



An assessment of the level of knowledge of secondary school mathematics subject matter among final year pre-service mathematics teachers as a basis for teaching school mathematics

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ABSTRACT

The study sought to establish whether final year pre-service mathematics teachers have mastered secondary school mathematics subject matter as a basis for teaching mathematics at secondary school level immediately after graduation. Based on the assumption of 80% of scores (Guskey & Anderman, 2013) and above in the test administered as accepted cut off point to signify mastery of secondary school mathematics curriculum, the finding of the study revealed that 48.57% of the final year pre-service mathematics teachers have scored 80% and above in the test, which signifies their level of knowledge of secondary school mathematics subject matter, while 51.43% of the final year pre-service mathematics teachers have scored less than 80% in the test, which signifies their inadequate mastery of school mathematics subject matter. The finding shows that over 50% of the final year pre-service mathematics teachers cannot be relied upon to teach secondary school mathematics curriculum with confidence, this is because majority of the final year pre-service mathematics teachers' (51.43%) have demonstrated inadequate mastery of the subject matter for which they have been trained to teach immediately after graduation. Based on the findings, the following recommendation were put forward; to ensure adequate mastery of school mathematics subject matter among final year pre-service mathematics teachers as a predictable tools for employment, and to serve as a basis for teaching mathematics at secondary school level, mathematics teacher education training should include all secondary school mathematics curricular in their training to ensure adequate mastery of the subject matter among the pre-service teachers.

Keywords: assessment, pre-service teachers, mathematics, curriculum, mastery, teacher training

INTRODUCTION

Teacher training refers to the undergoing a special training in education, which is designed to equip pre-service or in service teachers with adequate knowledge, skills, and behavior that are necessary for effective classroom instruction. The training was designed to prepare and equip the pre-service teachers with adequate knowledge, behavior, attitude, and skills, which would enable them to meet the desire and aspiration of the society of providing quality education at. It is on the basis of the needs and aspiration of the society the Nigerian government declared that "Since no education system may rise above the quality of its teachers, teacher education shall continue to be given emphasis in all educational planning and national development" (NPE, 2004, p. 39). Moreover, the national policy on education have states the objectives of providing teacher education training in the country as (NPE, 2004, p. 39):

1. To provide highly motivated, conscientious, and efficient classroom teachers for all levels of educational system.
2. To encourage further spirit of enquiry and creativity in teachers.
3. To help teachers to fit into the social life of the community and society at large and to enhance their commitment to nation objectives.
4. To provide teachers with intellectual and professional background adequate for their assignment and to make them adaptable to any changing situation not only in the life of their country but in the world.

However, the declaration of the objectives of teacher education training has steered into a new policy of teacher education training, which will enable the government to meet the demand of the society of highly motivated and qualified teachers. The new policy stated that the government will like to: "Produce highly skilled, knowledgeable and creative teachers based on explicit

performance standards through pre-service and in-service programs who are able to raise a generation of students who can compete globally” (NPE, 2004).

Despite the declaration of highly preparing skills, knowledgeable and competent schoolteachers who will shoulder the responsibility of providing quality education at all levels of education, there is cause of alarm over the quality and efficiency of pre-service mathematics teachers in teaching secondary school mathematics curriculum. Majority of the final year pre-service mathematics teachers cannot be relied upon to teach all secondary school mathematics subject matter with confidence and guide their students. The pre-service mathematics teachers are expected to exhibit higher level of knowledge of the curriculum for which they have been trained to teach immediately after graduation. Unfortunately, the pre-service teachers demonstrated inadequate level of knowledge of the curriculum to the extent that, when they have been assigned to teach secondary school mathematics courses they will select the topics they deem capable of teaching it and leave the rest.

This practice has seriously affected students learning and subsequently results into poor academic achievement. A considerable number of literatures has been published on the quality of pre-service mathematics teachers in teaching secondary school mathematics subject matter. These studies includes Ibrahim (2021) and Ibrahim et al. (2018a) who argued on the quality of some school mathematics teachers in terms of adequate subject matter knowledge and problem-solving skills in teaching secondary school mathematics; Aluede and Idogho (2014) noted that the number of turnout of teachers in the country has raised issue of concern to the extent that many stakeholders begins to doubt about the quality of the training they received.

