogical knowledge for teaching that particular subject. Pedagogical knowledge refers to the specialized knowledge of teachers for creating effective teaching and learning environments for all students (Hill, Rowan & Ball, 2005; Baumert et al., 2010) and others.

Motivation is arousal, selection, direction and continuation of behaviour (Biehler & Snowman, 2000). Motivation is stimulation for pupils to learn, for example (a) by rewarding them whenever they do well, (b) by punishing them whenever they do badly, (c) success, and so on. Intrinsic motivation is when someone is internally motivated to learn. This type of motivation is more sustaining than would be the extrinsic type which depends on external forces that are outside the learner (Tchombe, 2004). To Maslow (1970), motivation is the drive towards self-actualization. Self-actualisation needs make actual what one is potentially. It is the need to realize one's fullest potential. Wood, Wood and Boyd (2005) define motivation as all the processes that initiate, direct and sustain behaviour. Motives are needs or desires that energize and direct behaviour towards a goal. Geoff (2004) defines motivation as the reasons students would want to learn, such as: what I am learning is useful to me; the qualification for which I am studying is useful to me; and so on.

Government policy prescribes the Competency Based Approach from a situated perspective (through real life situations) exploited using the explicit teaching strategy as the main teaching method recommended. The approach is elaborated in the New Mathematics Syllabuses of Secondary Schools in Cameroon (Bapes, 2014). In it, the outcome or profile/expectation of the learner, at the end of the first cycle, requires him/her to use

Mathematical knowledge, skills and values with confidence to solve real life problems within the different domains of life, communicate concisely and unambiguously and develop power of mathematical reasoning (logical thinking, accuracy, and spatial awareness). So Mathematics teachers ought to teach in ways which enables learners achieves the four skills by the use of all the knowledge categories for a desired achievement to be feasible (Bapes, 2014).

Teacher's quality is thus a prerequisite parameter for improved Mathematics outcome and this can be judged from the profile of Mathematics teachers in the various schools. In secondary schools in Cameroon, Mathematics is taught by five grades of teachers, namely: the least Advance Level holders and/or CAPIEMP/CAPIET (Grade 1 teachers from Teacher Training Colleges) holders to the highest M.Ed. (Masters of Education Degree) holders trained in the faculty of education or/DIPES II (Diploma of High School Teachers) holders those from the second cycle of the higher teachers training college. The type of training received determines the level of teacher's knowledge, and so on that the teacher demonstrates in the teaching of Mathematics in the classroom (Felicia, Lasiele & Henry, 2018). However, those teaching with Advance Level certificates and degrees with non-educational courses have only content knowledge in Mathematics since they are not formally trained (African Institute of Mathematical Sciences-Teacher Training Programs, AIMS-TTPs, 2020; Tchombe, 2011).

They are also expected to motivate learners to show interest in their Mathematics lessons. The common observation is that many arts students are not interested in Mathematics while science students are. Some reasons that might be responsible for this are: the nature of the subject (figures, symbols, formulae) make some students consider the subject to be difficult, career choice,

poor orientation, indifference, anxiety, peer influence, negative advice from parents, poor teaching methods/strategies, and so on, are others. Teachers in secondary schools are therefore expected to use appropriate motivational strategies in order improve Mathematics achievement to the desired level (Yeh, Cheng, & Chan, 2019).

AIMS-TTP, MasterCard Programs (2020) points out that one of the challenges of effective teaching and learning of Mathematics in secondary schools is poor performance of learners in the subject seen as follows: below 50% pass from 2013-2019, 8.34% in 2016 and 9.4% in 2014, 64.04% in 2020 being the highest, 59.08% in 2021 and 53.41% in 2023, depicting a falling trend (GCEB, 2013-2023). The researcher ponders whether this is as result of the following factors: Teachers do not readily use the participatory teaching methods such as questioning, collaborative learning, feedback, which are key methods for interacting and engaging with students. According to (Lyonga, 2020) despite the emphasis on the digitalization of teaching and learning, some Mathematics teachers still lack ICT skills to both manage and facilitate instructions. Teacher's understanding of students and effective teaching strategies, lack of prerequisite knowledge by students, nonchalant attitude of some students, inability to make connections to real world contexts (Chris, 2021), Mathematics teacher shortage in large schools and the suburbs especially, poor background, and so on, are other challenges.

