Journal of Mathematics Instruction, Social Research and Opinion
Vol. 3, No. 1, March 2024, pp. 49 – 62, https://doi.org/10.58421/misro.v3i1.185
ISSN 2962-7842

Senior High School Mathematics Teachers' Perception of the Teaching and Learning of Logarithm in the Kwahu East District

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Article Info

Article history:

Received 2023-10-23
Revised 2023-11-20
Accepted 2023-12-06

Keywords:

Logarithm
Mathematics Teachers' Perception
Teacher quality
Motivation

ABSTRACT

The motive of the study was to find factors that influence the teaching and learning of logarithms at the senior High schools in the Kwahu East Municipality. The study employed a descriptive survey where a questionnaire was administered to Eighty-Six (86) teachers. The sample was selected using the Census method. After the SPSS software was used to analyse the data, the descriptive analysis revealed that most teachers positively perceive logarithms. Factors influencing Senior High School mathematics teachers' teaching of logarithm were identified. Teachers believe that suitable teaching methods can influence students' perceptions. Strategies to encourage positive perceptions should be promoted among teachers, and recommendations include developing innovative methods for teaching logarithms in Senior High School mathematics.

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1. INTRODUCTION

One area of algebra known for its potent reasoning skills and wide range of practical applications is logarithm [1]. Many areas of human activity, including engineering, banking, health, and many more, use logarithms [2]. Logarithm is an essential component of mathematics education, according to several studies. It is practically impossible to overstate the significance of mathematics in all facets of life. The development of human thought is greatly aided by studying mathematics. An individual with a mathematical understanding can reason critically and analytically. We use our mathematical skills to solve issues creatively in our daily routines and activities [3]. Mathematics is widely used daily and applied to several fields and new technologies. Without the study of science, technology, and mathematics, no country can readily develop. The precise sciences regulate a large number of everyday events.

Multiplication is a mathematical concept related to logarithms. A logarithm is the exponent of a given number (the base) being raised to get a different number. How many of these numbers (x) do we multiply to reach a specific number (y)? is an answer provided by the logarithm (7–9,9). How many 2s, for example, multiply to get 8? Since 2x2x2=8, then 3 is the base-2 logarithm of 8. In layman's words, a number's logarithm is the amount that must be increased from a set number (the base) to get the desired value. For example, what does the logarithm of 100 base 10 indicate regarding how many 10s multiplied to equal 100? Naturally, two of the tens will equal one hundred. Thus, we say that log100 base 10 equals 2. Log_10 100 = 2 is the mathematical notation for this. More specifically, the logarithm of 1000 will be log_10 1000 = 3, or 10 x 10 x 10.

One of the many uses for algebra is logarithm, which helps learn mathematics and has applications in architecture, engineering, and medicine. Logarithms can be utilised for forecasting, comparing, measuring, explaining, displaying, and understanding purposes. For instance, in economics, money growth at a certain interest rate may be calculated using the logarithm 4. In the medical field, logarithms are used by nurses and physicians to represent, on a graphical scale, the strength of the sounds that we perceive. In obstetrics, medical professionals utilise logarithms to ascertain the onset of pregnancy and forecast the fetus's growth 5. Wardle & Aaron [4] are a few graphing and measuring uses for logarithms. In order to measure various items that span a wide range of sizes on the same scale, he proposed using the logarithm scale to calibrate the graph's axis. He used the following examples to bolster his claim that various measurements should be compared on the same scale:

(a) How long it takes to go home,
(b) The amount of time needed to go across the whole nation by car,
(c) How long does it take for the earth to orbit the sun, and
(d) The time light travels from the sun to another galaxy.

Scientists and engineers use logarithms to solve complicated issues. Zhu et al. [5] used logarithms in their engineering career to create a vibration isolation system to gauge a space shuttle's acceleration and a customised nozzle to gauge how much rain an aircraft receives. The Richter scale was created to utilise a logarithm to determine the magnitude of an earthquake and the maximum sound pressure that human hearing can withstand [6]. Logarithms examine dynamics like compound interest, population expansion, and radioactive decay.