Moreover, research literature has revealed that the teacher training institution in the country has tended to produce teachers who are inadequate in terms of subject matter knowledge, literacy skills and numerical value (Kuiper et al., n. d.). Similarly, Odi and Omofonmwan (2007) asserted that the teacher training institution in the country has tended to neglect their duties by preparing teachers who are inadequate in their subject area and pedagogical skills. This is because the level of mastery of the subject matter knowledge displayed by recently employed school mathematics teachers has obliged many stakeholders to begin to doubt about the process they acquired the certificate they possess (Anaduaka & Okafor, 2013; Omorogbe & Ewansiha, 2013).

Previous study has shown that the level of mastery of school mathematics subject matter displayed by some schoolteachers is more of comparable with the understanding of students they were teaching to the extent that majority of the teachers cannot be relied upon to guide the students effectively (Ibrahim et al., 2018b). However, too little attention has been paid on the quality and effectiveness of the training for which the pre-service mathematics teachers have been expose to and equipping them with adequate subject matter knowledge and skills, which will enable them to shoulder the responsibility of providing effective classroom instruction immediately after graduation. There are a quite few research studies on quality and quantity of secondary school mathematics teachers. However, studies on final year pre-service mathematics teachers level of knowledge of secondary school mathematics subject matter as a predictable tool for effective classroom instruction and basis for teaching mathematics at secondary school level immediately after graduation, are rare to find in literature in the context of teacher education training provided by Nigerian universities.

Hence, the researcher deem it pertinent to carry out this study to assess final year pre-service mathematics teachers' level of knowledge or mastery of secondary school mathematics subject matter as a predictable tool for quality school mathematics teaching and instruments for assessing the effectiveness of mathematics teaching education training in grooming competent school mathematics teachers.

PIAGET’S THEORY OF COGNITIVE DEVELOPMENT

One of the most widely used theory of cognitive development among psychologist and educationist was Piaget’s theory of cognitive development, because of its adequate explanation of the process of learners’ intellectual development. The theory has extensively described the process of change involves in learners cognitive process and abilities. It is because of the adequate and relevant to the learners intellectual development the theory continue to receive much attention of expert from educational research and psychology despite of the various neo-Piagetian theories that evolved (Leongson & Limjap, 2003).

According to Piaget’s theory of intellectual development, learners potential of formal operational thought are developed during middle school years, and these operational thought can be actualized at the ages of 14 years and above. Therefore, if proper guidance and adequate learning experiences are encountered by the learners, their operational thought could be developed and achieve the set learning objectives. The attainment of operational thought by students could enable them to apply mental operations not only to concrete objects, but also to objects, ideas, situation, and concept that are not directly perceived.

It has conclusively been shown that individual are formal operational thinkers at ages of 14 years and above, which is the normal ages of secondary school students in Nigeria. The students at this level have extensively been exposed to different technique of solving mathematics, taught all syllabuses of secondary school mathematics, and assessed based on secondary school mathematics subject matter before they have been admitted into mathematics teacher education program. Therefore, the final year pre-service mathematics teachers are expected at the end of their training of becoming secondary school mathematics teachers to exhibit higher level of knowledge of secondary school mathematics more than their students to be able to provide effective classroom instruction (Ibrahim, 2020).

Mathematics teacher education training in the context of Nigeria universities was designed to train and prepare quality school mathematics teachers. The curriculum and syllabus of the program was designed with the objective of engaging students who are aspiring of becoming secondary school mathematics teachers and equip them with adequate and relevant subject matter and different skills of solving mathematics. The researcher was motivated by the objectives of the program to carry out this study by

applying Piaget's theory of intellectual development to find out whether the final year pre-service mathematics teachers have possessed adequate level of knowledge of school mathematics subject matter at the expected level of formal thought.

