
MATHEMATICAL PROBLEM SOLVING SKILLS AND ACADEMIC SELF-EFFICACY AS CORRELATES OF PRE-SERVICE NCE MATHEMATICS TEACHERS' PERFORMANCE IN SOUTH-EAST, NIGERIA

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ABSTRACT

The study ascertained mathematical problem-solving skills and self-efficacy as correlates of Pre-service NCE Mathematics Teachers' Performance in South-East, Nigeria. Seven research questions guided the study while seven hypotheses were tested at 0.05 level of significance. Correlation research design was used for the study. The population of the study was 197 pre-service NCE Mathematics teachers in South-East, Nigeria. All the population of 197 was studied as sample because, it is small and manageable. Mathematics Problem-Solving Skill Test (MPSST) and Pre-Service Teachers' Self-Efficacy Questionnaire (PSTSEQ) were used as instruments for data collection. Both instruments were validated by three experts in science Education while reliabilities of MPSST and PSTSEQ were established using Cronbach Alpha method and coefficient values of 0.82 and 0.80 respectively were obtained which were considered high enough to confirm the instruments as reliable. Data were collected and analyzed using Pearson product moment correlation coefficient. The findings revealed that a high positive and significant relationship existed between mathematical problem-solving skills scores and academic performance scores and between self-efficacy scores and academic performance scores of pre-service NCE mathematics teachers. It was recommended among others that Mathematics lecturers should make conscious effort towards improving the mathematical problem-solving skills and self-efficacy of the pre-service NCE mathematics teachers through modeling, conditioning, and behaviour modification for improved academic performance in Mathematics.

Key words: *Problem-solving Skills, Self-efficacy, Pre-service Mathematics Teachers, Performance*

Introduction:

Mathematics is perceived as an essential precursor to success in modern society. It is an aspect of science that deals with structure, order and relations. Mathematics as a subject of instruction is essential and existential in our contemporary society. It holds the potency of making individuals to apply mathematical knowledge, skills and values to daily problems and hence develop the individuals to a level that they are intellectually and economically stable (Ndubuisi, 2023). In Nigeria, as in most countries, mathematics occupies a key place in the basic, secondary and

tertiary education which include College of Education as well Curricula. Mathematics is a compulsory subject for every learner at these levels; especially those in science based disciplines. Thus, mathematics is a gate-keeper and critical filter for further studies in the country, Nigeria (Ampofo, 2019).

Mathematics is the science of space, time, capacity, amount, shapes, numbers and association with each other (Olaloye, 2019). Contributing to the benefit of mathematics, Charu (2018) stated that mathematics is the foundation of any meaningful scientific endeavor and any nation that needs development in science and technology should have strong mathematics knowledge for its youths. At colleges of education, mathematics teacher education programme are run to enable pre-service teachers to develop skills, learn the teaching methods and exude confidence in the teaching of mathematics. Going further, the programme offers pre-service teachers of mathematics the opportunity to be trained as teachers via direct interaction with the learning materials and the school environment.

Pre-service Nigeria Certificate in Education (NCE) Mathematics teachers are students trained in Colleges of Education with hope of producing trained NCE teachers to become professional Mathematics teachers. They are students enrolled in an initial educator preparation programme, studying to become practicing Mathematics teachers. They complete supervised field-based teaching experiences with the support and mentorship of College department and cooperating teachers. On graduation, they are expected to work in basic education sector one to nine (Basic 1-9) where they teach all school subjects most of the time. Training often includes a semester or year-long internship as a student teacher working under the guidance of a mentor in a classroom. During this period, the Pre-service NCE Mathematics teachers engage in problem solving in Mathematics in their various schools of teaching practice, as problem solving is an important component of mathematics education. This is because, problem solving has a way of testing one's ability of converting words to numbers or numbers to words.

