Research Article

Examining fresh students' achievement motivation and self-efficacy towards learning high school mathematics

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ABSTRACT

One of the reasons for students' reluctance to study and succeed in mathematics is that they may not be motivated to learn. This study examined fresh senior high school (SHS) students' achievement motivation levels and its correlate to self-efficacy towards core mathematics. The study adopted descriptive research design involving a random sample of 314 fresh students in three SHSs in a low performing district in Ghana. The achievement motive scale and the new general self-efficacy scale were adapted and used for data collection. Data were analyzed using descriptive statistics, independent t-test, one-way analysis of variance and Spearman rank correlation. The results indicated that the students' achievement motivation levels in dimensions of striving to achieve learning targets, participation in lessons, willingness to work and maintaining positive study habits towards mathematics were quite high. Furthermore, the students' achievement motivation levels did not differ by gender, type of junior high school attended and boarding status. However, the students' achievement motivation levels varied across the five programs of study. The study also found a moderately positive significant correlation between students' achievement motivation and self-efficacy beliefs. The study concludes that the fresh students in this study are highly motivated and believe they can succeed in their study. The study recommends that mathematics teachers should guide these fresh students to set realistic short-long term learning targets to facilitate higher achievement in mathematics. Mathematics teachers should try to first gauge the achievement motivation of the fresh students for high school mathematics for appropriate pedagogical decisions.

Keywords: achievement motivation, self-efficacy, fresh students, senior high school

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INTRODUCTION

The transition from basic to senior high school (SHS) marks a crucial phase in students' academic journey. During this period, they encounter not only new challenges but an increased academic expectation and a greater autonomy in their learning of mathematics. This period presents fresh students with two psychological dilemmas that can drive their learning behaviors and future achievement in mathematics. That is, either the students may

(1) show keen desire to learn or

(2) feel reluctant to strive to achieve success (Afrifa-Yamoah, 2016; Siddhu, 2011).

This psychological state, which is needed on a personal basis as a driving force for carrying out activities toward certain achievements is defined as achievement motivation (Brunstein & Heckhausen, 2018). According to the motivational theory of achievement goal and expectancy value theory (Wigfield & Eccles, 2000), this driving force promotes high goal setting, mastery skills and avoidance of failure or a feeling of reluctance to learn mathematics (Kasim, 2022; Roy & Saha, 2022). In this study, achievement motivation is operationalized as students' desire and determination to succeed, excel and perform well or avoid failure in mathematics activities. Such determination often leads students to strive for set goals by willingly participating in Mathematics lessons and maintaining consistency in their study behaviors.

Mathematics often poses challenges for high school students. Fortunately, research (Kasim, 2022; Roy & Saha, 2022; Sharma & Sharma, 2018) shows that students with high achievement motivation in mathematics are more likely to set challenging goals, engage in productive learning behaviors and persist in the face of difficulties. Therefore, understanding students' motivation during transitions can provide insights into how students can adapt to the challenges and navigate their academic activities effectively to achieve high mathematics performance.

This study is part of an ongoing evidence-based research to identify factors affecting poor performance in mathematics in Bongo District for next set of intervention.

Closely related to students' achievement motivation is their self-efficacy in mathematics, which describes students' beliefs in their own capabilities to understand and perform well in mathematics (Ayotola & Adedeji, 2009). It may also be seen as the personal assessment of the competence and confidence in dealing with mathematical challenges. For this study, self-efficacy refers to how much effort students put into a mathematical activity, how long they will persist when struggling with challenging mathematical problems and their endurance when they face obstacles in learning mathematics. Bandura (1997) expresses that students with high self-efficacy in believe that they have the skills and abilities required to succeed. This suggests why self-efficacy may be viewed as a significant predictor of students' mathematics performance (Arifin et al., 2021).