The researcher ponders whether if teachers and learners overcome these challenges and teach mathematics in accordance with the stipulations of the official syllabus, it would improve achievement in the subject in secondary schools. It is in this light that this study sought to find out the influence of psycho-pedagogic factors on students' Mathematics achievement in secondary schools in

the South West Region of Cameroon.

### **Statement of the Problem**

Mathematics is important as it provides an effective way of building mental discipline and encourages logical reasoning and mental rigour. Mathematics knowledge plays a crucial role in understanding the contents of other subjects such as science, social studies, and even music and art. It helps humans solve various problems and meet their needs. It is also used in decision making such as choosing modes of transportation and planning vacations. Mathematics is also essential for understanding and relating mathematical concepts to real life. Mathematics thus plays a crucial role across various domains in the modern world, with notable applications in fields such as business, finance, science, technology and engineering. Mathematical skill is used to compute financial matrices, analyze data for informed decision making and forecast upcoming trends. Mathematics help strengthen reasoning skills and critical thinking. It helps us think analytically about the world and reason logically. The same step you take to understand a problem, identify the known and unknown and then solve it can be applied to other areas of your life.

Many students across the South West Region perform poorly in Mathematics. Many fail in sequence evaluation and final examinations such as the GCE Ordinary Level and similar examinations. Many prefer to have a class for another subject such as English, Economics, History and others than Mathematics. Since 2013, even though there has been a marked improvement in performance in the subject, Mathematics remains one of the subjects with the least performance having a yearly average of 30.8% success rate at the GCE Ordinary Level when compared to English having 45.69% and French having 43.73% pass (GCE Board, 2013-2023).

According to Hannah (2022) several studies have attributed poor achievement of students to the deficiency in teaching methods used by teachers. The possible consequences of a poor background in Mathematics are a high rate of drop out in the subject at the GCE O' Level and related examinations. Others are a high risk of illness, unemployment and incarceration, just like poor literacy is. Having very little knowledge of Mathematics means that success and job options may be limited, which lead to limited income. It also leads to poor business skills, inability to gain admissions into science and technological careers such as engineering, civil aviation, physicians, computer science, and so on. Phobia and hatred for Mathematics are related consequences.

One area that may affect secondary school student's performance in Mathematics is psycho-pedagogic factors. Eba (1985) cited in Nekang (2016) stated that mathematics has been a threat to students because of problems associated with its instruction. Eba rightly said, "The main reasons why so many students hate mathematics and so many fail in it, is because of poor tuition. In many cases, teachers teach mathematics in a rather abstract way because of inadequate preparation, poor teaching methods and lack instructional materials". Thus, the teacher's knowledge, self-efficacy, teaching methods, and student's motivations are critical elements in the achievement of students in Mathematics. This study aims at investigating "influence of psycho-pedagogic factors on students' mathematics achievement in secondary schools". The findings of this study and recommendations may go a long way in improving achievement in mathematics.

### **Purpose of the Study**

To find out the influence of psycho-pedagogic factors on students' Mathematics achievement in secondary Schools in the South West Region.

**Objectives of the Study:** i) To find out the

influence of Teacher's knowledge in mathematics on students' achievement and ii) To find out the influence of students' Motivation on students' Mathematics achievement in secondary schools in the south West Region..

### **Research Questions**

**Main Research Question:** How do psychopedagogic factors influence students' Mathematics achievement in Secondary Schools?

**Specific Research Questions:** i) How does Teacher's knowledge influence students' Mathematics achievement in Secondary Schools? ii) How does student's Motivation influence students' Mathematics achievement in secondary Schools?

### **Research Hypotheses**

**Main Research Hypothesis:** There is no significant influence of psychopedagogic factors on Students' Mathematics achievement in Secondary Schools.

**Specific Research Hypotheses:-:** There is no significant influence of teacher's knowledge on Students' Mathematics achievement in Secondary Schools.

- There is no significant influence of students' motivation on Students' Mathematics achievement in Secondary Schools.

### **Justification of the Study**

The main justification of the study is: The nonchalant attitude and lack of interest in Mathematics by students is a prime reason for the study. The low achievement rate in Mathematics and the need to ensure improvement is a call for concern. The absence of research on psychopedagogic factors and student's mathematics achievement in secondary schools is another obvious reason for this study. The need to create awareness on teacher's roles as psychopedagogues who need to diagnose learners'

difficulties and teach in ways to enable them overcome their learning problems is imperative. The need to sensitize teachers on the regular update of their knowledge and motivational strategies in Mathematics is primordial.