Mathematics problem-solving skill refers to the use of cognitive skills and high-level of understanding to solve invisible, non-routine problems in a meaningful way (Jagals and Van der Walt, 2016). Mathematical problem-solving skills are related to the student's ability to understand verbal sentences in problems, convert them into mathematical models, make calculation plans from mathematical models, and use numeracy skills to solve non-routine problems (Anisa, 2014). In other words, many skills such as identification, problem definition, equation have to be learnt for one to acquire and be able to use problem solving skills generally. Problem-solving is one of the skills that students must develop to meet the digital era in addition to critical thinking skills, creativity, innovation, communication and collaboration. This approach will serve the purpose of gaining cognitive ability and efficacy of pre-service NCE mathematics teachers in mathematical problems through analysis, problem-solving steps and the use of some procedures to achieve expected results. Possessing a great skill to solve mathematical problems will provide pre-service NCE mathematics teachers with enhanced learning experience and help them answer questions in other subjects or in everyday life.

It is the focus of the school's mathematics curriculum which in the learning process is expected to gain the experience to transfer and apply learned knowledge and skills to solve problems. Regarding to that problem, skilled people solve problems to survive and to face the various issues in his life. Mathematics problem solving has long been seen as an important aspect

of mathematics, the teaching and the learning of mathematics. It has infused mathematics curricula around the world with calls for the teaching of problem solving skills (Permata, Kusmayadi and Fitriana, 2018). Problem-solving skills can be improved upon through the adoption of the following strategies: analogy, guess-check revised, problem reformulation, solution drawing, systematic experimentation, way back and use of graphs of functions (Novotná, et al., 2012).

The acquisition of problem-solving skills among pre-service teachers has become expedient given that mathematics as a course requires learners to think critically, systematically and reflectively and requires vigilant, detailed and earnest effort (Hutauruket al., 2019). The process of teaching and learning mathematics by the pre-service NCE mathematics teachers will be meaningless and fruitless if they lack the skills and self-efficacy required to solve the problems. Buttressing this point, Olatoye (2019) and Efobi and Okigbo (2021) stated that other personal factors which may influence the learning of science subjects include study habits, self-concept and self-efficacy.

Self-efficacy is a general conception (or image) that comprises a body of attitudes and values, that one comes to develop about his/her "being" as a result of social transactions (Goulao, 2014). Goulao added that self-efficacy is the level of confidence that a student feels regarding his or her ability to successfully complete academic tasks or reach selected academic milestone. In the view of Xia (2017), it is the belief in an individual's capability to undertake specific tasks. Put differently, self-efficacy is a contributing factor that one's performance of a specific task. Self-efficacy is defined as an individual's belief in his or her ability to succeed in a specific situation or accomplish a specific task (Bandura, 1997). Self-efficacy is an individual's evaluation of own ability to achieve a goal or self-belief to do so. For example, in academic situation, it can be assumed that learners with high self-efficacy have higher motivation to learn which resulted in higher academic achievement, because those learners believe that they have the ability to achieve their goal. It is known that academic self-efficacy is influenced by gender, age and domain. Huang (2012) conducted a meta-analysis and reported that academic self-efficacy differs between gender, age and also domains such as Mathematics and social sciences.

Self-efficacy within the context of academic achievement is a significant element of the self-regulatory human structure. It seems to be crucial in both stages of the self-regulation of health behaviour. According to Marcela and Lucia (2017), high self-efficacy, in addition to higher academic achievement and greater dedication to work, fosters elimination of unwanted emotional reactions and those students with higher academic self-efficacy experience less stress in school than those students, who doubt in their efficacy and abilities. In other words, within an academic context, Pre-service teacher self-efficacy is frequently described in terms of academic self-efficacy, which defines a learner's judgments about one's ability to successfully attain educational goals.