Research suggests there is a strong association between achievement motivation and self-efficacy of students in mathematics (Yan, 2022; Yanru et al., 2022). Furthermore, both variables are said to have combined positive effect on the students' mathematics achievement and future commitment to work (Ayotola & Adedeji, 2009; Kasim, 2022; Yan, 2022). Although these findings are well-documented, there is still a gap in our understanding of the behaviour of these psychological variables, particularly among adolescent students transitioning from basic to SHS. It is therefore worthwhile to investigate the achievement motivation levels and self-efficacy beliefs of fresh students in SHS mathematics classroom.

Achievement Motivation

The study is grounded on the theory of achievement motivation developed by McClelland (1958) from the earlier work of Atkinson (1953). McClelland (1958) described achievement motivation as a personal trait characterized by willingness to maintain high set goals and meet high standards of achievement. The theory describes the motives students have for learning based on

(1) the motivation to achieve a desire goal and

(2) the motive to avoid failure.

The theory also explains a person's behavior based on the needs for achievement, for power and for affiliation. According to McClelland (1958), need for achievement refers to an individual's intense desire to significantly accomplish a task, master a skill and control behavior or prolonged effort to attain high standards. The need for power refers to the desire to influence or control others, be responsible for others, and have authority over others. And finally, the need for affiliation describes the desire to form close personal relationships, avoid conflict, and establish warm friendships. McClelland et al. (1958) noted that individuals who display the need for achievement strive to accomplish realistic but challenging goals while those who show need for power want to be influential and make an impact. However, individuals with the need for affiliation will look for interactions with those within the community of learning.

All these three needs are influenced by both intrinsic and extrinsic motivations developed through school culture and life experiences (Akbar, 2020; Yan, 2022). These needs are also related to the difficulty of learning tasks that students choose to undertake. For example, students with low need for achievement, power and affiliation tend to settle on very easy tasks to minimize risk of failure, or very difficult tasks so that failure would not be embarrassing. On the other hand, students with high needs tend to choose moderately difficult tasks with the motive that they would be challenged but would reach their goal.

Most people develop different forms of motivation for achievement depending on the situation. Akbar (2020) observed that, in a situation, where achievement is evaluated against some standards of excellence, achievement motivation helps to explain how the motive to achieve and the motive to avoid failure influence students' mathematics learning. In SHSs, particularly in Ghana, the performance of students is set against national assessment standards and hence the levels at which fresh students are motivated to achieve such standards or avoid failure need to be investigated to understand their need for achievement in mathematics.

Self-efficacy & achievement motivation

Bandura (1997) defines self-efficacy as one's belief that they possess the planning and execution abilities necessary to overcome certain situations. Bandura (1997) identified four main sources of self-efficacy judgments viz. mastery experiences, vicarious experiences, social persuasion and physiological states (Lau et al., 2018). Regarding mastery experiences, students who have repeatedly succeeded in previous mathematics tasks believe they can equally succeed in future mathematics tasks. Vicarious experiences involve students recognizing social models similar to themselves succeeding with particular tasks and building the self-confident to also succeed in mathematics. Social persuasion refers to encouragement, both positive and negative, from peers, teachers, and parents in the pursuit of a mathematical task while physiological state refers to the student's physical state to endure such as fatigue, pain, or nausea. These four sources of self-efficacy significantly predict not only mathematics self-efficacy but also mathematics achievements (Zakariya, 2022). Hence, like the achievement motivation, self-efficacy is a significant personal variables in students' success in academic task (Bandura, 2012) and has positive effect on mathematics achievement (Arifin et al., 2022; Zakariya, 2022). Lau et al. (2018) particularly acknowledged positive influence of students' self-efficacy beliefs on their persistence, perseverance and resilience towards academic attainments in difficult situations often encountered by students in the learning of mathematics.

