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Female Students' Attitude towards the Learning of Mathematics: Empirical Evidence from a High School in Central Region

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Abstract:- The purpose of this study was to investigate senior high school female students' attitude towards the learning of Mathematics. The study was grounded in a positivist paradigm, using adescriptive case study design. Simple random sampling technique was used to select 161 female students. The results indicated that female students had less self-assurance when performing Mathematical tasks. The students were uncertain about whether motivation could change their attitude toward learning Mathematics. The female students were less enthusiastic about Mathematics. The students understood the value of Mathematics and how it applied to all facets of life. The students' knowledge of the importance of mathematics was a strong predictor of their positive attitudes toward learning Mathematics. The implication of the study to teaching and learning is that teachers should use instructional strategies that would meet the needs of female students. Teachers must take into account students' differences or barriers to learning, minimise anxiety, boost active interest, and appreciate what is being taught and learned.Teachers need to take corrective action to ease stress and offer their female students the assistance they need.

Keywords:- *Attitude, mathematics, students' learning, female senior high school.*

I. INTRODUCTION

An attitude is a psychological disposition that manifests as a degree of favouritism or disfavour toward a certain entity (Eagly & Chaiken, as cited in Mensah et al., 2014). It assesses a person's propensity to react favourably or negatively to a particular concept, object, person, or circumstance. As a result, attitudes are typically positive or negative opinions about a person, place, thing, or event that are frequently referred to as the attitude object that can influence a person's choice of action. According to Joseph (2013), aperson's learned propensity to react favourably or unfavourably to an object, circumstance, idea, or person is referred to as their attitude. It is also viewed as a personal idea that people have, one that reflects their thoughts and emotions and occasionally shows up in behaviour. People's attitudes influence their behaviour toward things, circumstances, and other people since attitudes, behaviour, and feelings are all interconnected. Additionally, they have an impact on how these variables are related to one another (Joseph, 2013).

Although it cannot be directly observed, attitude is a hypothetical concept that can be deduced from quantifiable responses to the attitude object. Attitudes can change and develop with time, and once a positive attitude is formed, it can improve students' learning. On the other side, a negative outlook prevents effective learning and subsequently has an impact on performance (Joseph, 2013). As a result, attitude is a crucial element that must be taken into consideration. Depending on the student, attitude may have a favourable or negative impact on how well students succeed in mathematics.

II. LITERATURE REVIEW

According to Han and Carpenter (2014), attitudes are made up of cognitive, affective, and behavioural responses that people exhibit toward an object or their environment based on their emotions or interests. The cognitive component of attitude is what a person believes or thinks about mathematics (Mensah et al, 2013). The person's feelings or emotions related to learning mathematics make up the affective part of attitude. Therefore, the emotive element is what motivates students to become interested in mathematics. Additionally, the cognitive component of attitude forms beliefs that have an impact on the affective part as well. These beliefs lead to a long-lasting mindset that affects how students feel about learning mathematics (Ingram, 2015). As a result, the cognitive and affective aspects of attitude are connected and actively interact (Di Martino &Zan, 2011). The propensity to react in a particular way to studying mathematics is the behavioural component of attitude. Affective attitude also has an impact on behavioural attitude. Being successful in mathematics is correlated with a student's level of mathematical confidence, which is viewed as a desirable behaviour. Students who lack mathematical confidence may not succeed, and poor behaviour is viewed as negative feelings (Zan& Di Martino, 2007). Therefore, the behavioural aspect of attitude also influences the cognitive aspect of attitude.

A person's attitude toward mathematics can be described by Kibrislouglu (2015) as either liking or disliking the topic, having a predisposition to engage in or avoid mathematical activities, believing they are good or awful at mathematics, and believing that mathematics is either beneficial or useless. According to Anamuah-Mensah and Mereku (2005), the majority of students do not have the opportunity to learn a significant portion of the mathematics curriculum's content, and the majority of students lack the conceptual understanding of the mathematics they have learned, which is required to make wise decisions and apply

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what they have learned to other situations or problems that are similar. Many nations have made it a priority to improve students' attitudes toward learning (Mullis, Martin, Goh, & Cotter, 2016), and a wealth of research has shown that there is a connection between student accomplishment and attitudes.