The underline assumption of the Piaget's theory of learners intellectual development centered on the ideas that child intellectual development occurs through a sequentially stages of cognitive transformation from different level of thought. The four stages of cognitive transformation are: Sensorimotor stage (age zero-two years), the child intellectual transformation at this stage begins from time of birth until the appearance of language; pre-operational stage (age two-seven years), the child intellectual transformation at this stage begins with an increase in language ability, limited thought, and symbolic thought.

Concrete operational stage (age seven-11 years), the child intellectual transformation at this stage begins when children utilize their senses in order to know, they are able to use two or three dimension at the same time instead of successively, the acquisition of basic learning skills at this stage accelerate dramatically. Apparently, this stage is the core to learning basic mathematical ideas, skills, and concept. Teachers at this stage should regularly use concrete experience to explore concept (i.e., place value and arithmetic operation). Mathematical ideas and concepts at this stage are the most useful tools for solving problems. This is because concrete experiences are needed for manipulative skills of solving problem. Therefore, it is necessary for teachers at this stage to introduce learners into activities, which will provide them with the opportunity of making abstract ideas concrete and allow them to get their hand on mathematics ideas.

Formal operational stage (11 years and above), the child intellectual transformation at this stage begins when learners begins to construct mathematics on their own, form hypothesis and deduce possible consequence. Since this study focus on final year pre-service mathematics teachers at teacher training institution in Nigeria and the pre-service teachers are above 11 years of ages. The discussion of learners' intellectual development will focus on formal operational stage and give more emphasis on the possible subject matter knowledge and problem solving skills should possess at their final level of graduation.

Learners at this stage construct mathematics on their own and they are capable of forming hypotheses and deduce possible consequences. Moreover, different pattern of abstract thought was developed at this stage where learners are capable to make a logical reasoning using pure symbols. The reasoning skills at this stage are fully developed where learners are capable of evaluating logical argument (Ojose, 2008). The possession of this skills will inevitably enhance learners' mathematics understanding and provides them with opportunity of connecting mathematics concept with real life problem. Since the pre-service mathematics teachers under this study are future school mathematics teachers and their abstract thought pattern was fully developed, therefore, they are expected to possess adequate problem solving skills and logical reasoning of solving school mathematics more than the students they are expected to teach after graduation. This is because the students' cognitive ability is on transition from concrete operational stage to formal operation stage. The ages of the student are between 10 years and above.

Anderson (1990) has identified four reasoning skills that are developed at formal operational stage, as follows:

1. **Clarification:** This is a reasoning skill that is concerned with identification and analysis of problem elements. The skill enable student to translate the information needed in solving mathematical problem.
2. **Inference:** This is a reasoning skill that is concerned with deductive and inductive inferences in mathematics. The deductive reasoning skill enables students to deduce mathematics problems from general concepts to specific instances. On the other hand, inductive reasoning skill enables students to deduce mathematics problems from specifics objects, events and arriving at generalization.
3. **Evaluation:** This is a reasoning skill that is concerned with judgment of adequacy of a problem solution. The skill enables students to formulate hypotheses about future events and judge the correctness of their solution to a problem.
4. **Application:** This is a reasoning skill that is concerned with connecting mathematical concepts to real life problem or situation. The skill enables students to relate mathematical concepts to real life situation in solving mathematics.

It is worthwhile to claim that the above reasoning skills are necessary for solving mathematical problem and the students have been fully developed with the skills. The skills are impossible to differentiate from taxonomy of behavioral skills in mathematics education (i.e., general knowledge skills, process skills, problem-solving, and application skills). The taxonomy of behavioral skills in mathematics education are problem solving skills, which are necessary for effective classroom instruction. The skills enable both students and teachers to identify relevant and appropriate process in solving problem and apply principle to a new situation (Van de Walle, 1998).

Consequently, it is important to examine pre-service mathematics teachers' level of knowledge of school mathematics subject matter to find out what exactly they possess at their final level of graduation as a basis of teaching mathematics at secondary school level. A concept of Guskey and Anderman (2013) was adopted in measuring final year pre-service mathematics teachers' level of knowledge of secondary school mathematics subject matter in which 80% correct responses or right answers was used as the percentages for deciding final year pre-service mathematics teachers' level of mastery of secondary school mathematics subject matter.