Several empirical studies have underlined the reciprocal relationship between students' self-efficacy and their achievement motivation (Akbar, 2020; Ayotola & Adedeji, 2009; Yan, 2022; Yanru et al., 2022). Ayotola and Adedeji (2009) conducted a study on the self-efficacy and achievement motivation of Nigerian senior secondary school students. They reported a strong positive relationship between mathematics self-efficacy and achievement in mathematics. Akbar's (2020) longitudinal study found a bidirectional relationship between students' self-efficacy and achievement motivation suggesting that improvement in self-efficacy leads to increased motivation to achieve over time. A study by Yaru et al. (2019) suggested that students who exhibited higher levels of need for achievement motivation also tended to have stronger beliefs in their ability to succeed in academic tasks, indicating a positive relationship between the two constructs. Similarly, Li et al. (2022) found that regardless of cultural differences, students who possessed a higher need for achievement motivation tended to exhibit stronger beliefs in their ability to perform tasks successfully. Other studies have also reported that enhancing students' achievement motivation could lead to improvement in their self-efficacy beliefs (Phan, 2012; Stajkovic, 2018; Yan, 2022; Yanru et al., 2022). Above all, Elias et al. (2010) concluded that students with higher levels of need for achievement motivation, along with stronger self-efficacy beliefs and

internal locus of control, tended to achieve higher academic success in higher education settings.

The existing literature primarily examines the relationship between self-efficacy and achievement motivation among continuing students. However, there is a gap in understanding this relationship among fresh students transitioning from basic to high schools. Specifically, there is limited empirical evidence, especially in the context of Ghana, to support the idea that new SHS students with a high sense of self-efficacy would exert significant effort into their mathematics activities despite facing learning obstacles. Recognizing and understanding this relationship could assist teachers in developing strategies to alleviate mathematics anxiety among fresh students and reduce their risk of failure in mathematics.

Achievement motivation & students' demographic variables

A plethora of research has been conducted to examine the achievement motivation of students with respect to their demographic characteristics such as gender, location and program of study (Ansary et al., 2021; Arul Lawrence & Vimala, 2013; Sivrikaya, 2019). Studies by Arul Lawrence and Vimala (2013) and Pawar (2017) found significant gender and locality differences in the students' achievement motivation. Both studies reported that male students in urban areas exhibited higher achievement motivation than female students in rural settings. Despite these findings, there are also studies, which reported no significant gender differences in achievement motivation of students (Ansary et al., 2021; Sharma & Sharma, 2018). A meta-analysis by Devi (2012) did not find significant gender differences in achievement motivation among college students. Ansary et al. (2021) reported no differences between males and females as well as between rural and urban undergraduate students in their achievement motivation. The inconsistencies in existing research coupled with scarcity of literature on how achievement motivation relates to students transitional characteristics such as previous school attended and program of study, warranted this present study.

Present Study

Over the years, there have been serious performance problems in mathematics across SHSs in Ghana. In most deprived districts in Ghana, the trend of performance has been quite abysmal (West African Examination Council [WAEC], 2021). Bongo is one of the deprived districts in the northern part of Ghana. Statistics shows that more than 80.0% of candidates in SHSs in Bongo district obtained core Mathematics grades that did not qualify them to go to tertiary institutions (WAEC, 2021). As a result, all SHSs in the district have been consistently classified as low performing schools (category C schools) in Ghana (District Education Office, 2021). Correspondingly, more than 50.0% of the students who entered SHSs in the district for the past seven years did so through self-placement system. That means they were cut off by the national computerized school selection and placement system as a result of obtaining as low as aggregate 40 and above.

Literature on students' performance problems have been well-documented (Yarin, 2022). In Bongo District, studies have examined the teacher pedagogy, students' attitudes and resources availability among others affecting students' mathematics performance. Unfortunately, studies on entry psychological need for achievement and self-efficacy beliefs of fresh SHS students appear to have been overlooked (Afrifa-Yamoah, 2016). Currently, little or no empirical evidence exists in Ghana on the achievement motivation levels of fresh students in SHS mathematics classroom. It is also not known if the motivational profile of fresh SHS students correlates with a key performance predictor in mathematics namely self-efficacy beliefs. There are also contradictions in research regarding the relationship between students' achievement motivation and their demographics variables such as gender, previous school attended, boarding status and program of study (Ansary et al., 2021; Sharma & Sharma, 2018; Sivrikaya, 2019). As a sequel, this study sought to fill these knowledge gaps by investigating fresh SHS students' achievement motivation levels and self-efficacy beliefs towards mathematics. Specifically, we sought to:

(1) examine the achievement motivation levels of fresh students to SHS mathematics,

(2) determine if their achievement motivation levels differ across key demographics variables such as gender, previous junior high school (JHS) attended, boarding status and program of study, and

(3) find out if fresh students' achievement motivation levels relate to their self-efficacy towards learning mathematics.