Wadesango, Chabaya, Rembe, and Muhuro (2011) in South Africa claim that one of the factors contributing to the low representation of female students in mathematics and science-related courses is the attitude of mathematics teachers toward female students. They claim that teachers provide males more opportunity than females to participate in practical demonstrations during mathematics lessons. They said that while female students were neglected during mathematics courses, male students had the chance to connect with mathematics lecturers, which put female students at a disadvantage. Female students' exhibit decreased interest in and unfavourable attitudes toward the study of mathematics and other science-related courses, they say, while having the same or even better aptitude for the subject than their male counterparts. Parents and teachers continue to hold the stereotype that females are not good at mathematics. They assume that females are unable to compete on an equal footing with their male colleagues.

Research conducted on students' attitude and their mathematics achievement most probably did not focus on Senior High School female students' attitude and their mathematics achievement. In Philippines, Cerbito (2020) found a significant relationship between attitudes towards mathematics and proficiency in mathematics across different strands of senior high school students. Similarly, Mushtaq (2013) found that in Afghanistan, females' mathematics achievements were lower than males. Likewise, In Italy, Meggiolaro (2017) observed that ICT-mathematics achievement association was weaker for females than males. Again, Mirza and Hussain (2018) found that students' attitude towards mathematics determines the interest and readiness to study the subject.

Currently, there is a great effort in literature and curriculum reforms in Ghana to create opportunities to bridge the gender gap in mathematics. Attitude is key in the learning of mathematics and could potentially change females approach to mathematics and if we should bridge the gender gap in mathematics achievement then, there is the need to examine the attitudes of students towards the learning of mathematics. It is this gap in knowledge that has given the researchers the impetus to conduct a survey to investigate female students' attitude towards the learning of mathematics. The study was guided by the research question below:

What attitudes do Senior High School female students hold towards the learning of Mathematics?

III. METHODOLOGY

A. Research Design

Adescriptive case study design was employed in this study to gain a broader and more in-depth understanding of female students' attitudes towards the learning of Mathematicsin the central region. A descriptive case study design seeks to describe the natural phenomena which occur within the data in question (Zainal, 2007). This is consistent with the purpose of the study, which sought to investigate female students' attitudes towards mathematics.The design was usedbecause the study sought to describe female students' attitude towards mathematics.

B. Participants and Sampling Technique

The participants were one hundred and sixty-one (161) female students from a senior high technical school within Mfantseman municipality in the central region of Ghana. The sampling technique employed for the study was simple random sampling. The sample included twenty-six (26) students from general science program, thirty (30) students from general science program, twenty-seven (27) students from visual art program, twenty-one (21) students from the business program, thirty-six (36) students from the home economics program and twenty-one (21) students from the technical program. All of them were form three female students and had taken mathematics subject from form one to form three and about sitting for their final standardized national test to enable them enrol in the tertiary institutions. The average age of the students was nineteen (19) years.

C. Instrumentation, Validity and Reliability

The main instrument employed for this study was Likert-type ATMQ questionnaire which is one of the most extensively used strategies for measuring attitudes (Ary, Jacob, &Razavieh, 2002). Attitudes Toward Mathematics Questionnaire (ATMQ) is a 40-item survey that assesses students' attitudes toward mathematics by Tapia (1996) was adapted for the study. The tool comprises four factors: (a) self-confidence, (b) value, (c) enjoyment, and (d) motivation, and it uses a five-point Likert-type scale that ranges from strongly disagree to strongly agree. The instrumentwas subjected to validity and reliability tests. The instrument was given to experts and research fellows in the University of Education, Winneba to check their validity. The suggestions given by them were used to effect the necessary changes to improve upon the instruments. A pilot test of the questionnaire was conducted using 50 respondents from three senior high schools in the Central Region of Ghana. The reliability of the instruments was estimated on scale with the help of Statistical Package for Social Sciences (SPSS) version 26.0 software. Cronbach alpha reliability co-efficient values were obtained for the following sections of the questionnaire. Items measuring self-confidence had a Cronbach alpha value of 0.849, enjoyment of Mathematics had a Cronbach alpha value of 0.886, motivation had a Cronbach alpha value of 0.837, and value of Mathematics had a Cronbach alpha value of 0.92. A total reliability of 0.835 was obtained for all the items on the questionnaire. The reliability co-efficients before the main data collection support the view of Sekaran (2013) who suggested that 'alpha value less than 0.60 is considered to be

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poor, those in 0.70 range, acceptable and those over 0.80 high. Therefore, with reference to the above the instrument was considered reliable and valid for the main data collection.