Piaget's theory of intellectual development suggests that higher institution students are expected to be matured in propositional thinking and should be able to engage in enquiry-based activities and mathematics. The students at this level are expected to possess adequate subject matter knowledge and higher level of formal thought; this could enable them to guide their students who are on transition from concrete operational stage of cognitive development to formal operational stage. Ojose (2008) posits that higher educational institution should develop a model, which will enable them to tract their students' progress in order to provide to the needs of students with different cognitive ability. This will not only provide the institution with the information of individual students needs but also provides them with opportunities to maintain quality assurance.

MATHEMATICS TEACHING KNOWLEDGE

Teaching as a profession, prospective mathematics teachers are expected to possess adequate subject matter knowledge, pedagogical skills and problem solving skills relevant to their chosen profession in order to meet the teaching demand in the society. The society needs not only mathematics teachers but also quality and effective school mathematics teachers who will provide effective classroom instruction and raise the academic achievement of their students. Previous study has shown that teaching competency has been identified as important factor in determining gains in student achievement (Guerriero, 2014). Thus, it is necessary for teacher training instruction to prepare the pre-service mathematics teachers with adequate subject matter knowledge and skills in order to qualify as competent school mathematics teachers.

A considerable amount of literature has been published on mathematics teaching knowledge. These studies are Baumert et al. (2010), Guerriero (2014), Hill et al. (2005), Ibrahim et al. (2018a, 2018b), Shulman (1987), and Voss et al. (2011), which identified content knowledge, pedagogical knowledge, context knowledge and practical skills as required mathematics teaching knowledge for effective classroom instruction. Since this paper focus on the pre-service mathematics teachers level of knowledge of school mathematics subject matter, the discussion will focus on the content knowledge and how it influence teachers effectiveness in classroom instruction.

Content Knowledge

This is the most important aspect of teaching and learning that is concerned with integration of subject matter knowledge and expertise in teaching a particular area of emphasis. Content knowledge generally includes concepts, theories, facts, and principles that are taught and learned in a particular subject area. The knowledge has been described by Shulman (1986) as subject matter knowledge. Previous research findings have shown that students success in school is determine by level of subject matter knowledge possess by teachers (Hill et al., 2005; Madeville & Qidua, 1997). Similarly, Goulding et al. (2002) and Zevenbergen (2005) described content knowledge as the most essential teaching characteristics that impact teaching quality and mathematics understanding.

The capacity to create network of knowledge between mathematics concept and, thereby, building strong connection for learners has largely depend on the strength of teaching approach and teachers capacity (Mandeville & Qiduan, 1997). Equally, teachers with poor content knowledge tended to create a disconnection between the learners and knowledge of mathematics concept through the approach and skills they used. This is to show that it is necessary for mathematics teacher education training to prepare the pre-service mathematics teachers with adequate subject matter knowledge that is relevant to their chosen profession to enable them to provide effective classroom instruction. In view of the fact that teachers' subject matter knowledge is central to effective classroom instruction Wun (2010) emphasized on the important of preparing pre-service mathematics teachers with comprehensive knowledge of mathematics, which will enable them to organize their teaching for better student understanding.

Recent development in teaching mathematics has highlighted the need for adequate content knowledge for effective classroom instruction. A large body of literature has shown a connection between the teachers' knowledge and quality instruction (Baumert et al., 2010; Hill et al., 2005; Kunter & Baumert, 2011). The studies revealed that adequate content knowledge correlates with higher students' achievement (Baumert et al., 2010; Hill et al., 2005; Kunter & Baumert, 2011). Hence, preparing pre-service mathematics teachers with above mathematics teaching knowledge will not only improve their quality and competency in discharging their duty, but also raised the quality of teacher training institutions and help them to maintain quality assurance in achieving national objectives of preparing competent school mathematics teachers. Thus, it is important to examine the pre-service mathematics teachers' level of knowledge of school mathematics subject matter to find out what exactly they possess at their final level of graduation as a basis of teaching mathematics at secondary school level.