An understanding of the achievement motivation levels and self-efficacy beliefs of fresh students before they begin lessons in mathematics at SHS could help teachers gauge and regulate their psychosomatic and motivational orientations. It is anticipated that the findings in this study would contribute to knowledge on the level of intrinsic motivation, achievement goal setting and achievement expectancies of fresh students in mathematics at SHSs. The study would also help clarify the debate on antecedent factors influencing mathematics performance at SHSs in deprived areas. Such information can help teachers provide appropriate congenial environment for learning mathematics at SHS. The findings of the study would also help first-year mathematics teachers to devise appropriate pedagogical interventions to whip up students' interest and promote their achievement goal setting.

METHOD

Design & Sample

This study adopted descriptive cross-sectional survey design to investigate fresh SHS students' motivation achievement levels and how it correlates to their self-efficacy levels. The design enabled the researchers to collect data on prevailing achievement motivation and self-efficacy across demographic variables of the students at a single point in time. The population was first year (fresh) students enrolled for 2021/2022 academic year in all three public SHSs in Bongo district. They were 1,462 fresh students comprising 447, 529, and 486 students from schools A, B, and C, respectively. A sample size of 314 was determined for the population using Yamane (1967) simplified formula $n = \frac{N}{1+N(e)^2}$, where n is the sample size, N is the population size (N=1,462), e is the acceptable sampling error (e=.05), 95% confidence level, and p=.50 were assumed.

Stratified and proportional simple random sampling techniques were employed to take account of students' gender, boarding status, types of JHS attended, and five programs offered in the schools. In all, the sample comprised 97, 113, and 104 fresh students from schools A, B, and C, respectively.

Table 1. Distributions of demographics of participating students (n=314)

Demographics	Categories	Frequency	Percentage (%)
Gender	Male	146	46.5
	Female	168	53.5
Age	14-15	19	6.0
	16-18	254	80.9
	19-21	41	13.1
Type of JHS attended	Public school	273	86.9
	Private school	41	13.1
Boarding status	Boarding	231	73.6
	Day	83	26.4
Program of study	General science	48	15.3
	Business	62	19.7
	Home science	46	14.6
	Agricultural science	49	15.6
	General arts	109	34.7

Table 1 displays the distributions of the demographic information of 314 students selected for the study.

From Table 1, the participating students were made up of more females (53.5%) than males (46.5%) with a large proportion (80.8%) of them within the age range of 16-18. About 87.0% of the students attended public JHS with only 13.0% from private JHS. Across the three SHSs, a large number of the students (73.6%) were in boarding houses while about a one-quarter (26.4%) attended school from home (i.e., day students). Finally, students offering general arts program were more than twice those offering general science or home economics or agricultural science programs.

Research Instrument

A questionnaire comprising three sections was used for data collection. Section A contained five items designed to capture five demographics variables of the students (see Table 1). Section B had 20 items adapted from Ellez's (2004) achievement motive scale (AMS) designed to measure students' achievement motivation levels. The scale had six items measuring striving, five items on participation, four items on willingness to work, and five items on maintaining the working. All the items were on a five-point differentiable scale from not at all to always. Finally, section C consisted of eight items adapted from the new general self-efficacy scale (NGSES) meant to measure students' self-efficacy levels on a five-point differential scale.