### **Significance of the Study**

A study of this magnitude is significant to the following persons: The study may help students, student teachers and researchers to know the place of mathematics in the curriculum, a core subject of all the sciences and useful in everyday life. It may help teachers and teacher trainers to understand various strategies on how to improve their knowledge, diagnose learners' difficulties, plan content and motivate students to do Mathematics. It may enable parents to see the need of providing Mathematics texts books, coaching, parental support and other school needs to their children. It serves as a manual to Ministries of Education, pedagogic inspectors on how to plan the curriculum of secondary schools.

**Theoretical Framework:** The study is centralized around the following theories: Theory of Cognitive Development (Piaget, 1936), Social Constructivism Theory (Vygotsky, 1968), Social Cognitive Theory/Social Learning Theory (Bandura, 1997), Discovery Learning Theory (Bruner, 1961), Meaningful Learning Theory (Ausubel, 1969) and others.

### **METHODOLOGY**

#### **Research Design**

Kuma (2014) defined research design as the road map that you decide to follow during your research journey to find answers to your research questions as vividly, objectively, accurately and economically as possible. This study employed a descriptive cross sectional study design, also known as one-shot or status study. It made use of both descriptive and inferential statistics.

#### **Area of Study**

The Area of Study is the South West Region specifically in 4 of the 6 Divisions of the South West Region of Cameroon. These include: Fako with headquarters at Limbe, Ndian headquarters Mundemba, Meme headquarters Kumba, and KupeMuanenguba with headquarters Bangem. As of 2015, the South West Region has an estimated population of 1,553, 320 inhabitants and occupying a surface area of 25410 sq.km.

### **Populations of the Study**

The total population of the study consists of 105359 students, that is, 41744 males and 63615 females taught by 12996 teachers (5699 male and 72297 female) of the regular government, denominational and lay private secondary schools in the South West Region. The target population for this study is made of 11851 teachers ( 4950 male and 5901 female ) and 96741 students (37475 males and 59226 female) drawn from 248 secondary schools composed of 104 Government, 31 Denominational and 113 lay private secondary schools in the Four Divisions. The accessible population for this study is 2941 teachers made of 1473 male 1468 female teachers teaching 39049 students divided into 14471 male and 24578 female students selected from 53 secondary schools of the type 24 Government, 12 Denominational and 17 Lay Private secondary schools in the 4 Divisions.

### **Sample and Sampling Method**

The sample of this study comprised of 384 students selected randomly from 39049 students and the 64 Mathematics teachers selected purposively from 2941 teachers of the 53 Government, Denominational and lay private secondary schools in the Four Divisions.

### **Instruments for Data collection**

The study used two Likert scale questionnaires. The first instrument named Mathematics Achievement Student Opinion Sheet-MASOS with

22 items was addressed to the 384 students and it measured students' mathematics achievement in secondary schools. It was divided into four sections- 6 items on Section A- Competency in Mathematics, 6 items on Section B-Logical Reasoning; 5 items on Section C- Communication in Mathematics Language and 6 items Section D- Performance/grade /Interest in Mathematics.

The Second Instrument was named Mathematics Teacher Opinion Questionnaire-MATOQ). It was addressed to the 64 teachers. It was divided into two parts; Part One comprised of Demographic Data-gender, age and qualification in Mathematics occupying the first 3 items. Part two had 5 sections. Each contained items on the indicators of the Independent variable; Psychopedagogic Factors; Section B- 10 items on Teacher's Knowledge and Section E-9 items on Student's Motivation. It had a total of 19 items.

### **Validity of the Instrument**

The instrument was validated by six experts. The valuator examined the items of the instruments to ensure that they were clear and in line with the objectives of the study, as well as the appropriateness of the instruments in terms of the language used. Their valuable observations and corrections were used to design the final versions of the instruments which were used for data collection for the study.

### **Reliability of the Instrument**

The instruments were trial tested in 5 secondary schools which were out of the main sample population. A sample of 15 form five students and 10 Mathematics teachers in these secondary schools in Fako Division was randomly and purposively selected for this purpose. The researcher administered 15 instruments of MASOS to the 15 students while 10 instruments of MATOQ were administered to the 10 teachers. After the administration, the internal consistency reliability



of the instruments was estimated using Cronbach Alpha method. The estimates of the various clusters of the instruments were calculated and the overall reliability of the instruments gave a coefficient of internal consistency of  $\alpha = 0.77$  for MASOS and 0.86 for MATOQ.