Objectives of the Study

The study was aims to find out final year pre-service mathematics teachers level of knowledge of secondary school mathematics subject matter.

Research Questions

The research will provide answers to the below question:

1. What is the final year pre-service mathematics teachers' level of knowledge of secondary school mathematics subject matter?

METHODOLOGY

The study employed descriptive research design in which school mathematics content test (SMCT) was used as instrument for data collection. A descriptive design is a research design, which is used to assess the output and outcomes of the program. Pantenburg et al. (2012) described descriptive as a research designed that help evaluators to clarify program process and objectives. The design also help evaluators to identify whether a particular program is operating as planned in the set objectives and offer feedback about the outcomes of the program (Pantenburg et al., 2012).

In order to measure the level of mastery of secondary school mathematics subject matter among final year pre-service mathematics teachers, the study adopted concept of Guskey and Anderman (2013) in achievement test of measuring students

mastery of a task in which they used 80% correct responses or right answers as percentage for deciding students level of competency (mastery) of a task. But this study was aimed to measure final year pre-service mathematics teachers' level of knowledge of secondary school mathematics subject matter.

The final year pre-service mathematics teachers are the prospective secondary school mathematics teachers, and they are expected to exhibit higher level of knowledge of the subject matter more than their students. The instrument used under this study was SMCT. The instrument contained 50 items on secondary school mathematics subject matter. The items measure pre-service mathematics teachers' level of knowledge of secondary school mathematics subject matter. The instrument consists of 50 items (i.e., 37 multiple choice items and 13 short-answered items). The items are derived from the senior secondary school mathematics curriculum. It covered class four, five and six syllabus (i.e., 17 items from class four, 20 items from class five, and 13 items from class six). This was because of the number of topics covered in the respective classes. The items were carefully constructed based on the taxonomy of behavioral skills.

Reliability of the Test

Reliability of the test is a measure of estimating internal consistency of the test items, how well SMCT was actually measuring final year pre-service mathematics teachers' level of knowledge of secondary school mathematics subject matter. Based on the information gathered from the item analysis of SMCT administered to final year pre-service mathematics teachers, the test has a reliability coefficient weighted 0.87. The reliability coefficient of the test administered to final year pre-service mathematics teachers was acceptable and indicates very good relationship between the test items (Cortina, 1993; Nunnally, 1957). The reliability coefficient value was very good in discriminating against the higher and lower performing final year pre-service mathematics teachers.

FINDINGS AND DISCUSSION

The study sought to establish whether final year pre-service mathematics teachers have mastered secondary school mathematics subject matter as a basis for teaching mathematics at secondary school level after graduation. This section is presented in two parts: namely, presentation of data and discussion.

Presentation of Data

This section discussed findings of the study based on the criteria defined in methodology, on the assumption of 80% of scores and above in SMCT administered to final year pre-service mathematics teachers, as accepted cut-off point to signify mastery of secondary school mathematics subject matter. The analysis of scores of the test administered shows that 48.57% of the final year pre-service mathematics teachers who sat for the test have scored 80% and above in the test, which signified their level of knowledge of school mathematics subject matter competency while 51.43% of the final year pre-service mathematics teachers have scored less than 80% in the test administered, which signified their level of knowledge of school mathematics subject matter. The finding revealed that over 50% of the final year pre-service mathematics teachers cannot be relied upon to teach secondary school mathematics subject matter with confidence, since they have not mastered the curriculum contents for which they were expected to teach immediately after graduation.