Academic self-efficacy (ASE) refers to a person's conviction that they can successfully achieve at a designated level in a specific academic subject area (Kevin, 2008). It refers to the extent, or confidence, to which students believe that they will be able to succeed in school (Soheila, 2020). Bandura described self-efficacy as a person's evaluation of his or her ability or competency to perform a task, reach a goal, or overcome an obstacle. Self-efficacy can have different meanings in different contexts. Thus, it is important to use "academic" self-efficacy

instead of “generalized” self-efficacy in an academic setting. Academic self-efficacy refers to students’ perceived capability to manage their own learning behaviour, to master academic material, and to fulfill academic expectations. It is the extent to which students believe that they will be able to succeed in school and it has been identified as a positive predictor of academic performance within different disciplines; English, mathematics; chemistry; and anatomy and physiology.

Enactive mastery experience, which is seen as the most vital of all the factors, embodies students’ retrospective experiences of success or failure. Past successes have a way of increasing self-efficacy while unabated failures lower it, which is a reflection of students’ levels of capacity. In a vicarious experience, students tend to compare themselves with their peers whom they perceive as having similar ability and intelligence. The deduction here is that a student’s self-efficacy is likely to increase on observing the success of their peers and vice versa. Tenaw (2013) viewed verbal persuasion as being limited in its power to create enduring increases in perceived efficacy, but it can bolster self-change if the positive appraisal is within realistic bounds.

It is instructive to note that students when confronted with certain task in some cases, under-rate their capabilities with the ‘erroneous’ belief that they cannot acquire basic skills. However, as they gain experience, their self-efficacy improves. For instance, in performing mathematical operation such as addition, children may concentrate on how many numbers the problems contain and judge longer problems more difficult than those with fewer numbers, even when the longer ones are much simpler. However, as their ability to concentrate on multiple features improves, so does their precision. There is a tendency for Pre-service NCE Mathematics teachers who are confident in their capability to organize, execute and regulate their problem-solving or task performance at a designated level of competence to demonstrate high self-efficacy. More so, self-efficacy could be a contributing factor to college students’ performance in mathematics.

Academic performance is an indication of the level of personal and educational goals a student has achieved at school (Marcela and Lucia, 2017). It is the amount of knowledge derived from learning. Academic performance depends on a number of factors like students’ attitudes, interests, personality characteristics and social class in addition to learning. It has been argued that certain psychological factors like academic self-esteem and academic self-efficacy play major roles in determining the academic performance of students. These two variables are directly interrelated to each other, it is hypothesized that if one increases then it leads to an increase in the other variable. Schools are primarily focused on cognitive goals (e.g. knowledge, critical thinking) or intellectual domain (e.g. numeracy, literacy, history and science), but academic achievement is a construct with more different domains of learning. In a narrow point of view, academic performance is the outcome of education as it indicates the extent to which the student, teacher, curricular and indeed the educational institution has achieved the predetermined educational goals (Soheila, 2020). Suffice it to say that the academic performance of pre-service National Certificate in Education (NCE) Mathematics teachers is vital given the role of mathematics in national development.

In South-East, Nigeria, in spite of the vital role of Mathematics in national development, the performance of students in Mathematics course in colleges of education has been consistently

unsatisfactory. For instance, the researcher observed that in Federal College of Education, Umunze and AlvanIkoku College of Education, the performance of candidates in their second year mathematics examination as released by the course lecturers from 2021 to 2023 revealed that 52.94%, 54.77% and 46.00% of the candidates that sat for the examination in Mathematics failed as they did not have credit passes in the course. The afore-mentioned statistics is further confirmed by the researchers' observation in Colleges of Education in South-East, Nigeriathat Pre-service NCE Mathematics teachers find it difficult to solve word problems presented in a paragraph. Corroborating with this observation, Swanson, Orosco and Lussier (2014) stated that it is easier for students to solve problems presented in numbers or a certain equation than those in word format. Additionally, Gabina, Assan-Donkoh, Puotier and Wiafe (2020) observed that students' errors in algebra have been associated with poor performance in Mathematics. The trend of poor performance in Mathematics has continued despite concerted by government, Mathematics lecturers and other relevant stakeholders in improving students' academic performance in Mathematics. However, the academic performance of pre-service NCE mathematics teachers could differ along gender lines.