Statement of the Problem

Mathematics teachers and other education stakeholders in Ghana have expressed worry about the low maths achievement among students. Test results have continuously shown that there are issues with pupils' learning processes, and these issues have remained over time. For example, the mathematics performance of pupils in KEA is not promising. Even though the government has implemented several initiatives to enhance STEM education, the outcomes do not adequately account for stakeholder investment. The teachers' methods of instruction have been partially attributed to the kids' subpar arithmetic results. The subjects WAEC and other organisations have classified as challenging are

logarithms. The introduction of the logarithm is postponed until the second year of secondary education (Form 2) [7]. A portion of the delay can be attributed to how challenging the traditional logarithm teaching method is. One contributing component is the amount of relevant prior knowledge (RPK) needed to understand the idea. Studies by Ansah [3] attested to the challenges associated with teaching logarithms in classrooms. Poor performance in mathematics, particularly in responding to questions involving logarithms, is confirmed by the examination report of the West Africa Examination Council (WAEC), which is in charge of overseeing external examinations in the West Africa sub-region, which includes Ghana. Nonetheless, there is a paucity of research on teaching and learning algebra in Ghana, particularly regarding the variables influencing algebra instruction. Therefore, this study aimed to determine the variables influencing SHS math instructors' logarithm teaching and learning in KED.

Theoretical Framework

In learning, constructivism falls within the general category of cognitive science. Constructivism is the theory that students create knowledge independently [8], [9]. As they learn, each student creates meaning on an individual and societal level. Social constructivism and cognitive constructivism are two subtypes of constructivism. Even within these categories, there is a range of epistemological orientations, even though terminology like "radical constructivism" and "social constructivism" offer some guidance [10]. Constructivism will be restricted to cognitive constructivism for this investigation.

The evolution of the constructivist learning theory in recent years has changed how science classes are taught. In addition to changing the way lessons are taught, the changes can completely transform the classroom culture, redefining the roles that students and teachers play as well as the objectives of the course [11]. To put it another way, a creative constructivist education program typically involves changing the learning and teaching activities and tactics and the standards for learning accomplishments. It is proposed that students' roles change from information collectors to active practitioners and that teachers' roles change from knowledge providers to learning facilitators [12]. The emphasis on learning accomplishment can be expanded from acquiring knowledge alone to personal growth, learning attitudes, and adopting learning techniques [13].

The constructivist framework was predicated on the idea that inadequate perception and a lack of comprehension of its application would result in subpar instruction and make solving specific logarithmic function issues difficult. The framework also included the constructivist method since it would apply to various logarithmic situations. This method is built on intervention tactics that students may utilise to their advantage while addressing various logarithmic issues through well-designed exercises. For instance, I included constructivist-based training in my framework to help students comprehend logarithmic notation and functions after witnessing a student attempt to solve an equation by factorising "log."

The Evolution of Logarithmic Concepts Through History

A historical overview of the evolution of logarithmic notions is presented by Pierce and Haugh [14]. They argue that much can be learned from understanding how

mathematicians developed logarithmic notation to reconcile complex multiplications that were becoming commonplace as mercantilism and astronomy flourished in the fifteenth and sixteenth centuries, even though they do not support instruction that follows the historical development of this concept. Comprehending the historical origins of logarithms offers the teacher an alternative viewpoint when assessing the students' thinking. Historians claim that Napier is the one who first introduced the term "logarithm," defining it as a "reckoning number" that denotes the number of ratios utilised [15]. Napier was not unfamiliar with the concept of the juxtaposition of geometric and arithmetic sequences. Therefore, he devised a strategy to replace multiplication and division with addition and subtraction for all real numbers.

Despite the advantages of logarithms, students still struggle to understand the idea. Many pupils struggle to solve logarithms and are frustrated as they cannot get it right. Research provides empirical proof that secondary school pupils do not fully comprehend logarithms. Chua and Wood [16] lists a few likely reasons why students make mistakes when learning logarithms:

a) incorrect application of previously learned concepts to explain new concepts;
b) students viewing "log" as a variable rather than an operation;
c) unclear teacher statements;
d) students' ideas or thinking; and
e) incorrect interpretation and explanation combined with an incomplete statement provided by peers.

Studies have found that the issue stems from students' excessive reliance on the algorithm and their ineffective usage of the digital tool while using the algorithmic method to logarithms [17]. Instead of focusing only on using digital tools to solve logarithms, the situation forced them to consider what requires students to choose a particular method, how well they understand it, and how that can help with reasoning. Rachael Kenney and Signe Kastberg [17] realised that students' proficiency with logarithmic expressions does not imply they comprehend their operational meaning.