To ensure content and face validities, the questionnaire was vetted by a senior research fellow at one of the public universities in Ghana and two experienced mathematics teachers at one SHS. Two students from a SHS also answered the questionnaire and were later interviewed to check ambiguity, wording and time needed to complete the questionnaire. The comments made were used to improve upon the validity of the questionnaire.

For reliability checks, a pilot study was conducted to determine the consistency of the questionnaire. The analysis yielded Cronbach's alpha coefficient of .766 for the 20-item AMS and .827 for the 8-item NGSES. The overall reliability coefficient was .848 for all the 28 items. The coefficients obtained are consistent with previous studies (Afrifa-Yamoah, 2016) and showed that the instrument yielded high internal consistency and hence reliable for the study. The validity of the demographics variables was ascertained by face and content validity methods.

Prior to data collection, ethical considerations for conducting research with high school students included obtaining approvals from heads of the schools and adherence to ethical guidelines. This involved obtaining assent from the students themselves. Confidentiality of information from participants was maintained throughout the study. Participating students were also assured of their confidentiality and further given the option to exit at any point in time they felt they did not wish to continue responding to the questionnaire. These measures were implemented to safeguard the well-being and rights of the participants involved in the study.

Data Analysis

Data were analyzed using descriptive statistics, independent t-test, one-way analysis of variance (ANOVA) and correlational analysis at .05 significance level. The descriptive statistics was performed to determine the students' achievement motivation levels and self-efficacy level in learning mathematics. The independent samples t-test was used to ascertain whether SHS students' achievement motivation differ by gender, type of JHS attended and boarding status. One-way ANOVA was used to determine whether there exists statistically significant differences in the achievement motivation of the students across the five programs of study. Finally, Spearman rank correlation was used to establish the nature of relationship between SHS students' achievement motivation levels and their self-efficacy level.

Before proceeding with t-test and ANOVA analyses, several assumptions were addressed. A sample of 314 participants was obtained statistically relative to the population size and hence deemed adequate for the study. The assumption of independence of observations was met by ensuring that each participant responded to the questionnaire independently. The equality of variance among groups were examined statistically and descriptively. Specifically, for achievement motivation, the Levene's test for equality of variances yielded F=2.668, p=.103 for gender, F=.117, p=.733 for boarding status, and F=3.24, p=.058 for JHS attended by participating students. These non-significant results signified that equality or homogeneity of variances is assumed across groups. Moreover, Shapiro-Wilks test for normality, had p-values exceeding .05, indicating that the measured variables did not significantly deviate from a normal distribution. Additionally, visual examination of the histograms, normality probability plots (P-P and Q-Q) and box-plots confirmed the approximate normal distributions of both achievement motivation and self-efficacy variables.

RESULTS

Achievement Motivation Levels

For this study, the achievement motivation levels were measured at four dimensions. The first dimension, strive, refers to a kind of intrinsic motivation, where a student makes frantic efforts to achieve a learning goal, performance target or avoid failure in mathematics. The second dimension, participation, refers to the students partaking in mathematics tasks regularly and fully during mathematics lessons. The third dimension, willingness to work means the students' readiness to engage in mathematics activities and the last dimension, maintaining working, describes the persistence in learning mathematics tasks. Figure 1 shows the mean responses of students in each dimensions and overall mean response in achievement motivation on five point scale.

Figure 4. Means of four dimensions & overall mean for achievement motivation (Source: Field data from survey)

Table 2. Descriptive statistics: t-test results

Variable	Category	Achievement motivation means (SD)	Independent samples t-test		
			t	df	p-value
Gender	Male	3.82 (.521)	.700	312	.484
	Female	3.87 (.651)			
Type JHS attended	Public school	3.84 (.606)	.357	312	.722
	Private school	3.88 (.508)			
Boarding status	Boarding	3.86 (.604)	.497	312	.620
	Day	3.82 (.586)			

Table 3. ANOVA results of differences of achievement motivation by program of study

