

## **Relationship between pre-service teachers' mathematics self-efficacy and their mathematics achievement**

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### **Abstract**

This study sought to explore the relationship between pre-service teachers' perceived self-efficacy in teaching mathematics and their achievement in mathematics. It is a descriptive study which involved forty students (47.5% male, 52.5% female) of Kibi College of Education. Data was collected through a Mathematics Self-Efficacy Scale (MSES) questionnaire and a Mathematics Achievement Test (MAT). The findings of the study revealed a strong positive relationship between the pre-service teachers' self-efficacy in mathematics and their achievement in mathematics. In view of the findings, the study recommends among others that teacher educators should focus on helping to develop pre-service teachers.

Keywords: teachers' perceived self-efficacy; teaching mathematics; mathematics achievement

### **Introduction/Background to the Study**

Mathematics is perceived as an essential precursor to success in modern society. Its usefulness in science, technological activities as well as commerce, economics, education and even humanities is almost at par with the importance of education as a whole (Tella, 2008). In Ghana, as in most countries, mathematics occupies a key place in the basic school, senior high school (SHS) as well as Colleges of Education (CoE) curricula. Mathematics is a compulsory subject for every learner at these levels; essentially, it is a gatekeeper and critical filter for further studies in the country. According to Fletcher (2007), the ability to cope with more of mathematics improves one's chances of social advancement. In the face of its significance and wide applicability, students' achievement in this all important subject in the country has been problematic (WAEC, 2016; Enu, Agyeman & Nkum, 2015; Butakor, 2015; Bawuah, Yakubu & Seyram 2014; UNESCO, 2010; Ghana News Agency [GNA], 2012; Davis, 2008; Duedu, Atakpa, Dzinyela, Sokpe & Davis, 2005; Anamuah-Mensah & Mereku 2005).

Locally, performance of Ghanaian students in mathematics has consistently been low over the years. Recent records show that only 32.83% of the 247,262 candidates who sat the May/June 2016 West African Senior School Certificate Examination (WASSCE) obtained a pass of A1- C6 in core Mathematics. The poor standard in the subject is also alive even on the macro level. For example, in a global educational rankings conducted by the Programme for International Students Assessment (PISA) in 2015 for countries in the Organization for Economic Cooperation and Development (OECD), Ghana's 8th graders (i.e. Junior High School (JHS) 2 pupils) were placed at the bottom of 76 nations (Amenyo, 2015). What appears to be more alarming is the achievement of trainee teachers in Colleges of Education. The Chief examiners report for the 2013/2014 academic year first semester examination for Colleges of Education pointed out that the trainees' performance was worst in mathematics (Enu, Agyeman & Nkum, 2015). The report indicates that

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32.9% of the candidates who took the mathematics paper (i.e. FDC 112: Number and Basic Algebra) had the grades D or D+ and 20.9% failed in the paper.

These poor performance levels in mathematics are of great concern to stakeholders in education and a threat to the future of the country's science and technology industry. To research the reasons for these low standards, it is imperative to pursue the variables that influence students' performance. According to Crosnoe, Johnson and Elder (2004), these variables may be termed as family factors, socio-economic factors, students' personal factors, school-based factors and peer or social factors. Of these variables, the impact of students' personal factors on Mathematics achievement continues to be of high interest. Of all the personal variables that have attracted the attention of researchers, Mathematics self-efficacy has gained more popularity (Tudy, 2014; Aldridge et al., 2013; Cheema, 2013; Zeldin, Britner & Pajares. 2008; Zeldin & Pajares, 2000; Pajares, 1997; Zimmerman, Bandura & Martinez-Pons, 1992; Lent, Brown & Larkin 1986).