Gender embodies the biological or social quality of being male or female. Gender differences in students' performance in mathematics have become key global issues of concern among educators and researchers. This may not be separated from the inconsistencies in findings of some researchers regarding gender and students' performance in mathematics. For instance, Bala and Shaafiu (2016) found no significant relationship between male and female students' academic achievement and their problem-solving ability. On the other hand, Adewumi and Akinodi (2016) found that performance of students taught using problem-solving strategy is not in any manner affected by their gender while Allahnana, et al. (2018) found that male students excel in mathematics performance more than their female counterparts. Apparently, mathematical problem-solving skills as well as self-efficacy are linked to pre-service Mathematics teachers' academic performance in Mathematics.

Mathematics has beauty just as it has patterns. It is a tool and a language and it has many uses. There is need therefore for students to study Mathematics to be properly prepared and equipped to face the challenges ahead if they are to be effective in this present age. The relevance and the importance of mathematics might be the reason it is included as a general knowledge of course to study for all pre-service NCE teachers in their general mathematics courses (GSE 105&106) as part of the requirement for graduation. Despite the importance of Mathematics to economic, industrial and technological modern world, the performance of second year students in Mathematics examination as released by the course lecturers in Federal College of Education Umunze and AlvanIkoku College of Education from 2021 to 2023 revealed a consistent trend of poor performance. This is further evidenced by the researcher's preliminary investigation which showed that Pre-service NCE Mathematics teachers find it difficult to solve word problems presented in a paragraph.

The trend of poor performance of Pre-service NCE Mathematics teachers could be as a result of the level of mathematical problem-solving skills and low self-efficacy of the NCE pre-service teachers. The problem is "what is the relationship between problem solving skills, academic self-efficacy and performance of NCE mathematics students? Consequently, there is

need to empirically investigate the relationship that exists among the pre-service NCE mathematics teachers self-efficacy, mathematical problem solving skills and their academic performance in South-East, Nigeria.

Purpose of the Study

The purpose of this study was to determine mathematical problem-solving skills and self-efficacy as correlates of Pre-service NCE Mathematics Teachers' Performance in South-East, Nigeria. Specifically, the study aimed at determining:

1. The nature of relationship existing between mathematical problem-solving skills and academic performance of pre-service NCE mathematics teachers in South-East, Nigeria.
2. The nature of relationship existing between self-efficacy and academic performance of pre-service NCE mathematics teachers in South-East, Nigeria.
3. Correlation between mathematical problem-solving skills, self-efficacy and academic performance of pre-service NCE mathematics teachers in South-East, Nigeria.

Research Questions

The following research questions were formulated to guide this study:

1. What is the nature of relationship existing between mathematical problem-solving skills scores and academic performance scores of pre-service NCE mathematics teachers in South-East, Nigeria?
2. What is the nature of relationship existing between self-efficacy scores and academic performance scores of pre-service NCE mathematics teachers in South-East, Nigeria?
3. What is the correlation between mathematical problem-solving skill scores, self-efficacy scores and academic performance scores of pre-service NCE mathematics teachers in South-East, Nigeria?

Research Hypotheses

The following research hypotheses were tested at 0.05 level of significance:

1. There is no significant relationship existing between mathematical problem-solving skills scores and academic performance scores of pre-service NCE mathematics teachers in South-East, Nigeria.
2. There is no significant relationship existing between self-efficacy scores and academic performance scores of pre-service NCE mathematics teachers in South-East, Nigeria.
3. There is no significant correlation between mathematical problem-solving skill scores, self-efficacy scores and academic performance scores of pre-service NCE mathematics teachers in South-East, Nigeria.