Variable	Category	Achievement motivation means (SD)	One-way ANOVA			Eta squared
			t	df	p-value	
Program of study	General science	3.96 (.544)	2.407	df_1=4 & df_2=309	.046	.0302
	Business	3.79 (.604)				
	Home science	3.62 (.679)				
	Agricultural science	3.88 (.656)				
	General arts	3.91 (.536)				

The mean (M) response for students' strive towards mathematics was 3.90 with standard deviation (SD) of .740. The result signifies that students' desire to strive for success in the learning of mathematics was high. Also, the mean response for students' participation level in mathematics lessons was reportedly high (M=3.50, SD=.740). The highest mean response of 3.60 corresponded to "I enjoy studying mathematics lessons" and the lowest of 2.70 corresponded to "I revise my notes before mathematics lessons". Again, the mean response for students' willingness level to learn mathematics was high (M=3.80, SD=.820). The highest mean response of 4.00 corresponded to "I like being successful at school" and the lowest mean response of 2.70 corresponded to "I get disturbed when I cannot finish my mathematics homework". Finally, the mean response for students' level of maintaining to work on learning mathematics was 4.10 with SD of .880. This means that the students' ability to maintain their desire to learn mathematics was high. The overall mean of 3.90 with SD of .590 shows that students' achievement motivation levels were generally high.

Achievement motivation & demographic variables

Further analysis was done to determine if the students' achievement motivation was associated with their gender, type of JHS attended, boarding status and program of study. The results of independent t-test and one-way ANOVA are presented in **Table 2** and **Table 3**.

From **Table 2**, the descriptive statistics shows that the achievement motivation mean response level of males (M=3.82) and females (M=3.87) differ by .05. However, an independent samples t-test shows that the mean difference in the achievement motivation of the students did not differ significantly by gender (t[312]=.700, p=.484). In terms of type of JHS attended, students from public JHS reported lower achievement motivation level (M=3.84) than those from private JHS (M=3.88). An analysis of the independent sampled t-test however shows no significantly differences in the achievement motivation of students between public and private JHS attended (t[312]=.406, p=.687). Similarly, the mean achievement motivation level of 3.86 for borders and 3.82 for day students were not significantly different at .05 significance level (t [312]=.497, p=.620).

For program of study, the descriptive statistics shows that agriculture science, business, and home science programs recorded higher mean responses of 3.88 (SD=.656), 3.79 (SD=.604), and 3.63 (SD=.679), respectively. However, a one-way ANOVA shows that students' achievement motivation levels differed significantly across programs of study (F[4, 309]=2.407, p=.046). The students offering general science and general art programs had the highest mean achievement motivation 3.96 (SD=.544) and 3.91 (SD=.536), respectively. Further examination was conducted using Post Hoc test to detect the programs yielding the significant differences. The result shows that general science (mean difference=.45, p<.001) had higher statistically significant achievement motivation than those offering home science. An eta square value of 0.0302 signifies that approximately 3.0% of variance in students' achievement motivation levels can be attributed to the differences in their programs of study. This proportion indicates students' program of study had small but significant effect on their achievement motivation.

Table 4. Descriptive statistics of level of self-efficacy of students (n=314)

Self-efficacy items	Mean	Standard deviation	Level
I will be able to achieve most of the mathematics goals that I have set for myself.	4.0	1.19	High
When facing difficult task in mathematics, I'm certain that I will accomplish it.	3.8	1.12	High
In general, I think I can obtain mathematics outcomes that are important to me.	3.9	1.22	High
I believe I can succeed at most any mathematics endeavor to which I set my mind.	3.8	1.21	High
I will be able to successfully overcome many mathematics challenges.	3.8	1.23	High
I'm confident that I can perform effectively on many different mathematics tasks.	3.7	1.22	High
I believe I can get an "A1" when I am learning mathematics.	4.1	1.25	Very high
I believe I will be able to use mathematics in my future career when needed.	4.1	1.22	Very high
Overall	**3.9**	**.81**	**High**

Note. 0.0-1.0: Very low; 1.1-2.0: Low; 2.1-3.0: Moderate; 3.1-4.0: High; & 4.1-5.0: Very high

Table 5. Spearman rank correlations between self-efficacy & four dimensions of achievement motivation

Variable		Strive	Participation	Willingness	Maintaining working	Achievement motivation
Self-efficacy	r	.469**	.259**	.270**	.571**	.469**
	p	.000	.000	.000	.000	.000
	n	314	314	314	314	314

Level of Self-Efficacy

In this study, eight items were analyzed to determine the level of students' self-efficacy in learning mathematics. **Table 4** shows the students' mean response levels and SD corresponding to each items.