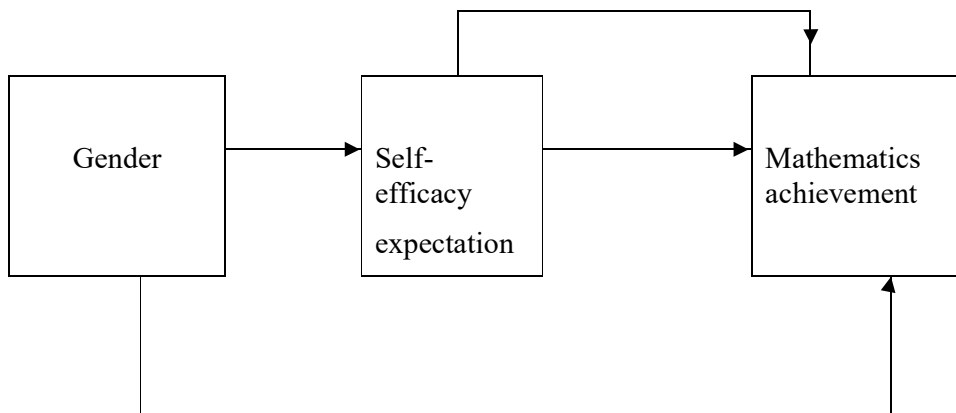
Self-efficacy can be explained as the judgement of one's capabilities to successfully perform a particular given task (Bandura, 1977). Since its introduction in the late 70's by psychologist Albert Bandura, the concept has gained much prominence in research space. He proposed four sources of self-efficacy. Namely, mastery experiences, vicarious experiences, social persuasions, and physiological and affective states. Mastery experiences include a person's interpretations of his/her past performances and are supported as the most powerful source of self-efficacy (Lent, Brown & Multon, 1991; Usher & Pajares, 2009). Vicarious experiences involve a person's interpretation of his or her performance in comparison to the performance of another individual and whether they conclude it to be a success or failure. Social persuasions are encouragements that a person receives from influential sources including peers, teachers, and parents. Lastly, physiological or affective states involve symptoms such as stress and anxiety that are stimulated as a result of a specific event or grouping of events. Together, these four categories have been widely accepted as enveloping all observed means of influence on self-efficacy.

Self-efficacy is known to be the main factor in someone's decision making process (Bandura 1977), but Mathematics self-efficacy has largely been identified to be strongly related to students' choice of courses and career pathways (Vukovic, Roberts & Green 2013; Zeldin et al. 2008; Betz & Hackett, 1983; Lent & Hackett, 1987). Mathematics self-efficacy shows the belief of a person in his/her own competence to perform mathematical tasks successfully. It indicates the confidence and the expectation an individual has in his own ability to solve a particular mathematics problem. According to Pajares & Kranzler (1995), these beliefs and expectations influence whether somebody starts working on a mathematics task and the intensity of the performance. A plethora of evidence exist that shows positive relationship between mathematics self-efficacy and students' choice of science-related educational and career pathways (Vukovic et al., 2013; Zeldin et al. 2008; Betz & Hackett, 1983; Lent & Hackett, 1987; Lent et al., 1991). For example, in their investigation Vukovic et al., (2013), found that mathematics self-efficacy showed significant effect on the tertiary entrance ranks.

Pajares and Miller (1995) observed that self-efficacy beliefs and expectations "are task and domain specific". In view of this, measurements of self-efficacy expectations have been known to be linked to a domain or task. For example, questionnaires have been proposed to measure self-efficacy expectations in the field of computer usage (Cassidy & Eachus, 2000; Barbeite & Weiss, 2004). Similarly, questionnaires have also been drawn specifically to measure self-efficacy in the area of Mathematics (Betz & Hackett, 1983; Pajares & Miller, 1995; May & Glynn, 2008). According to Bandura's social cognitive theory, student's judgement of their capability to perform academic tasks or self-efficacy beliefs predicts their capability to accomplish such tasks. Thus, unless people believe they can produce desired outcomes they have little incentive to act. Self-efficacy in Mathematics has been identified as a strong factor of performance in the subject.

According to May and Glynn (2008), persons with low mathematical self-efficacy will avoid mathematical tasks or situations. A number of studies have also revealed a strong relationship between mathematics self-efficacy and Mathematics achievement (Aldridge et al., 2013; May & Glynn, 2008; Liu & Koirala, 2009; Kabiri & Kiamanesh, 2004). In their conclusions, they claim that the higher a person rates on Mathematics self-efficacy scale, the better this person performs on mathematical problems.