Methods

Correlation research design was adopted for the study. According to Nworgu (2015), correlation research design seeks to establish the existing relationship between two or more variables. It focuses on the determination of the extent, direction and magnitude of relationship between two or more variables. The appropriateness of correlation research design to the current study stemmed from the fact that the researcher sought to determine the relationship between two

independent and one dependent variable. Problem-solving skills and academic self-efficacy being the independent variables while academic performance in mathematics is the dependent variable. The study was carried out in South-east geopolitical zone of Nigeria. South East is one of the six geo-political zones in Nigeria. It is constituted by Abia, Anambra, Ebonyi, Enugu and Imo States. On the east, it is bounded by Cross-River State on the East, Rivers State on the South, Delta State on the West (all in South-South geo-political zone) and Benue on the North (North Central geo-political zone). It prides itself as having many higher institutions viz: universities, polytechnics and mono-techniques.

The population of the study consisted of 197 NCE 2 and 3 (90 males and 107 females) students for the 2022/23 session in both State and Federal Colleges of Education in South-East, Nigeria in the 8 Colleges of Education (3 Federal and 5 State). There was no sampling. This is because; the population is of manageable size. Instruments that were employed for data collection are two sets of questionnaires. The questionnaire was captioned 'Pre-Service Teachers' Self-Efficacy Questionnaire (PSTSEQ)' and 'Mathematics Problem-Solving Skill Test (MPSST)'.

PSTSEQ was modified from Bituin and Dacanay (2018) self-efficacy scale for teachers which was originally made up of 54 items but reduced to 40 after validation. It was developed in such a fashion that the respondents responded by opting for one of four response categories viz: strongly agree, agree, disagree and strongly disagree. MPSST was adapted by the researcher from Problem-solving performance and skills instrument by Pentang *et al.* (2021). It contains 49 items which was reduced to 40 after validation and which has respondents responded by opting for one of four response categories viz: strongly agree, agree, disagree and strongly disagree.

For the academic performance of the pre-service teachers, it is an already existing data that were drawn from documents containing NCE 1 and NCE 2 of the pre-service teachers in Mathematics examinations. Specifically, the 2022/23 academic session results were taken into cognizance. Drafts of the PSTSEQ and MPSST were given alongside the purpose of the study, research questions and hypotheses to three experts; one in the Department of Science Education, one in the Department of Educational Foundations (Measurement and Evaluation) from Nnamdi Azikiwe University, Awka and the other in the Department of Mathematics Federal College of Education Technical, Asaba, Delta state. These experts validated the instruments to ensure that relevant items are included in the final draft of the PSTSEQ and MPSST. Reliability of PSTSEQ and MPSST were tested using Cronbach alpha method. This was carried out via by administering the PSTSEQ and MPSST to a group of 30 NCE 2 and NCE 3 students of College of Education in Delta State with similar characteristics which is outside the area of the current study. The choice of Cronbach statistics was informed by the fact that the items in the PSTSEQ and MPSST are internally consistent. The alpha coefficient values obtained for PSTSEQ and MPSST were .82 and .84 respectively. These values were considered adequate and the PSTSEQ adjudged reliable as they fell in line with the stipulation of Nworgu (2015) that an instrument is deemed reliable and excellent when its reliability co-efficient is above .80 for quantitative research.

Data were collected by the researcher alongside eight research assistants who were the course lecturers in the Colleges of Education under consideration. The justification for the use of their course lecturers was for ease of administration. The course lecturers ensured the administration of the PSTSEQ and MPSST before the commencement of semester examination in the course.