From **Table 4**, the mean responses of the students in all the items ranged from 3.70 to 4.10 signifying either high or very high levels of self-efficacy. Among the responses given by the students in **Table 3**, the highest mean response level corresponded to "I believe I will be able to use mathematics in my future career when needed", which is 4.10 (SD=1.220). The means for the rest of the items remain high with the least among them being "I am confident that I can perform effectively on many different mathematics tasks" recorded as 3.70 (SD=1.220). The overall mean of 3.90 (SD=.810) indicates that majority of the students have high sense of self-efficacy to learn mathematics.

Self-Efficacy Beliefs & Achievement Motivation

Spearman rank correlation analysis was performed at .05 level of significance to determine the correlation between fresh students' self-efficacy and the four dimensions of achievement motivation. The result is shown in **Table 5**. From **Table 5**, the correlation analysis shows that there was statistically significant positive correlation between strive and self-efficacy (r=.469, N=314, p<.001). The correlation between participation and self-efficacy was weak but statistically significant (r=.259, N=314, p<.001). For willingness to work and self-efficacy, the correlation was also weak but positively significant (r=.270, N=314, p<.001). Also, a moderately positive but significant correlation existed between maintaining the working and self-efficacy (r=.571, N=314, p<.001). Cumulatively, the correlation between overall achievement motivation and self-efficacy was quite moderate but statistically significant (r=.469, N=314, p<.001).

DISCUSSION

One of the reasons for students' reluctance to study and succeed in mathematics is that they may not be motivated to learn. This study examined the levels of achievement motivation and self-efficacy beliefs of fresh students towards SHS mathematics. The study found that the achievement motivation levels of the fresh students were generally high. This means that the majority of the fresh students have the desire to strive to achieve learning targets, meet performance goals or avoid failure in SHS mathematics. This finding is in line with previous studies (Afrifa-Yamoah, 2016; Dagnew, 2017; Yan, 2022; Yanru et al., 2022) in which most students exhibited a relatively high levels of achievement motivation towards mathematics. The finding indicates that the fresh students are intrinsically motivated and very eager to learn mathematics in their new learning environment. Such eagerness could reflect the fresh students' desire to satisfy their personal aspirations, to affiliate with peers, avoid embarrassment among peers and for power to make an impression. It is however important to recognize that students' motive to achieve is only an inherent behavioral intention, which can be either reinforced or weakened by external factors such as teacher actions, parental involvement and peer influences (Roy & Saha, 2022; Siddhu, 2011; Wigfield & Eccles, 2000). It must also be acknowledged that the participants in this study are adolescents who are in the period of development and adaptation and are responding to various physiological and psychosocial influences to meet perceived needs. It therefore behoves on the mathematics teachers to boost such inherent motives by reinforcing students' positive study habits and encouraging them to set realistic learning goals. Additionally, parental encouragement and support are also needed to ensure that the students' motivational levels do not decline but rather drive them to achieve higher goals in mathematics.

In terms of entry demographics variables, the results showed no statistically significant differences in the achievement motivation levels of the fresh students based on gender, type of JHS attended and boarding status. This implies that, both male and female fresh students share similar aspirations regardless of whether they attended public or private JHS or whether they were boarding or day students. This challenges previous notions suggesting variations in motivation based on these demographic variables (Ansary et al., 2021; Sivrikaya, 2019). This goes to suggests that gender of the fresh students has little influence on their motive for learning mathematics. Also, the fact that the achievement motivation of the fresh students did not differ by type of JHS attended tends to alley the fear that private JHS students are more adaptive and self-motivated to learn mathematics than public JHS students. Similarly, the non-significant difference in the motivation, implies that boarding status has no effect on achievement motivation. This study therefore suggests that any differences in achievement motivation in mathematics among the fresh students may not be

attributed to gender, type of JHS previously attended or boarding status at SHSs in the district.