Studies regarding gender differences in Mathematics performance and Mathematics self-efficacy ratings have also been reported. While some reports have suggested that males are usually scoring higher in Mathematics self-efficacy questionnaires than females (Betz & Hackett, 1983; Osafehinti, 1988; Randhawa & Gupta, 2000), some other studies found no significant mean difference between male and female mathematics self-efficacy (Aremu & Tella, 2009; Hyde, Fennema, Ryan, Frost & Hopp, 1990; Popoola, 2000). Considering the literature, this paper explored similar path by investigating on the experience of pre-service teachers offering the initial teacher programme at the Colleges of Education in Ghana. This study was anchored on Bandura's Social Cognitive Theory, which views human beings as cognitive, self-regulatory, and self-reflective. Self-efficacy is major component on this theory which is defined as "beliefs in one's capabilities to organize and execute the course of action required to produce given attainments" (Bandura, 1977). Based on the theory, this study sought to examine pre-service teachers' mathematics self-efficacy with regards to their performance in a Mathematics task. The literature was reviewed in order to draw a conceptual framework for the study. Figure 1 presents the conceptual framework for the study.



**Figure 1: Factors contributing to students' performance in mathematics**

### **Statement of the problem**

Students often expect to fail, because conventionally, there has been a high failure rate in Mathematics among Ghanaian students. This encourages low motivation for learning the subject, produce high anxiety and gratuitous phobia as well as low Mathematics self-efficacy. Studies cited with regards to personal factors that affects Ghanaian students' achievement in Mathematics have focused on students' attitude towards the subject, anxiety, perceptions and motivation together with other variables such as family and socio-economic, and school-based factors (Butakor, 2016; Butakor, 2015; Enu, Agyeman & Nkum, 2015; Nabie, Akayuure & Sofo, 2013; Asante, 2012; Nyarko, 2010; Fletcher, 2007; Etsey, 2005 and Etsey et al, 2004). Butakor (2016) highlighted on family level variables and revealed a positive association between parents' educational level and basic school pupils' Mathematics achievement. Students' personal factors and school-based factors were the focus of Enu, Agyeman & Nkum, (2015). In their study, Enu, Agyeman and

Nkum, (2015) identified inadequate teaching and learning materials as well as method of instruction as some of the factors which affect Ghanaian pre-service teacher trainees' performance in mathematics.

There appear to be paucity of research in the area of relationship between mathematics self-efficacy beliefs and mathematics performance of students in Ghana. It is important to identify these personal or internal variables that affect students' performance in order to help improve achievement in the subject. This is particularly important when the students involved are future basic school teachers; otherwise, they are more likely to graduate as teachers and produce yet another set of generation of children who are weak cognitively and have low self beliefs that could lead them to eventually avoid mathematics or demonstrate low performance in the subject. In order to fill in this gap, this research paper attempts to explore teacher trainees' self-efficacy beliefs in teaching mathematics and their mathematics achievement. In particular, the problem of this study is to determine the relationship between teacher trainees' perceived mathematics self-efficacy and their mathematics achievement. The research was guided by the following research questions:

1. What is the rate of performance of pre-service teacher trainees in Mathematics?
2. What is Pre-service teacher trainees' self-efficacy towards Mathematics?

### **Methodology**

The research is an exploratory survey study that adopted the descriptive research design.

#### *Population and Sample*

The target population for this study were pre-service teacher enrolled on the Diploma in Basic Education (DBE) programme taking "Number and Basic Algebra" (FDC 112) course in the Mathematics and ICT department at Kibi College of Education. The rationale for choosing this category of students was two-fold. First, these students are matured enough to form independent opinion about the mathematics they do in relation to their Mathematics self-efficacy expectations and their achievement in the subject. Second, pre-service teacher trainees are our future basic school teachers; they will soon graduate and will be ushered into the teaching profession where they will be expected to teach mathematics to other young ones. It is therefore not out of place to inquire of their confidence levels in solving mathematics problems. According to the college's records of registered students, there were 334 registered students for the 2017/2018 academic year. The list of these students was obtained from the quality assurance department into an Excel file and used as a sampling frame from which a random sample was drawn with a sampling fraction of 15%. Random numbers between 0 and 1 were generated in the Excel file against the list of students.