**Method of Data Analysis**

Mean and standard deviations were used to answer the items of MASOS, the Objectives and the research questions while t-test was used to test the formulated hypotheses at  $p < 0.05$  level of significance. The “significance” influence of psychopedagogic factors on the students’ achievement in Mathematics was determined by comparing the t-calculated value to the t-critical value of 1.960 read at  $df = 63$ . The influence was categorized using mean ratings; 0- 1.5 = low level of influence; 1.6-2.5 = moderate level of influence; and 2.6- 4.0 = high level of influence. The decision for opinion was got by comparing the MRS of the opinion to 2.5. A  $MRS > 2.5$  means respondents Agree to the opinion, otherwise, they disagree.

**Presentation of Findings**

The presentation of findings was done as follows: Presentation of Tables of responses on mathematics achievement students’ opinion (MASOS), tables of responses on Mathematics teacher opinion questionnaire (MATOQ) for teacher’s knowledge and student’s motivation, verification of hypotheses of the two indicators including t-tables, Summary of findings of the two indicators and Mathematics achievement.

**Mathematics Achievement Student’s Opinion Sheet (MASOS) – the Dependent Variable.**

Tables 1-4 are based on the findings from the responses of students in the MASOS, the dependent variable. This was made of four indicators as seen in the statistics below:

**Competency in mathematics**

The table below shows responses on the indicator competency in Mathematics (solve problems in real life, give accurate judgment, and so on) in Secondary Schools in South West Region of Cameroon.

Table 1

*Students’ opinion on competency in Mathematics*

SN	Competency in mathematics	$\bar{X}$	S	Decision
1	My Knowledge in Mathematics enables me to understand diverse problems in real life.	3.05	.86	A
2	Mathematics knowledge enables me draw definite plans to solve particular problems.	3.08	.83	A
3	With my Mathematics knowledge I have abilities to provide solutions to all life challenges.	2.52	.94	A
4	Mathematics knowledge enables me to fit successfully in the job market.	3.33	.80	A
5	After studying Mathematics, I can give accurate judgment to life challenges.	2.52	.91	A
6	I can relate knowledge to real life situation.	2.95	.84	A
	<b>MRS</b>	<b>2.91</b>	<b>.87</b>	<b>A</b>

MRS = Mean response score     $\bar{x}$  = Mean score    S = Standard deviation

The table above shows that learners agree to all the opinions, indicating that, students have competency in Mathematics to solve problems in real life in Secondary Schools in the South West Region ( $\bar{x} = 2.91 \pm .87$ ).

The table below shows responses on the Logical Reasoning in Mathematics (Mathematical Thinking) in Secondary Schools in South West Region of Cameroon.

**Logical Reasoning in Mathematics.**

**Table 2**

*Students' opinion on Logical Reasoning in Mathematics*

SN	Logical Reasoning in mathematics	$\bar{X}$	S	Decision
1	I always present my ideas coherently when solving Mathematics problems.	2.99	.87	A
2	With the skills gained, I am always curious in solving mathematics problems.	3.05	.88	A
3	Due Knowledge gained in Mathematics I often think critically when solving problems.	3.02	.88	A
4	With Mathematics knowledge gained, I can take initiative when face with challenges.	2.76	.89	A
<b>MRS</b>		<b>2.95</b>	<b>.88</b>	<b>A</b>

MRS = Mean response score     $\bar{x}$  = Mean score    S = Standard deviation

The table shows that learners agree with all the opinions the construct, meaning that students have logical reasoning in Mathematics (Solve problem in real life) in Secondary Schools in the South West Region of Cameroon ( $\bar{x} = 2.95 \pm .88$ ) > 2.5, the Decision level.

**Communication in Mathematical Language (Maths Fluency)**

The table below shows communication in mathematical language in Secondary Schools in South West Region of Cameroon.

**Table 3**

*Students' opinion on communication in mathematical language*

SN	Communication in mathematical language	$\bar{X}$	S	Decision
1	Mathematics knowledge enables me to be concise in my speech.	2.45	.77	D
2	With the knowledge gained, I can interpret concepts and symbols used in mathematics correctly.	3.20	.93	A
3	During discussion in Mathematics lessons I participate fully.	2.88	.93	A
4	I always answer questions in Mathematics correctly.	2.42	.93	D

5	Knowledge acquired in mathematics enables me to explain concepts, symbols, definitions and facts clearly.	3.03	.86	A
6	I am fluent in speech when answering questions in Mathematics.	2.66	.84	A
<b>MRS</b>		<b>2.77</b>	<b>.91</b>	<b>A</b>

MRS = Mean response score     $\bar{x}$  = Mean score    S = Standard deviation

The table shows that learners are in agreement to all opinions in the construct; meaning that, communication in mathematical language help learners to perform well in Secondary Schools in the South West Region ( $\bar{x} = 2.77 \pm .91$ ) > 2.5, the

decision level.