D. Data Collection Procedure and Analysis

Prior to the distribution of the questionnaire, permission was sought from the headmaster of the senior high school where the study was conducted. The senior high school administration's approval was required before contacting the students who were selected to take part in the study. The purpose of the study was explained to the participants (students), and those who were selected received questionnaires. It should be mentioned that the researcher gave the 161 respondents their surveys in person. A total of 25 minutes were provided to the respondents to respond to the items on the instruments. The female senior high school students answered all the questions with 100% accuracy.The process of editing, coding, and statistical computing made up the data analysis step. To ensure easy identification, reduce errors, and facilitate coding, each questionnaire's items were serially labelled immediately following data collection. In order to look for any problems, such as outliers and missing values, frequencies were conducted. After the data had been compiled and edited, it was next analysed using the Statistical Package for Social Sciences (SPSS), version 26, to address questions that had only been partially or not at all addressed. It should be noted that tables, percentages, and frequencies were employed to analyse the respondents' background data. Descriptive statistics, such as mean and standard deviations, were used to analyse the data for the study topic, which sought to explore the attitudes of Senior High School female students toward the acquisition of Mathematics.

IV. RESULTS AND DISCUSSION

This section deals with the discussion of data from the field to address the research question that was formulated to guide the study. The five-point Likert scale questionnaire that was administered was analysed using means and standard deviations. It is important to note that a mean value of 4.5 – 5.0 showed that the respondents strongly agreed to the statement, a mean value of 4.4 – 3.5 showed that the respondent agreed with the statement, a mean value of 3.4 – 3.0 showed that the respondents are uncertain with the statement, a mean value of 2.9 – 2.5 showed that the respondents disagreed with the statement, a mean value of 2.4 – 1.5 and below showed that the respondents strongly disagree with the statement. A standard deviation below 1.0 showed that the responses from the respondents were having similar views or opinions about the attitude variable (homogeneous) and respondents were having different or divergent views about the attitude variable (heterogeneous) when standard deviation was above 1.0.

Research Question: What attitudes do Senior High School female students hold towards the learning of Mathematics?

The research question sought to find out from the respondents the attitudes that Senior High School female students hold towards the learning of Mathematics. The results are presented in Table 1.

Variables	Items	M	SD
Self-confidence	I have a lot of self-confidence when it comes to mathematics	3.01	1.19
	I am always under a terrible strain in a math class	2.58	1.16
	Studying mathematics makes me feel nervous	2.58	1.12
	I expect to do fairly well in any mathematics class I take	3.84	1.11
	I feel a sense of insecurity when attempting mathematics	2.48	1.15
	I learn mathematics easily	2.69	1.19
	I am confident that I could learn advanced mathematics	3.27	1.24
	I like to solve new problems in mathematics	3.28	1.19
	I would like to avoid using mathematics in college	3.04	1.38
	I am comfortable answering questions in mathematics class	3.09	1.19
	Mean of Means/Average Standard Deviation	**2.98**	**.41**
Variables	**Items**	**M**	**SD**
Enjoyment of mathematics	Mathematics does not scare me at all	3.05	1.22
	Mathematics makes me feel uncomfortable	2.82	2.56
	When I hear the word mathematics, I have a feeling of dislikeness	2.65	1.27
	I feel nervous to even think about having to do a mathematics problem	2.74	1.16
	My mind goes blank and I am unable to think clearly when working with mathematics	2.91	1.26
	Mathematics is one of my most dreaded subjects	3.01	1.30
	I am always confused in my mathematics class	2.75	1.28
	I usually enjoyed studying mathematics in school	3.08	1.18
	I believe I am good in solving mathematics problems	2.98	1.14
	I am happier in a mathematics class than in any other class	2.66	1.19
	Mean of Means/Average Standard Deviation	**2.87**	**.46**
Variables	**Items**	**M**	**SD**
Motivation	I get a great deal of satisfaction out of solving a mathematics problem	3.12	1.22
	I want to develop my mathematical skills	4.33	.97
	I am able to solve mathematics problems without too much difficulty	2.61	1.11