#### *Instrumentation*

Two instruments were used to collect data for this study, a Mathematics Self-Efficacy Scale (MSES) questionnaire and Mathematics Achievement Test (MAT). The MSES instruments asked students to express their level of confidence to successfully solve each of 18 Mathematics problems drawn from the MAT. The MSES is an adapted version of Pajares and Kranzler (1995), Pajares and Miller (1995) and May and Glynn (2008). However, the MAT was developed and constructed in line with the Colleges of Education mathematics curriculum and with the assistance from senior lectures of the University of Cape Coast. The items were given to them for their comments and corrections. Their comments helped in modifying the MAT. The MAT consisted of the same Mathematics tasks on which the sample for this study passed their confidence judgement.

### *Data Analysis*

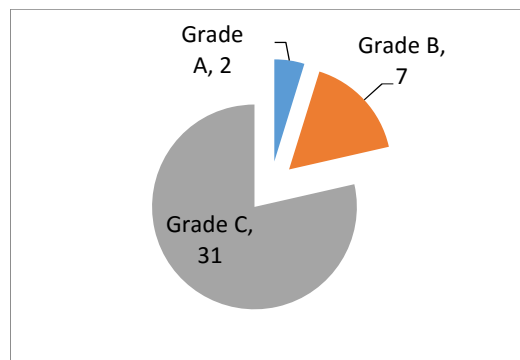
The research obtained students' raw scores from the MAT and confidence ratings from the MSES at the end of the first semester (January) of the 2017/18 academic year. Entry grades of students in mathematics were also collected. For the purposes of this study, the MAT enjoyed a minimum pass mark of 50% (grade D) and a maximum proficiency rate of 100% (grade A). This was in accordance with the passing mark for every course taught at the College of education. The MSES was one-dimensional, it measured only one construct namely "confidence" with a scale of increasing strength ranging from low to high (i.e. 1 standing for very low or no confidence and 5 for very high or total confidence). The scores from the MAT and MSES constituted the main data source used for the study. In testing the hypothesis, the independent sample t-test was used to test for the significance difference in mean performance and mean self-efficacy in mathematics respectively, between male and female pre-service teachers. All t-tests were two-tailed and conducted at a 5% level of significance. The Pearson's Product-Moment Correlation Coefficient (r) was used to measure the relationship between students' self-efficacy in mathematics and performance.

### *Assumptions and Constraints*

The major assumptions made in this study were that students answered the survey questions truthfully and that they fully understood what the questionnaire required of them. It was also assumed that the MSES questionnaire accurately measured students' self-efficacy. Chances of recall error were high when students were asked to state their entry grade in core mathematics. However, their claims were further authenticated by calling for their entry qualification files from the college's administration. The study tested a representative sample of students taking FDC 112 in the 2017/2018 academic year. Hence results are not subject to generalizations beyond this group of students.

### **Results**

Of the 50 questionnaires distributed, 43 were completed and returned, indicating a response rate of 86.0%. However, 3 of the instruments had too many item with partial responses (most of the affected items were on the MAT) and they were all classified as complete non-response, thus reducing the response rate to 80.0%. The sample of 40 respondents consisted of 19 male and 21 female students. All the students were full-time students offering the general Diploma in Basic Education (DBE) programme. The study collected data on students' entry behaviour, their confidence ratings on the MSES and their performance rate with regards to the MAT. Figure 2 shows a summary distribution of pre-service teachers' mathematics entry grades. Figure 2 indicates that majority (77.5%) of the students sampled for this study gain admission into the College with a credit pass (bare minimum grade) in mathematics. However 5.0% and 7.5% had grades A and B respectively, upon which they obtained admission into the college.



**Figure 2: Distribution of teacher trainees' mathematics entry grade**

The results of their mean performance in the MAT as well as the MSES are presented in Table 1.

**Table1: Teacher trainees' mean performance and self-efficacy expectation according to entry grade**

Entry Grade	Frequency	Mean Expectation	Performance Rate (%)
A <sub>1</sub>	2	4.20	71
B <sub>2</sub> / B <sub>3</sub>	7	3.42	53
C <sub>4</sub> /C <sub>5</sub> /C <sub>6</sub>	33	2.64	34