**Performance/Grade/ interest in Mathematics**

The table below shows performance/grade in Mathematics in Secondary Schools in South West Region of Cameroon.

Table 4

*Students' opinion on Performance/grade in Mathematics*

SN	Performance/grade in in mathematics	$\bar{X}$	S	Decision
1	Knowledge in Mathematics has enabled me to always pass in my test.	2.86	.87	A
2	With this Knowledge I will score a good grade at the Mock /GCE examinations.	3.19	.88	A
3	Mathematics knowledge enables me to answer questions correctly during mathematics lessons.	3.08	.80	A
4	With knowledge gained in mathematics I always excel in calculation games/activities.	3.00	.88	A
5	My knowledge in Mathematics enables me to generate more interest in the subject.	3.10	.92	A
6	Based on the mathematics skills acquired I always earn awards during contests.	2.29	.96	A
<b>MRS</b>		<b>2.92</b>	<b>.88</b>	<b>A</b>

MRS = Mean response score     $\bar{x}$  = Mean score    S = Standard deviation

The table shows that learners agree with all the opinions in the items. By implication, learners perform and score good grades in Mathematics when psycho pedagogic factors are applied during lessons in Secondary Schools in the South West Region of Cameroon ( $\bar{x} = 2.92 \pm .88$ ) > 2.5, the

decision level.

Summarily, from the responses and the values of the  $\bar{x}$ =MRS and SDs of the indicators of the Mathematics Achievement students' opinions sheet (MASOS) above, each MRS > 2.5 and the calculated average mean respond score which is

2.885 (AMRS=2.885) is also greater than (> 2.5) the decision level. Implying, learners agree that they have the competencies for achievement in Mathematics after studying Mathematics in Secondary schools. Conclusively learners have achievement in Mathematics in secondary schools in the South West Region of Cameroon.

**Objective one: The influence of Teachers' knowledge in mathematics on students' Mathematics achievement in secondary schools.**

The table below shows teacher's opinions on Teachers' knowledge of mathematics in Secondary Schools in South West Region of Cameroon.

**Table 5**

*Teachers' opinion on Teachers' knowledge in Mathematics*

<b>SN</b>	<b>Teachers' knowledge in mathematics</b>	$\bar{X}$	<b>S</b>	<b>Decision</b>
1	As a Mathematics teacher, I master all the topics in the mathematics syllabus of my class.	3.20	.80	A
2	Mathematics teachers usually employ knowledge of instructional theories when facilitating instruction.	3.22	.74	A
3	As a Mathematics teacher I usually plan my lessons before teaching.	3.64	.60	A
4	I often adapt my lessons taking into consideration environmental context.	3.02	.81	A
5	I often explain concepts fluently when teaching Mathematics.	3.41	.66	A
6	I usually employ a variety of instructional strategies when teaching Mathematics lessons.	3.27	.72	A
7	I often use knowledge of classroom control to boost achievement in Mathematics.	3.27	.70	A
8	I make use of values relevant to the society in my Mathematics.	3.16	.76	A
9	As a mathematics teacher I always relate content to real life when teaching.	3.39	.70	A
10	I often ensure that I cater for the diversity of learners when delivering my lessons.	3.31	.64	A
<b>MRS</b>		<b>3.29</b>	<b>.71</b>	<b>A</b>

MRS = Mean response score     $\bar{x}$  = Mean score    S = Standard deviation

The table shows that Mathematics teaches master all the topics in the mathematics syllabus, employ knowledge of instructional theories when facilitating instruction, usually plan lessons before

teaching, often adapt lessons taking into consideration environmental context, and explain concepts fluently when teaching Mathematics. They usually employ a variety of instructional

strategies when teaching Mathematics lessons, use knowledge of classroom control to boost achievement in Mathematics, make use of values relevant to the society, always relate content to real life when teaching, and cater for the diversity of learners when delivering lessons. Conclusively, Teachers' knowledge in mathematics has a high influence on students' Mathematics achievement in Secondary Schools in the South West Region of

Cameroon ( $\bar{x} = 3.29 \pm .71$ ).