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	Mathematics is dull and boring	2.40	1.29
	I would prefer to do an assignment in mathematics than to write an essay	2.96	1.47
	I really like mathematics	3.07	1.24
	I am willing to take more than the required amount of mathematics	3.12	1.24
	I plan to take as much mathematics as I can during my education	3.31	1.21
	Mathematics is a very interesting subject	3.48	1.15
	I am comfortable expressing my own ideas on how to look for solutions to a difficult problem in mathematics.	3.43	1.24
	Mean of Means/Average Standard Deviation	**3.18**	**.71**
Variables	**Items**	**M**	**SD**
Value of Mathematics	Mathematics is a very worthwhile and necessary subject	4.17	1.03
	Mathematics helps develop the mind and teaches a person to think	4.37	.89
	Mathematics is important in everyday life	4.42	.84
	Mathematics is one of the most important subjects for people to study	4.24	.93
	I can think of many ways that I use mathematics outside of school	3.77	1.02
	High school mathematics subjects would be very helpful no matter what I decide to study	3.92	1.08
	I think studying advanced mathematics is useful	3.79	1.08
	I believe studying mathematics helps me with problem solving in other areas	3.96	1.06
	A strong mathematics background could help me in my professional life	4.22	1.00
	The challenge of mathematics appeals to me	3.57	1.04
	Mean of Means/Average Standard Deviation	**4.04**	**.66**

Table 1: Attitudes of Female Senior High School students'

Source: field data 2022

Table 1 shows the attitudes of Female Senior High School students' attitudes towards the learning of Mathematics. Their attitudes were measured based on Self-Confidence, Enjoyment of Mathematics, Motivation and value of Mathematics. The results indicated that majority of the respondents disagreed with the items measuring their Self-Confidence in Mathematics and their responses clustered around the same mean (M=2.98; SD=0.41). From the results it can be seen that majority of the respondents disagreed with statements soliciting their responses on they; being under a terrible strain in mathematics class (M=2.58; SD=1.16), feeling nervous when studying Mathematics (M=2.58; SD=1.12), feeling insecure when attempting Mathematics (M=2.48; SD=1.15) and learning Mathematics easily (M=2.69; SD=1.19). Also many of the female senior high school students were uncertain with statements soliciting their responses on they being confident that they could learn advanced Mathematics (M=3.27; SD=1.24) and they being able to solve new problems in Mathematics (M=3.28; SD=1.19). Furthermore, less percentage of the respondents agreed to the statements soliciting their responses on their expectation in doing fairly well in any Mathematics class they take (M=3.84; SD=1.11). I like to solve new problems in mathematics, majority of the respondents were uncertain to this statement and their responses were clustered around (M=3.28; SD=1.19) which also indicated heterogeneous responses among the female senior high school and senior high technical school students. Also, I would like to avoid using mathematics in college, the female students in the study were uncertain with this statements and majority of their responses were different (M=3.04; SD=1.38) and finally, I am comfortable answering questions in mathematics class, the students were having different responses and their mean and standard deviation was around (M=3.09; SD=1.19).

The findings above are in consonance with that of Moneva et al., (2020) who revealed that there is a significant relationship between close assistance and self-confidence. The researcher concluded that with the help of close assistance students' difficulty decreases and self-confidence increases. These students are ready to take mathematical challenges which in turn increase their academic achievement; otherwise, students with low self-confidence do not believe in themselves, thus tend to avoid taking mathematics challenges (Adelson & McCoach, 2011).

The results on Enjoyment of Mathematics showed that majority of respondents disagreed with the items measuring their enjoyment of Mathematics and their responses clustered around the same mean (M=2.87; SD=0.46). Again from the results it can be observed that the respondents disagreed with statements soliciting their responses on Mathematics making them feel uncomfortable (M=2.82;SD=2.56), when they hear the word Mathematics they having a feeling of dislikeness (M=2.65;SD=1.27), they feeling nervous to even think about having to do Mathematics problem (M=2.74 ;SD=1.16), their minds go blank and they are unable to think clearly when working with Mathematics (M=2.91; SD=1.26), they always being confused in Mathematics class (M=2.75; SD=1.28), they believing that they are good and in solving Mathematics problems (M=2.98 ;SD=1.14), they being happy in Mathematics class than in any other class(M=2.66; SD=1.19). It can also very few of the respondents were uncertain to items soliciting their responses on enjoyment of Mathematics such as, Mathematics does not scare me at all (M=3.05; SD=1.22) and Mathematics is one of my most dreaded subjects (M=3.01; SD=1.30). In agreement, students' enjoyment while learning can influence their behaviour or cognitive aspect of attitude (Syyeda, 2016). According to PISA 2012 results published by OECD (2013),

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students may learn mathematics because they find it enjoyable and interesting.