Table 1 shows the performance rate of pre-service teacher trainees with regards to their entry grade. The result from the table indicates that students with entry grade 'A' rated 4.20 on the confidence scale and had an average score of 71% in the MAT. Whilst students who gain admission with grades C and B recorded 2.64 and 3.42 respectively, on the confidence scale with corresponding average mean performance rates of 34% and 53% on the MAT. The results seems to suggest that students who enter our Colleges of Education with better grades do not only rate high their confidence and expectations, but also do perform better academically. This result supports the findings of Mlambo (2011), who maintained that learning is a cumulative process, and therefore students admitted with higher entry requirement will be well prepared for the course material compared to a student admitted based on the bare minimum qualification. The findings also agree with the revelations made by Chemers et al., (2001) and Vukovic et al., (2013). The result of this study paints a gloomy picture about the levels of proficiency of our basic school teachers in mathematics; with an average mean performance of 52.7% on the MAT, it suggests that several of our pre-service teachers who are being trained to man our basic schools already had weak backgrounds in mathematics.

*What is Pre-service teacher trainees' self-efficacy towards Mathematics?*

Students who participated in this study were asked to rate their level of confidence in solving a MAT problem on an 18 item Likert scale. This helped in detecting whether or not they would attempt to solve a mathematics task. Their responses are presented in Table 2. The majority of students (77.5%, mean = 4.15) have absolute confidence (45%) or much confidence (32.5%) in expressing a recurring number as a rational number in the form  $\frac{x}{y}$ , where  $y \neq 0$ . A sizeable number of the respondents (72.5%, mean = 4.075) also have 42.5% absolute confidence or 30% much confidence in changing a numeral from one base to another. However, the problem on which most of the trainees (65%, mean = 2.5) expressed low confidence in was "finding the largest possible domain of a rational function" involving a square root. On the whole, students' self-efficacy towards Mathematics recorded a mean expectation value of 3.43. This value indicates that most students admitted to pursue the DBE programme have "some confidence" to begin to work out mathematics tasks. But the level of self-efficacy is neither high nor low. This finding is consistent with the results reported by Tudy (2014), who also revealed that students' self-efficacy in mathematics was neutral, however in his study, the sample were chosen to be K 12 students.

**Table 2: Students' self-efficacy towards Mathematics**

<b>I am confident in:</b>	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Undecided</b>	<b>Agree</b>	<b>Strongly Agree</b>
a. Determining the area of a rectangle whose length is $5x$ meters, $3x$ meters wide and has a perimeter 2400meters	3(7.5)	12(30.0)	12(30.0)	7(17.5)	6(15.0)
b. Expressing $0.\bar{3}$ as a number rational in the form $\frac{x}{y}$ where $x$ and $y$ are integers and $y \neq 0$	0(0.0)	3(7.5)	6(15.0)	6(15.0)	18(45.0)
c. Representing the complement of sets on a Venn diagram.	0(0.0)	5(12.5)	9(22.5)	13(32.5)	13(32.7)
d. Determining the rule of mapping	5(12.5)	6(15)	7(17.5)	15(37.5)	7(17.5)
e. Finding the largest possible domain of the function $f$ given by $x: x \rightarrow \frac{3x+4}{\sqrt{5x+3}}$	8(17.0)	18(42.5)	5(12.5)	4(15.0)	5(12.5)
f. Changing a numeral from one base to another	1(10.0)	5(15.0)	5(12.5)	12(30.0)	17(42.5)
g. Solving the systems of equations with $x + y = 7$ and $x \cdot y = 30.$ "	1(2.5)	6(17.0)	9(17.5)	13(32.5)	12(30.0)
h. Estimating or approximating real numbers to a required value	5(12.5)	10(25.0)	11(27.5)	10(25.0)	4(10.0)
i. Comparing the ratio, rate and proportion of quantities	3(7.5)	8(20.0)	15(32.5)	7(17.5)	7(17.5)
j. Making $E$ the subject of the relation $D(3 + E) = F(E + 1)$ "	1(2.5.0)	4(8.0)	6(15.0)	17(42.5)	12(30.0)
k. Factorizing a quadratic expression	2(5.0)	5(12.5)	8(20.0)	10(25.0)	15(37.5)
l. Determining the logarithm of a number whose base is not 10	4(10.0)	13(32.5)	10(25.0)	10(25.0)	3(7.5)
m. Simplifying surds into the form $a\sqrt{b}$ where $a$ and $b$ are natural numbers	2(5.0)	12(30.0)	12(30.0)	6(15.0)	8(20.0)
n. Drawing on the same graph sheet, a linear function and a quadratic curve	3(7.5)	10(25.0)	9(22.5)	10(25.0)	8(20.0)
o. Determining the composite of two functions	1(2.5)	14(35.0)	13(32.5)	7(17.5)	5(12.5)
p. Finding the solution to the exponential equation: $125^{3x-1} = 25(5^{2x+3})$	2(5.0)	8(20.0)	8(20.0)	8(20.0)	14(35.0)
q. Determining the image of an object of a given function	5(12.5)	8(20.0)	12(30.0)	10(25.0)	5(12.5)
r. Illustrate two and three set problems on the Venn diagram and solve	2(12.5)	3(7.5)	7(17.5)	18(45.0)	13(32.5)