**Verification of Hypotheses one**

**H<sub>02</sub>:** There is no significant influence of Teacher's knowledge on students' Mathematics achievement in secondary Schools in the South West Region of Cameroon.

**Table 6**

*The influence of teacher's knowledge on Students' mathematics achievement*

Variable	N	$\bar{X}$	S	Std Er	T	df	Sig. (2-tailed)
Teachers' knowledge	64	32.88	4.40	.549	59.839	63	.000

$\bar{x}$  = Mean score, t = t-calculated value, df = degree of freedom, Std Error = Standard Error

The one-sample t-test analysis shows that the  $t_{cal. value} = 59.839$  is greater than the  $t_{crit. value} = 1.960$  at  $\alpha < .05$  level of significance, with degree of freedom (df) = 63. We therefore reject the null hypothesis and conclude that there is a significant influence of teachers' knowledge on students' Mathematics achievement in secondary Schools in the South

West Region of Cameroon.

**Objective one: The influence of motivation in mathematics on students' Mathematics achievement in secondary schools.**

The table below shows teacher's opinions on motivation in mathematics in Secondary Schools in South West Region of Cameroon.

**Table 7**

*Teachers' opinion on student's motivation in Mathematics.*

SN	Motivation in mathematics	$\bar{X}$	S	Decision
1	I always reward learners with (marks, gifts, etc.) so that they can do better.	3.16	.88	A
2	I often use challenging task to encourage students learn mathematics better	3.11	.67	A
3	I often use positive comments to boost performance learners.	3.45	.56	A
4	When students are punished their performance increases.	2.67	.96	A

5	I always give prompt feedback to learner’s responses.	2.67	.69	A
6	I sometimes allow students to make a choice in the task to under-take during mathematics lessons.	2.67	.85	A
7	As a Mathematics teacher I am often encourage learners to make an effort in order to overcome challenge.	3.36	.60	A
8	Students who are persistent in solving challenging problems in Mathematics perform better at the end.	3.67	.54	A
9	When learners are encouraged to work hard their achievement level increases subsequently.	3.70	.52	A
<b>MRS</b>		<b>3.15</b>	<b>.70</b>	<b>A</b>

MRS = Mean response score  $\bar{x}$  = Mean score S = Standard deviation

The table shows that Teachers reward learners with marks, gifts, praises, and so on, so that they can do better, use challenging task to encourage students learn mathematics better, use positive comments to boost performance learners. Teachers give prompt feedback to learners’ responses and sometimes allow students to make a choice in the task to under-take during mathematics lessons. Mathematics teachers often encourage learners to make an effort in order to overcome challenge. Students who are persistent in solving challenging problems in Mathematics perform better at the end. When learners are

encouraged to work hard their achievement level increases subsequently. To conclude, motivation in mathematics has a high influence on students’ Mathematics achievement in Secondary Schools in the South West Region of Cameroon ( $\bar{x} = 3.15 \pm .70$ ).

**Verification of Hypotheses two**

**H<sub>02</sub>:** There is no significant influence of student’s motivation in mathematics on students’ Mathematics achievement in secondary schools in the South West Region of Cameroon.

Table 8

*The influence of student’s motivation on mathematics achievement.*

Variable	N	$\bar{X}$	S	Std Er	T	df	Sig. (2-tailed)
Motivation	64	28.375	3.13	.391	72.536	63	.000

$\bar{x}$  = Mean score t = t-calculated value df = degree of freedom Std Error = Standard Error

The one-sample t-test analysis shows that the  $t_{-cal.}$  value = 72.536 is greater than then the  $t_{-crit.}$  value =

1.960 at  $\alpha < .05$  level of significance, with degree of freedom (df) = 63. We therefore reject the null hypothesis and conclude that there is a significant influence of motivation in mathematics on students' Mathematics achievement in secondary Schools in the South West Region of Cameroon.

**Table 9**

**Summary of Findings**

The table below presents the summary of findings for the study.