Weber [18] also highlighted how inadequate pupils' comprehension is and how challenging it is for them to grasp the material. Weber created exercises and assignments to help students grasp concepts better. In order to increase conceptual comprehension and maintain students' enthusiasm for studying logarithms, mathematics instructors should implement novel and practical techniques for teaching logarithms. This will ultimately lead to improved performance.

Factors Affecting Logarithm Instruction

Despite the wide range of real-world applications of logarithms, research indicates that teaching logarithms and mathematics is more difficult for many teachers and that students struggle to understand the mathematical ideas being taught. As indicated by Chua and Wood [16], most secondary school pupils lack a fundamental grasp of logic, and one factor contributing to this issue is instructors' incapacity to communicate topics to their students. According to Newton, Jang, Nunes, and Stone [19], the three most important

issues facing urban schools in the US are finding, training, and keeping highly qualified secondary maths and science teachers. Studies by Preez [20] indicated that the private sector has drawn top-tier mathematicians away from the classroom by offering them high wages, performance-based pay, and more excellent prospects for advancement. This explains the importance of motivation in successfully teaching logarithms and mathematics.

Motivation

People are motivated to do actions that advance their objectives [21]. There is a plethora of hypotheses that might impact educators' motivation levels. Among these are the theories of human motivation by McClelland and Frederick Herzberg, the two-factor theory by Herzberg, the theory of self-stability, the goal-setting theory, the theory of equality, and the reinforcement theory of motivation [22]. McClelland's theory of human motivation, the Three Needs Theory, highlights people's desires for power, relationships, and success. According to Frederick Herzberg's two-factor theory, an individual's work-related discontent may be influenced by organisational policies, salaries, job security, and physical working conditions. Conversely, an individual's effective internal motivators are the likelihood of a job promotion, acknowledgement, professional growth, accountability, and job achievement.

In contrast to the advantages of internal motivation, the self-stability hypothesis proposes that external motivating sources may be harmful to people over time. According to the goal-setting idea, individuals are motivated to improve their performance when they are given specific, challenging goals to work towards. The premise behind the reinforcement theory is that people care about the results of their conduct, whether or not it is functional. The idea of equality postulates that people would respond to workplace inequalities, but the expectation theory contends that people anticipate behaviour to result in an appealing and successful end [21]. According to these beliefs, workers are vulnerable to external and internal factors that might impact their behaviour and performance at work.

Teachers' Method of Teaching Logarithm

Students' comprehension of logarithms is significantly impacted by how it is taught. The problem of technique and the technical expertise of instructors are the top reasons why children score poorly on assessment tests. It must be acknowledged that certain subjects require higher-order critical thinking and analytical skills; however, this must be combined with the teacher's expertise to employ a suitable pedagogy that allows him to break the content down into understandable bits for their students based on their cognitive abilities and levels of understanding. Some subjects' comprehension of students is mainly dependent on how they are taught or how much the teacher knows about the subject. It has been suggested that the heuristic technique, analytical method, problem-solving method, inductive, and deductive methods help teach logarithms. In contrast to students' seeming participation in a class, defined by apathy and/or lack of enthusiasm in the course or subject, these teaching strategies are used to actively engage, involve, and focus attention from students [23].

Teaching Technique and Quality

As with the invention of slide rules for use in computations, the development of logarithms and the capacity of logarithmic functions to model and solve a variety of real-world situations, including finance and psychology, spearhead ongoing efforts to support students' understanding of logarithms and their various applications. Three distinct classroom and/or teaching variables are considered when delivering effective school teaching. These factors include class size, instructor quality, and instructional quality. The individual features of instructors, including their demographics, aptitude, professional training and competency, and subject area specialisations, are measured regarding teacher quality [24].

As defined by Arthur et al. [25], teaching quality is the work instructors undertake in the classroom to improve students' learning. It is typified by accurate topic covering and instructional authenticity. Students' performance in the social sciences and mathematics is improved by real instruction. Since the curriculum content is used to gauge student and teacher performance, it substantially impacts the quality of instruction. Geary [26] said that although some curricula outline the material that must be taught in the classroom, others include the "cognitive demand" of the curriculum standards from the students and the subject presented.

The instructor will pitch the idea in a conventional or normal mathematics class while writing the mathematical topic's characteristics and/or principles on the whiteboard. He continues by resolving a few issues about the subject. For repeatability, students are frequently expected to be able to memorise certain ideas, concepts, and formulae and become familiar with example solutions. Students taught using such methodology only gain a relational comprehension of the methods; they cannot speak mathematics logically or be understood by others [9].