Conscious efforts were made by the researcher towards ensuring that same code was used by each student for PSTSEQ and MPSST. On-the-spot delivery approach was used by the researcher to ensure that 197 copies of PSTSEQ and MPSST were administered with utmost precision and efficiency through the help of the research assistants and retrieval facilitated immediately. This approach minimized loss or guaranteed the retrieval of all the 197 copies of PSTSEQ and MPSST. The research questions were answered using Pearson product moment correlation coefficients. The hypotheses were tested with t-test of correlation at 0.05 alpha levels. In taking decisions with respect to the hypotheses, a null hypothesis was rejected if the probability value (p-value) was less than or equal to significant value of 0.05; if otherwise ($p > 0.05$), the null hypothesis was accepted.

Results

Research Question One: What is the nature of relationship existing between mathematical problem-solving skills scores and academic performance scores of pre-service NCE mathematics teachers in South-East, Nigeria?

Table 1: Pearson r on Relationship between Mathematical Problem-Solving Skills and Academic Performance of Pre-Service NCE Mathematics Teachers.

Source of Variation	n	r	Decision
Mathematical Problem-Solving Skills	197	0.81	High Positive Relationship
Academic Performance			

Data in Table 1 show that there is a high positive relationship existing between mathematical problem-solving skills scores and academic performance scores of pre-service NCE mathematics teachers in South-East, Nigeria. This is evident by the size of Pearson's Correlation Coefficient r , which is 0.81.

Hypothesis One: There is no significant relationship existing between mathematical problem-solving skills scores and academic performance scores of pre-service NCE mathematics teachers in South-East, Nigeria.

Table 2: Test of Significance of Pearson Correlation between Mathematical Problem-Solving Skills scores and Academic Performance scores of Pre-Service NCE Mathematics Teachers.

Source of Variation	N	r	p-value	Decision
Mathematical Problem-Solving Skills	197	0.814	0.00	Sig
Academic Performance				

Table 2 shows that there is a significant relationship between mathematical problem-solving skills scores and academic performance scores of pre-service NCE mathematics teachers in

South-East, Nigeria. The calculated r (0.814) has P -value <0.05 . The null hypothesis one was therefore rejected.

Research Question Two: What is the nature of relationship existing between self-efficacy scores and academic performance scores of pre-service NCE mathematics teachers in South-East, Nigeria?

Table 3: Pearson r on Relationship between Self-Efficacy and Academic Performance of Pre-Service NCE Mathematics Teachers.

Source of Variation	N	r	Decision
Self-Efficacy	197	0.80	High Positive Relationship
Academic Performance			

Data in Table 3 show that there is a high positive relationship existing between self-efficacy scores and academic performance scores of pre-service NCE mathematics teachers in South-East, Nigeria. This is evident by the size of Pearson's Correlation Coefficient r , which is 0.80.

Hypothesis Two: There is no significant relationship existing between self-efficacy scores and academic performance scores of pre-service NCE mathematics teachers in South-East, Nigeria.

Table 4: Test of Significance of Pearson Correlation between Self-Efficacy Scores and Academic Performance Scores of Pre-Service NCE Mathematics Teachers.

Source of Variation	N	r	p-value	Decision
Self-Efficacy	197	0.802	0.04	Sig
Academic Performance				

Table 4 shows that there is a significant relationship between self-efficacy scores and academic performance scores of pre-service NCE mathematics teachers in South-East, Nigeria. The calculated r (0.802) has P -value <0.05 . The null hypothesis four was therefore rejected.

Research Question Two: What is the correlation between mathematical problem-solving skill scores, self-efficacy scores and academic performance scores of pre-service NCE mathematics teachers in South-East, Nigeria?

Table 5: Summary of Regression Analysis on Mathematical Problem-Solving Skill Scores, Self-Efficacy Scores and Academic Performance Scores of Pre-Service NCE Mathematics Teachers.

R	R ²	Adjusted R ²	Decision
0.65	0.423	0.324	Moderate positive relationship

Table 5 shows that a moderate positive relationship ($R = 0.65$) exists among mathematical problem-solving skill scores, self-efficacy scores and academic performance scores of pre-service NCE mathematics teachers. More so, the adjusted r^2 explains that 32.4% of the total

variability of academic performance scores of pre-service NCE mathematics teachers can be explained by their mathematical problem-solving skill scores and self-efficacy scores.