*Summary of Findings*

S/N	Research Questions	$\bar{x}$ and s –values	Conclusion
1	What is the influence of Teachers' knowledge in mathematics on students' Mathematics achievement in secondary schools?	$\bar{x} = 3.29 \pm .71$ $t_{-cal. value} = 59.839$	Teachers' knowledge in mathematics has a high influence on students' Mathematics achievement in Secondary Schools in the South West Region of Cameroon. There is a significant influence of teachers' knowledge on students' Mathematics achievement in secondary Schools in the South West Region of Cameroon.
2	What is the influence of motivation on students' Mathematics achievement in secondary schools?	$\bar{x} = 3.15 \pm .70$ $t_{-cal. value} = 72.536$	Motivation in mathematics has high influence on students' Mathematics achievement in Secondary Schools in the South West Region of Cameroon. There is a significant influence of motivation in mathematics on students' Mathematics achievement in secondary Schools in the South West Region of Cameroon.

**Mathematics Achievement Students' Opinion (MASOS)**

Competency in Mathematics	$\bar{x} = 2.91 \pm .87$	Students have competency in Mathematics to solve problem in real life in Secondary Schools in the South West Region of Cameroon.
Logical Reasoning in Mathematics	$\bar{x} = 2.95 \pm .88$	Students have logical reasoning in Mathematics (Solve problem in real life) in Secondary Schools in the South West Region of Cameroon.

Communication in Mathematical Language	$\bar{x} = 2.77 \pm .91$	Communication in mathematical language helps learners to perform well in Secondary Schools in the South West Region of Cameroon.
Performance/grade in Mathematics	$\bar{x} = 2.92 \pm .88$	Learners perform and score good grades grade in Mathematics when psycho pedagogic factors are applied during lessons in Secondary Schools in the South West Region of Cameroon.

## DISCUSSIONS

This section of the study compared findings got from the work to previous studies. For the purpose of convenience, the discussions are based on the two hypotheses presented in the study as seen below

### **H<sub>01</sub>: There is no significant influence of teacher’s knowledge on students’ Mathematics achievement in secondary Schools in the South West Region of Cameroon**

Findings reveal that there is a significant influence of teacher’s knowledge on students’ Mathematics achievement in secondary Schools in the South West Region of Cameroon (table 6 & 9). This means that the level of content knowledge that a teacher has in Mathematics can influence students’ Mathematics achievement in secondary schools in the South West Region of Cameroon (table 5). This is in line with opinions of teachers where they agreed that content knowledge, curricular knowledge, general pedagogic knowledge, pedagogic content knowledge and others are used for facilitating mathematics instructions in secondary schools and has a high influence on Mathematics achievement.

Khan (2012) agrees that content influences Mathematics achievement in teacher training colleges in Shashinshan Pakistan. In the study students agreed that Content of mathematics

enabled them to understand the content of school mathematics, provided students with a strong base foundation and to relate Mathematics to the daily life examples. NMAP (2008) confirms that students whose teachers had taken more mathematics courses performed better on achievement tests than their peers whose teachers had taken fewer of such courses and that courses that addressed teaching methods showed an even stronger benefit.

Floden and Meniketti (2005) summarized the findings of this and other research on the effects of undergraduate coursework on teachers’ knowledge and maintain the proposition that prospective mathematics teachers should study mathematics learning and teaching methods. Garet, et al. (2016) also agrees that content knowledge had a positive impact on fourth-grade teachers’ knowledge and some aspects of instructional practice but it did not, however, have a positive impact on student achievement. Norris, Hiebert and Spitzer (2009), argue that pre-service teachers are likely to experience challenges as they unpack lesson-level mathematical learning goals (identify the sub concepts and the sub skills that fees into target learning goals), a form of special mathematical knowledge for teaching, an essential starting point for studying and improving ones teaching.

Felicia, Lasiele and Henry (2018) in another study



whose purpose was to find out whether teachers' Knowledge Indices serve as Predictors of Secondary School Students' Academic Achievement in Nigeria, showed that teachers with B.Sc. demonstrated the deepest Depth of Subject Content Knowledge, Depth of Pedagogical Knowledge and Depth of Subject Content and Professional Knowledge pedagogical and that subject content knowledge of teachers were found to be significant predictors of Students' Academic Achievement. Kweku, Quansah and Nugha (2020) agree that Mathematics achievement in senior high schools (SHS) in Ghana is not encouraging and this has become a concern for major stakeholders. The study showed that teacher's knowledge and teaching experience significantly influenced students' mathematics achievement and that PCK had a significant indirect effect on students' mathematics achievement through teachers' SMK.