The importance of teaching methods in teaching logarithms using Skemp's Theory of Understanding was emphasised by David Tall [27]. The paper explained that even though a student can correctly solve and comprehend a mathematical problem, specifically a logarithmic problem, it does not mean that he can formally prove that the steps are based on a set of methodical and logical corollaries that are applied in mathematical proofs [28].

For example, given that f(x) = 〖log〗_4 x, a student could be able to evaluate f(16) and write f(16)= 〖log〗_4 16 = 〖log〗_4 4^2 = 2. It is not always a sign of logical comprehension of the logarithm notion that pupils can execute this operation; rather, it shows their relational grasp of the concept. Students with logical knowledge can communicate mathematically with others using understandable mathematical concepts [29].

Student Attitudes towards Mathematics and Maths Anxiety

The common understanding of attitude is a person's fundamental approval or disapproval of a subject or concept. Various evaluation techniques are used to quantify the behaviour of attitude. For instance, the Minnesota Research and Evaluation Project determined the following attitude-related factors: the importance of mathematics in society, attitude towards mathematics, anxiety towards mathematics, self-concept in

mathematics, motivation to increase mathematical knowledge, and perception of mathematics teachers. Recber et al. [30] looked at further facets of math attitudes. It evaluates motivation, value, enjoyment, worry, and confidence. Students' self-esteem and perceptions of their mathematical performance are gauged by their confidence. Anxiety quantifies both the experience of anxiety and its effects. The concept of mathematics' value pertains to the perceptions held by students on its practicality, significance, and value in their individual and future careers. The degree to which students like using and learning mathematics is a measure of their enjoyment of the subject. The student's interest in mathematics and willingness to enroll in extra courses are measured by motivation [30]. Another way to think about attitude is as an emotional attitude towards mathematics. This definition is made up of four parts:

1) the feelings a pupil has when engaging in math-related tasks;
2) the feelings that the learner immediately connects to the term "mathematics," the importance of mathematics-related objectives in the student's global goal structure, and
3) assessments of the scenarios that the student anticipates to occur due to performing mathematics".

Studies indicate that attitudes may be modified by addressing the elements contributing to unfavourable attitudes. SHS teachers should be motivated to modify their teaching methods to influence students' attitudes positively. Students' feelings, expectations, and values about mathematics are shaped by their experiences, influencing whether they enjoy or despise the subject. A multitude of factors influence students' attitudes or self-perceptions as learners. Their prior maths course experiences influence their actions. Other factors lead to a negative attitude or view of mathematics. Students' behaviours are influenced by their beliefs about the utility of mathematics, their confidence in their ability to study it, and their attitudes about " discovering" mathematics.

It is well known that maths anxiety contributes to pupils' disinterest in the subject. The definition of mathematics anxiety is an "irrational dread of mathematics that interferes with manipulating numbers and solving mathematical problems within a variety of everyday life and academic situations." According to Furner & Berman's review of the research on math anxiety, two-thirds of adult Americans detest and are afraid of mathematics. When working in mathematical circumstances, a lack of confidence is typically the root cause of math anxiety Perina, as mentioned in Amankwah [31]. The cultural mindset that prevents pupils from seeing the importance and making meaning of mathematics when they are uncomfortable with it is the result of society viewing mathematics as hard and pointless due to technology [32]. This notion has undermined the value of mathematics. The inability to grasp arithmetic or the inability to finish chores properly were the causes of the discontent. These negative encounters exacerbated the students' fear, embarrassment, and inadequacy. Ohipeni-Ablode [33] used a variety of instructional strategies to help her fifth-grade students feel less anxious about maths. She gave out surveys to students throughout the year to find out their opinions of the various tactics. She discovered that her pupils felt more at ease addressing issues with their peers when she employed cooperative learning.

Teachers Content Knowledge

Conversely, content knowledge reflects an instructor's understanding of the material (logarithm), including how to utilise proper mathematical terminology and notation and identify when a student has provided an inaccurate response. Teachers "must be able to do the work that they assign to their students," according to this sort of knowledge [34], which includes understanding the mathematical concepts involved and how those concepts relate to higher-level topics. While understanding the type of error requires specific topic knowledge, teachers must be able to identify an inaccurate response.