Central to this study is the determination of the relationship between pre-service teachers' mathematics self-efficacy expectations and their performance in a mathematics achievement test.

Three hypotheses were proposed based on the objectives of the study and the results presented below.

- Ho<sub>1</sub>: There is no significant difference between the mean performance of pre-service male and female teacher trainees in MAT.
- Ho<sub>2</sub>: There is no significant difference between male and female mean scores on the MSES for pre-service teacher trainees.
- Ho<sub>3</sub>: There is no significant relationship between pre-service teacher trainees' MSES and MAT.

Tables 3 and 4 present the results of the t-test of the mean scores of male and female pre-service teacher trainees in the MAT and *MSES*. With a calculated t-value of 0.600 and at 0.05 level of confidence there is no basis to reject the null hypothesis (see Table 3).

**Table 3: Results of t-test of the mean scores of male and female trainee teachers in MAT**

Sex	N	$\bar{x}$	t-crit.	t-cal	df	Decision
Male	19	53.16	1.96	0.600	38	NS
Female	21	52.23				

N.S- Not significant at 0.05 confidence interval

**Table 4. T-test showing the comparison of mathematics self-efficacy of male and female pre-service teacher trainees**

Sex	N	$\bar{x}$	t-crit.	t-cal	df	Decision
Male	19	3.492	1.96	0.890	38	NS
Female	21	3.370				

N.S- Not significant at 0.05 confidence level

Results from Table 4, shows that at 38 degrees of freedom and a calculated t-value of 0.890, there is no significant difference in the mean ratings between male and female pre-service teachers on the mathematics self-efficacy scale.

The results of the correlational analysis of the relationship between the pre-service teacher trainees' MSES and MAT are presented in Table 5. The table indicates a strong positive relationship between pre-service teacher trainees' mathematics self-efficacy and achievement in mathematics at ( $r(40) = 0.754$ ). The table further suggest that approximately 57% of the variation in mathematics achievement is accounted for by the variation in mathematics self-efficacy expectation.

**Table 5: Results of correlation between students' self-efficacy and achievement in mathematics**

Variable	n	Spearman's rho( $\rho$ )	$\rho^2$	p
Students	40	0.754**	0.5685	0.001**

\*\* Significant at 0.01 significant level (two-tailed).

## **Discussion**

One interest in this study was to estimate the degree to which pre-service teachers' mathematics self-efficacy influence their achievements in mathematics. The study also focused on whether or not there is any significance in mean performance between male and female pre-service teachers on the MSES and on MAT respectively. The result shows that the majority of the teacher trainees were admitted with grade C in Mathematics. This suggests that several of our teacher trainees who are being trained to be in charge of basic level teaching already had weak foundation in mathematics. This revelation was confirmed when analysis was done on their responses to the



MAT (which recorded an overall average performance of 52.7%). However, it was found that the teacher trainees who gained admission with high entry grade also rated high on the mathematics self-efficacy scale and they were high achievers in the MAT as well. More importantly, the study further revealed that students who were involved in this study poses some self-efficacy in mathematics, however, students self-efficacy rate (mean = 3.43) is neither high nor low.

Analysis of data indicates no significant differences between the mean scores of male and female teacher trainees' in the MAT. This result is consistent with studies conducted by Aremu and Tella (2009), Hyde, Fennema, Ryan, Frost and Hopp, (1990), and Popoola (2000), who found no gender difference in students' mathematics achievement. However, Osafehinti (1988), found a contrasting result to the present findings. His study revealed that gender difference in Mathematics Achievement Test is highly significant in favour of male students.