Piaget (1936) and Vygotsky (1968) agree with the findings and maintain that children learn by constructing knowledge either individually by forming schemes (accommodation) or socially through guidance or support (scaffolding) from a mentor or coach. When children gain knowledge it boosts their interest and understanding and their achievement improves subsequently. Thus, Vygotsky and Piaget share the same views with of Khan (2012), Garet, et al. (2016), Felicia, Lasiele and Henry (2018) and others who maintain that teacher's knowledge in Mathematics enhances students Mathematics achievement in secondary schools in the South West region as shown in the literature review and the findings.

### **H<sub>02</sub>: There is no significant influence of Motivation on Students' Mathematics achievement in secondary Schools in the South West Region of Cameroon.**

Findings proof that there is a significant influence of motivation in mathematics on students' Mathematics achievement in secondary Schools in

the South West Region of Cameroon. It means respondents agree with the opinions that, the use of motivation strategies such as reward, feedback, positive comments, challenge, achievement level, effort, choice, persistence, in the classroom enables students to achieve highly Mathematics in secondary schools in the south west region of Cameroon (table 7).

Jaen and Baccay (2016) agreed that, in terms of curiosity, they felt that they have the ability to seek out opportunities to challenge themselves and grow as a person resulting in higher motivation and higher effect on mathematical performance. Motivation directly affected the respondents' perception about performance while attitude contributed a lot to performance in mathematics. Also motivation is a significant predictor of mathematics performance. Aminu, Yusuf, and Adedayo (2019) confirmed that there was significant main influence of motivation on participants' academic performance; while there was no significant main influence of gender on participants' mathematics performance. Aida and Wan (2009) in a study showed that, overall, students' motivations was found to be high and majority of the respondents were in the high level for effort but were only moderate for self- efficacy. Yeh, Cheng and Chan (2019) in an article on 'Enhancing achievement and interest in Mathematics through maths Island in Taiwan found out that there is an increase in students' mathematics achievement, especially in the calculation and word problems and that both the low achieving students and the high-achieving students in the experimental school maintained a rather high level of interest in mathematics and in the system with the use of Maths Island.

The social constructivism theory of Vygotsky (1968) supports the findings and maintains that as learners are scaffold to go through the ZPD it boosts their interest and this enhances

Mathematics achievement. Bruner (1961) in his theory of Discovery also supports the findings in that, if learners are given regular exposure to discovery learning they become less dependent and able to direct themselves as they grow. When this is done, they are able to carry out challenging tasks on their own and this enhances their achievement in Mathematics in secondary schools. Oladele (1989) adds that discovery learning leads to a shift from extrinsic to intrinsic rewards and learning the heuristics of discovery which are all forms of motivation to the learner. All these further enhance achievement in the subject in secondary schools.

### **CONCLUSION**

Looking at the objectives and from the summary of findings, the conclusion is that:

Teachers' knowledge in mathematics has a high influence on students' Mathematics achievement in Secondary Schools in the South West Region of Cameroon. Motivation in mathematics has high influence on students' Mathematics achievement in Secondary Schools in the South West Region of Cameroon. By implication, psychopedagogic factors have a high influence on students' Mathematics achievement in secondary schools in the South West Region of Cameroon.

Based on the discussion of the findings got from the verification of the two hypotheses above, the following conclusion can be drawn:

There is a significant influence of motivation on students' mathematics achievement in secondary schools in Cameroon, (motivation being the variable with a higher significance). There is a significant influence of teacher's knowledge on students' mathematics achievement in Secondary schools, (teacher's knowledge being high comparatively). This means, besides using knowledge of mathematics in the classroom, motivating students to learn Mathematics is more

important. Therefore, the use of motivational strategies and all the facets of teacher's knowledge will enable learners to have all the competencies in Mathematics in Secondary Schools of the South West region of Cameroon. Conclusively, there is a significant influence of psychopedagogic factors on students' Mathematics achievement in Secondary Schools in the south West Region of Cameroon.

Teachers are strongly advised to use both when facilitating such instruction in the classroom. However, other factors such as, parental support, effective teacher's support, classroom support, maths anxiety, teacher-pupil ratio, parental background, literacy rate, and others also have a role play.

### **Recommendations**

Based on the objectives of the study, the study recommended that: mathematics teachers should regularly update their knowledge, at least once yearly, in order to keep pace with the exigencies in content and pedagogy; Government should organize more of these seminars regularly to equip teachers with requisite knowledge and skills. Teachers should intensify the use of both intrinsic and extrinsic motivation techniques in Mathematics classrooms so as to make the learning of the subject attractive to learners. Government should provide more of these facilities in schools, and so on.

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