The results indicated that majority of the respondents were uncertain with the items measuring their Motivation in Mathematics and their responses clustered around the same mean (M=3.18; SD=0.71). Again from the results majority of the respondents strongly disagreed with the item soliciting their views on Mathematics being dull and boring (M=2.40; SD=1.29). Also majority of the respondents disagreed with the statements soliciting their responses on how they are able to solve mathematics problems without too much difficulty (M=2.61; SD=1.11), how they prefer to do their assignment in Mathematics than to write an essay (M=2.96; SD=1.47). Furthermore, majority of the respondents were uncertain on the statements soliciting their responses on whether they get a great deal of satisfaction out of solving a mathematics problem (M=3.12; SD=1.22), how they like Mathematics (M=3.07; SD=1.24), their willingness to take more than the required amount of Mathematics (M=3.12;SD=1.24), Mathematics being their very interesting subjects (M=3.48; SD=1.15), their comfortability in expressing their own ideas on how to look for solutions to a difficult problem in Mathematics (M=3.43; SD=1.24).

In line with the above findings, Doño, and Mangila (2021) found that students' motivation to learn Mathematics as to "Relevance," "Interest," "Satisfaction," and "Confidence" were "High".

The results indicated that majority of the respondents strongly agreed with the items measuring their Value of Mathematics and there were no differences among their responses (M=4.04; SD=0.66). Majority of the respondents agreed with statements soliciting their responses on the way they think of many ways that they use Mathematics outside of school (M=3.77; SD=1.02), high school Mathematics subjects would be very helpful no matter what they decide to study (M=3.92; SD=1.08), how they think studying advanced mathematics is useful (M=3.92; SD=1.08), how they believe studying mathematics help them with problem solving in other areas (M=3.96; SD=1.06), whether the challenge of mathematics appeals to them (M=3.57; SD=1.04). Also greater percentage of the respondents strongly agreed with the statements soliciting their responses on Mathematics being a very worthwhile and necessary subject (M=4.17; SD=1.03), how mathematics helps develop the mind and teaches a person to think (M=4.37; SD=.89), how Mathematics is important in everyday life (M=4.42; SD=.84), how they think about Mathematics being one of the most important subjects for people to study (M=4.24;SD=.93) and eventually, how they think a strong Mathematics background could help them in their professional life (M=4.22; SD=1.00). This finding is in line with that of Guy, et al. (2015) who asserted that Mathematics value is a positive predictor of success.

V. LIMITATIONS

This study has significant restrictions. The generalizability of the findings is constrained by the use of data from a sample of senior high school form three(3) female students. Although the female senior high school students in their third year were the most practical for the study, including female students in senior high school form (1) and senior high school form two (2) could have improved the extension of the findings and the conclusions. Again, there is no evidence to suggest that the study, which involved just senior high school form three (3) students from a senior high technical school in the central region, is representative of the situation in the entire nation or of a different setting.

VI. CONCLUSION

From the results of the current study, the following conclusions are made. In accordance with how female senior high school students felt about learning mathematics, it became clear that these students had less self-assurance when performing mathematics and less enthusiastic about mathematics. The study discovered that female students were uncertain about whether motivation could change their attitude toward learning mathematics. The study further demonstrated that female senior high school students understand the value of mathematics and how it applies to all facets of life.

VII. IMPLICATION FOR TEACHING AND LEARNING

Based on the findings, the implication of the study to teaching and learning is that teachers use instructional strategies that, in order to meet the needs of female students, take into account learners' differences or barriers to learning, minimise anxiety, boost active interest, and appreciate what is being taught and learned. They need to take corrective action to ease stress and offer their female students the assistance they need when they need it. In a relaxed teaching and learning environment, this will promote mutual understanding. Female students should also manage their time effectively so that they have adequate time to practise and internalise the mathematical ideas they have learnt in class. To ensure that female students study mathematics effectively, the government should provide them with an adequate number of trained teachers, books, computers, and other educational resources. This would allow them to develop their skills and, in turn, perform better in Mathematics.

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