The present study also observed no significant mean difference in the mathematics self-efficacy ratings of male and female pre-service teacher trainees. Thus, both male and female pre-service teachers who participated in this study did not differ in mathematics self-efficacy expectations. This result is in harmony with the work of earlier researchers such as (Kabiri & Kiamanesh, 2004; Liu & Koirala, 2009) who also found no evidence of gender difference on a mathematics self-efficacy scale at any age level.

To determine whether pre-service teacher trainees' self-efficacy in mathematics makes an independent contribution to their mathematics achievement, the results of the present study revealed a strong positive relationship ( $r(40) = 0.754$ ). This indicates that, about 57% of the students' performance in the MAT could be accounted for by their self-efficacy. This result supports the findings made by researchers such as (Liu & Koirala, 2009; Usher & Pajares, 2009; Kabiri & Kiamanesh, 2004; Pajares, Britner & Valiante, 2000; Zimmerman, Bandura & Martinez-Pons, 1992; Lent & Hackett, 1987), who have found that self-efficacy in Mathematics is positively related to mathematics performance and education outcomes on the whole. Largely, the findings from this study support the work of researchers who have reported significant relationship between self-efficacy and academic achievements and in particular, the claim by Bandura (1986) and Bandura (2006) that, self-efficacy beliefs predict academic outcomes.

The result of this study is a good feedback tool for the stakeholders to look at personal factors (self-efficacy) of our future basic school teachers especially when it only gave a rating of neutrality. It means the students do not possess a high level of positive self-efficacy towards Mathematics. It is no wonder why their overall performance was just about the minimum proficiency level.

### **Implication for practice**

Mathematics continues to pose a challenge for students at the basic, secondary and teacher training colleges in the country. With the result showing low performance of students in mathematics, there is a need to go back to the drawing board beginning with curriculum review, teaching strategies and understanding students' psychology towards the subject. Students' beliefs about their mathematics abilities are very important component of motivation and of academic achievement (Bandura, 1997; Pajares, 1997; Schunk, 1991; Zeldin and Pajares, 2000), therefore teacher educators should be looking out for these constructs in their students. According to Aldridge et al., (2013), Mathematics self-efficacy is developed most especially if there is positive teacher support and personal relevance. Hence, students' self-efficacy in mathematics should be given attention in teaching the subject if one is serious in advancing the performance of the student. In particular, teacher educators should endeavour to infuse new and effective strategies like those that have been proven to provide positive results (Gregory, Gregory & Eddy, 2014; Arhin & Osei, 2013; Choi et al., 2013; Fathurrohman et al., 2013; Walkington et al., 2013; Taclay, 2013;

Limjoco, 2012; Asante, 2012). Since in this study self-efficacy was found to have a strong positive effect towards performance, teacher educators should make sure teacher trainees continue to develop a positive confidence themselves. In the absence of this, one cannot expect a change for the better. The main challenge lies on the teacher educators who should be aware of the attributes which affect students' self-efficacy towards Mathematics because they are influential and significant factors. Teacher educators must also ensure to be a good model for making the students appreciate and love the subject. However, this does not excuse other stakeholders because good education is a product of unified efforts of all who are involved in the formation of the students.

While self-efficacy showed significant influence on mathematics performance, it only explains around 57%, meaning there are other factors not included in the study. It is, therefore, recommended that these other variables are explored in order to build a more powerful model. Thus, continues research into and understanding of the unique roles that personal constructs has on performance skills should be encouraged to bring clearer and deeper understanding of the nature of the interplay among the diverse personal constructs and mathematics achievement. In conclusion, the result in this study has shown that the pre-service teacher trainees would need to develop positive outlook towards mathematics so as to increase their confidence levels in tackling mathematics both for their classroom teaching and for further studies. Though the results validated previous findings, this study is limited only to just one college (i.e. Kibi College of education) in Ghana.

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*Relationship between pre-service teachers' mathematics self-efficacy and their mathematics achievement*

C. B. Ampofo

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*Relationship between pre-service teachers' mathematics self-efficacy and their mathematics achievement*

C. B. Ampofo

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