Hypothesis Two: There is no significant correlation between mathematical problem-solving skill scores, self-efficacy scores and academic performance scores of pre-service NCE mathematics teachers in South-East, Nigeria.

Table 6: Summary of Regression Analysis on Mathematical Problem-Solving Skill Scores, Self-Efficacy Scores and Academic Performance Scores of Pre-Service NCE Mathematics Teachers.

N	R	R ²	R ² adjusted	Df	Cal. t	p-value	α	Decision
197	0.65	0.423	0.324	195	0.418	0.507	0.05	Not significant

Table 6 indicates that at 0.05 level of significance and 195df, the calculated t (0.418) with p-value 0.507 is greater than alpha level of 0.05, the null hypothesis is not rejected. Therefore, it means that the correlation between mathematical problem-solving skill scores, self-efficacy scores and academic performance scores of pre-service NCE mathematics teachers is not significant.

Discussion

The findings of the study revealed that a high positive and significant relationship existed between mathematical problem-solving skills scores and academic performance scores of pre-service NCE mathematics teachers in South-East, Nigeria. This may be as a result of the fact that mathematical problem-solving skills aids in the understanding and retention of many concepts in Mathematics. Undoubtedly, any pre-service teacher who has acquired mathematical problem-solving skills is bound to be performing well in many areas in Mathematics. Apparently, problem-solving approach has a way of enriching pre-service prospective elementary mathematics teachers' knowledge of Mathematics and equipping them for instructional delivery. Thus, performance in the subject can best be enhanced with the acquisition of mathematical problem-solving skills and its application to solving mathematics problems.

The findings of the study revealed that a high positive and significant relationship existed between self-efficacy scores and academic performance scores of pre-service NCE mathematics teachers in South-East, Nigeria. This could be due to the fact that in academic subjects like Mathematics, self-confidence is a pre-requisite for improved performance. This is to the extent that the more self-efficacious one is in Mathematics, the fewer tests anxious one would likely be and the logical consequence is improved academic achievement.

The revelation of the findings of the study equally showed that a moderate positive and non-significant relationship existed among mathematical problem-solving skill scores, self-efficacy scores and academic performance scores of pre-service NCE mathematics teachers. This is traceable to the fact that academic achievement of students in Mathematics is interplay of psychological variables. Although, there is paucity of research works that looked at the combination of the afore-mentioned variables, the deduction from the findings is that in as much as academic achievement of pre-service teachers is influenced by both mathematical problem-

solving skill scores and self-efficacy scores; their combined effect does not significantly influence academic achievement.

Conclusion

Based on the findings of the study, it was concluded that while a high positive relationship existed between mathematical problem-solving skills scores and academic performance scores of pre-service NCE mathematics teachers, a high positive relationship existed between self-efficacy scores and academic performance scores of pre-service NCE mathematics teachers. Finally, the study concluded that pre-service NCE mathematics teachers' mathematical problem-solving skills and self-efficacy together did not significantly influence their academic achievement in Mathematics.

Recommendations

In view of the implications of the findings of the study, several recommendations were made which include:

1. Mathematics lecturers should make conscious effort towards improving the self-efficacy of the pre-service NCE mathematics teachers through modelling, conditioning, and behaviour modification for improved academic performance in Mathematics.
2. Guidance counsellors should schedule counselling sessions especially for the female pre-service NCE mathematics teachers on the need to develop self-efficacy in Mathematics by being more confident in themselves. That way, their academic performance in the course would be improved upon.
3. Pre-service NCE mathematics teachers should sustain their acquisition of mathematical problem-solving skills. This is with a view to improving their academic performance in Mathematics.
4. Female pre-service NCE mathematics teachers should work on their self-efficacy with a view to bridging the academic performance gap between them and their male counterparts in the course.

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