In term of programs of study however, it was established that the fresh students' achievement motivation in mathematics varied across five programs of study. In particular, fresh students enrolled for the general science and general arts had higher achievement motivations than those in agricultural science. Moreover, those enrolled for agricultural science had high achievement motivation than those in business and home science. This finding collaborates with a study by Dagnew (2017), which concluded that students' program of study has significant effect on their levels of achievement motivation to learn mathematics. The finding also goes to support public assertion that the students in general science tend to be more inclined to learn mathematics than those in other programs. It must however be admitted that only small proportion (3.0%) of the variance in achievement motivation is attributed to program type. Perhaps, the differences may stem from criterion used for placement to SHS, students' previous mastery levels or vicarious experiences of failure in the learning of mathematics. For instance, students with better grades in mathematics from the national basic certificate examinations in Ghana are more likely to be placed in general science program. This finding suggests that different motivational strategies are required to whip interest of fresh students in different programs of study in SHSs.

Self-efficacy in mathematics indicates students' belief on their ability to overcome difficulty or obstacles when solving mathematics problems (Zakariya, 2022). The present study found that the levels of the fresh students' self-efficacy towards mathematics was high. Furthermore, there was a moderately positive relationship between the fresh students' achievement motivation and their self-efficacy beliefs measured by mastery experiences, vicarious experiences and social persuasion. This confirms previous studies (Akbar, 2020; Lau et al., 2018; Stajkovic, 2018; Yan, 2022; Yanru et al., 2022; Zakariya, 2022) and emphasises the interrelatedness of motivation and self-efficacy in shaping students' success in mathematics. The interrelatedness also plays an important role in elevating the identity of students as mathematicians. This identity may help in improving the perceptions of students about themselves and about their academic competence and hence, contribute to their overall success in mathematics in the district.

CONCLUSIONS & RECOMMENDATIONS

The study concludes that majority of the fresh students are highly motivated and willing to set learning targets in mathematics and work consistently towards achieving them. In effect, majority of the students have shown readiness to learn mathematics and achieve high outcomes. They have also portrayed greater confidence in their own ability to overcome challenges in mathematics. Since both achievement motivation and self-efficacy significantly predict mathematics achievement, it can be concluded that the fresh students in this study have the intrinsic desire and high sense of belief to achieve high learning outcomes in mathematics. Hence, to promote the performance in mathematics, interventions need to target the motivational profiles and belief patterns of these students across different programs of study at SHSs in the district. The study recommends that

(1) to attain greater success in mathematics, fresh SHS students should be guided by their mathematics teachers to set realistic goals and strive to achieve them,

(2) SHS mathematics teachers should diagnose and identify students with low self-efficacy and use motivational strategies to promote the existing intrinsic motivation that students have towards mathematics lessons, and

(3) the schools should also institute mathematics forum for both teachers and students to share their success stories. This will help those with low self-efficacy and low achievement motivation to choose role models to counsel them to strive to be like them.

Limitations

Limitations of the study relate largely to sample bias and lack of qualitative data. The study was limited to fresh students in three category C SHSs in an economically deprived district in Ghana. Therefore, the findings may lack generalizability to broader populations, including students in categories A and B schools. Also, the use of a closed-ended questionnaire constrained participants from qualitatively expressing themselves. Such qualitative data could have been used to triangulate the quantitative findings to provide varied insights. Future research should address these limitations to enhance understanding of achievement motivation and self-efficacy among Ghanaian SHS students. Studies on fresh students' study habits and learning styles may also help reveal the mathematics performance challenges in the district.

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