The study of Shulman, cited by Knap et al. [35], measured the effects of particular facets of teachers' conduct and thought processes. Teachers' ideas about mathematics and learning and their confidence in using and teaching various mathematics subjects significantly impacted student learning and mathematical accomplishment. It was proposed that understanding how "current" teacher decisions about their knowledge and practices may "facilitate or obstruct" their students' future learning is necessary for horizontal content knowledge. As Esperanza et al. [36] observed, understanding mathematics positively influences the future and where kids' mathematical learning goes in the high school setting. "I feel confident in what I am doing," said one instructor. Knowing where they are headed academically helps me tailor my teaching. The necessity for information at the mathematical horizon, or horizon content knowledge, is supported by increasing data. Research and professional development on how instructors acquire this information are underway.

Students Mathematics Foundation and Confidence Level

Logarithm teaching and learning are impacted by students' lack of confidence and weak foundation while solving mathematical issues. Students are less likely to finish assignments and skip work when they lack confidence in their work. According to Knap et al. [35], students use avoidance methods to cope with their lack of confidence stemming from their weak mathematical foundation. They are afraid that by asking for assistance, they may appear inept or make blunders in front of their colleagues. Students who doubt their capacity for achievement in mathematics may adopt deceptive techniques to hide their aptitude to preserve their pride. Examples of foundation and avoidance methods include refusing assistance, rejecting tasks that seem straightforward, and purposefully not trying hard enough to give the impression that one is arithmetic illiterate.

2. METHOD

This study used a quantitative research design, meaning that the data was quantitatively analysed. Large samples may be used in quantitative research, and their analysis accurately depicts the data. The study population consisted of all the maths instructors in the KEA District's seven senior high schools, which served as the study's domicile. Despite voluntary participation, the sampling technique used was the Total Population Sample, sometimes called the census approach. Eighty-six responders, seven department heads, and 79 instructors were from all seven (7) KED schools. Respondents

received questionnaires in order to gather data for the study. Before a pilot study, the items were taken from reliable sources and put through professional proofreading and editing to ensure the validity and reliability of the instruments. Tables and charts were used to illustrate the analyses in an approachable manner, beginning with the respondents' demographic information.

3. RESULTS AND DISCUSSION

Table 1 Analysis and Interpretation of Demographic Data

Age	Number	Percentage	Cum (%)
21-30	12	13.95	13.95
31-40	56	65.12	79.07
41-50	14	16.28	95.35
51-60	4	4.65	100
Total	86	100	

SEX	Number	Percentage	Cum (%)
MALE	64	74.4	64(74.4)
FEMALE	22	25.6	86(100.0)

Working Experience	Number	Percentage	Cum (%)
1 – 5 YEARS	6	7.0	6(7.0)
6 – 10 YEARS	42	48.8	48(55.8)
11 – 15 YEARS	30	34.9	78(90.7)
16 – 20 YEARS	8	9.3	86(100.0)

Class Taught	Number	Percentage	Cum (%)
FORM ONE	22	25.6	22(25.6)
FORM TWO	45	52.3	67(77.9)
FORM THREE	19	22.1	86(100.0)

Source: Field Survey (2021)

Table 1 above explains the demographic distribution of the respondents available for the study. From the above table, it can be said that most respondents are between the ages of 31 and 40 years, followed by those between the ages of 41 and 50 years, and so on. Looking at the gender side, most of the respondents available for the study were male, with 64 respondents out of the 86 respondents, whereas the remaining were female, with 22 respondents.

Table 2. Factors influencing the teaching of logarithm

QUESTION	SD	D	U	A	SA	TOTAL
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
The time set aside to teach logarithms is not enough	30(34.9)	51(59.3)	5(5.8)	0(0)	0(0)	86(100)
Inadequate teaching materials affect the teaching of logarithm	1(1.2)	0(0)	6(7.0)	61(70.9)	18(20.9)	86(100)
Students' attitude towards Mathematics affects the teaching of Logarithm	0(0)	0(0)	0(0)	65(75.6)	21(24.4)	86(100)

QUESTION	SD	D	U	A	SA	TOTAL
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Students are not motivated enough to learn Logarithms	3(3.5)	0(0)	14(16.3)	65(75.6)	4(4.7)	86(100)
Students have a weak mathematical foundation for learning Logarithm	0(0)	0(0)	0(0)	35(40.7)	51(59.3)	86(100)
The quality of teaching affects students' performance in Logarithm	0(0)	0(0)	0(0)	7(8.1)	79(91.9)	86(100)
Large class size affects students' performance in Logarithm	0(0)	17(19.8)	41(47.7)	28(32.6)	0(0)	86(100)
Teacher's content knowledge affects students' performance in Logarithm	0(0)	0(0)	0(0)	46(53.5)	40(46.5)	86(100)
The method of teaching logarithms affects how students understand the concept	0(0)	0(0)	1(1.2)	60(69.8)	25(30.6)	86(100)

Key**: SD** = Strongly disagree**, D** = disagree **U** = undecided**, A** = Agree**, SA** = Strongly Agree

Among the nine items, as indicated in Table 2, which sought to determine the factors that affect students' understanding of logarithms, teachers' content knowledge got 100% endorsement, teaching quality 100%, student weak background 100%, and teaching method 98.8% agreement rate. Others were inadequate material 91.8% and student motivation 80.3%. Time constraint was not listed among the serious factors affecting the teaching and learning of logarithm since 81 out of the 86, representing 94.2%, disagreed.

The study's findings indicate that the significant factors influencing the teaching of logarithms are the availability of teaching and learning materials, students' interest, teaching quality, and teaching method. These are not different from what some researchers in Ghana like (Y. Arthur et al., 2021; Arthur et al., 2017, 2022)

Table 3. Method of teaching logarithm

QUESTIONS	SD	D	U	A	SA	TOTAL
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
The teaching of logarithms requires an Activity-oriented approach	0(0)	0(0)	10(11.6)	75(87.2)	1(1.2)	86(100)
Teaching Logarithms by Lecturing does not encourage experimenting and participatory form of learning	0(0)	0(0)	0(0)	44(51.2)	42(48.8)	86(100)
Logarithm is best taught using the Discovery method	0(0)	10(11.6)	62(72.1)	14(16.3)	0(0)	86(100)
The Heuristic method of teaching logarithms can be difficult and time-consuming	0(0)	7(8.1)	64(74.4)	15(17.4)	0(0)	86(100)
The Inductive approach to teaching Logarithms depends on the student's ability to reason critically.	0(0)	8(9.3)	65(75.6)	13(15.1)	0(0)	86(100)

QUESTIONS	SD	D	U	A	SA	TOTAL
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
The deductive approach to teaching logarithms does not develop the thinking ability of students.	0(0)	5(5.8)	66(76.7)	15(17.4)	0(0)	86(100)
I use the Analytical method to simplify complex logarithmic problems in teaching logarithms.	0(0)	10(11.6)	63(73.3)	13(15.1)	0(0)	86(100)

Table 3 sought to find out the method commonly applied by the teachers to tea logarithm. Among the seven items, the responses show that 88.4% of the respondents believe using the activity method to teach logarithms is the best. Interestingly, all the respondents agreed that the lecture method for teaching logarithms does not encourage students' understanding of concepts. Another item that sought to determine if using the heuristic method was complicated was that 74.4% of the respondents were undecided. Again, 75.6% of the respondents were undecided on the item that asked whether the success of the inductive approach to teaching logarithms depends on a student's ability to reason.

The analysis shows that the activity method is the most widely accepted method for teaching logarithms among the teachers in the KEA. They all believed that the lecture method was not helpful when teaching logarithms. However, it is entirely unclear if they know the heuristic, inductive, and deductive approaches to teaching since almost all of them were undecided in response to the items on these teaching methods. The findings from the study confirm the works of some scholars on modern methods of teaching logarithms, such as Khalid et al. [2], Ansah [3], Esperanza et al. [36], and Silviani et al. [37].

4. CONCLUSION

Logarithms as a topic have so many real-life applications, and as a result, teachers need to ensure students understand the concepts by applying a realistic approach to teaching. As illustrated by the study's findings, the significant factors influencing the teaching of logarithms are the availability of teaching and learning materials, students' interest, teaching quality, and teaching method. The method that the teachers also endorse is the activity method. They do not seem very into the heuristic, inductive, and deductive approaches. Therefore, the researchers conclude that the students' lack of understanding of logarithm must be partly blamed on the teachers' approach to teaching. We therefore recommend that the teachers ensure that they have a conceptual understanding of the logarithm to enhance their classroom delivery.

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https://doi.org/10.58421/misro.v3i1.185