Table 1 presents pre-service mathematics teachers level of knowledge of school mathematics subject matter. The finding shows that 51% of the pre-service mathematics have inadequate level of knowledge of school mathematics subject matter with mean scores ($M=35.17$, $SD=3.65$), which is lower than the overall mean scores ($M=39.61$, $SD=3.10$) of the general test. It indicates that the pre-service teachers are very weak and have inadequate mastery of school mathematics subject matter. The pre-service teachers cannot be relied upon to teach secondary school mathematics subject matter with confidence, since their mean score was lower than the overall mean scores of SMCT. Moreover, the pre-service mathematics teachers have not answered correctly 80% of the questions from the curriculum contents, which they were expected to teach after graduation. The pre-service mathematics teachers are expected to exhibit higher level of knowledge of school mathematics subject matter more than their students (Ibrahim et al., 2018b). Unfortunately, the pre-service teachers have not answered correctly 80% of the subject for which they have been preparing to teach. **Table 1** also reveals that 49% of the pre-service mathematics teachers who sat for the test have adequate level of knowledge of school mathematics subject matter with mean scores ($M=44.32$, $SD=3.10$), which is greater than the overall mean scores ($M=39.61$, $SD=3.10$) of the general test. This indicates that the pre-service teachers are competent and possess adequate level of knowledge of the subject matter. This which will enable them to teach school mathematics subject matter effectively and simplify the subject, so that their students will be successful and useful members of their society (NPE, 2004; Reid & Reid, 2017).

Table 1. Pre-service mathematics teachers level of knowledge of school mathematics subject matter

Level of knowledge of secondary school mathematics subject matter	n	%	M	SE	SD	Min.	Max.
Inadequate level	36	51	35.17	0.61	3.65	25	39
Adequate level	34	49	44.32	0.53	3.10	40	50
Overall	70	100	39.61	0.68	3.10	25	50

The analysis of the pre-service mathematics teachers level of knowledge of school mathematics subject matter shows that the measurement of error across the SMCT test was very small ($ME=0.68$, $SD=3.10$), which is lower than the standard deviation of the test. Such value indicates that test was reliable since standard error was less than standard deviation of the test. The information on pre-service mathematics teachers' scores on each topic of secondary school mathematics contents was presented in **Table 2**.

Table 2. Distribution of pre-service mathematics teachers' scores on each topic

Topics	Number of items	Mean	SE	SD
Numerical process	8	55.88	5.13	14.52
Geometry	5	42.20	10.60	23.70
Algebraic process	8	62.00	5.09	14.39
Set	5	66.40	6.60	14.76
Logical reasoning	2	64.00	4.00	5.66
Trigonometry	6	46.83	7.56	18.52
Mensuration	1	67.00		
Statistics	6	54.83	5.62	13.76
Vector	2	68.00	1.00	1.41
Coordinate geometry	2	44.00	4.00	5.66
Calculus	5	63.60	7.19	16.09
Overall	50	62.92	5.16	12.57

Table 2 presents distribution of pre-service mathematics teachers' scores on each topic. The table shows that the pre-service mathematics teachers have scored above the overall mean scores of SMCT in 45% of secondary school mathematics topics, which includes: vector, mensuration, set, logical reasoning, and calculus with mean scores (**M=68, SD=1.41; M=67, SD=0; M=66.40, SD=14.76; SD=64, SD=5.66; M=63.60, SD= 16.09**), which is above the overall mean (**M=62.92; SD=12.57**) of the pre-service mathematics teachers scores in all the topics. Such values indicate that the pre-service mathematics teachers are very strong in the topics since their mean scores in the topics were greater than the overall mean value of all the topics. This signifies their knowledge of the topics and can be used as a basis of teaching all the topics at secondary school level with confidence. Heggart (2016) posited that "if you are going to teach a subject, then you should really know a lot about the subject, right" (p. 1). Adequate understanding of the subject matter is a prerequisite to effective teaching and learning and it has direct effect on students learning (Ngugi & Thinguri, 2014). This implies that if the pre-service mathematics teachers were allowed to be teaching these topics at secondary school level, there is possibility to influence students learning. The pre-service mathematics teachers have demonstrated adequate understanding of the topics.

The finding also revealed that the pre-service mathematics teachers have scored below the overall mean scores of SMCT in 55% of the topics, which includes: geometry, coordinate geometry, trigonometry, statistics, numerical process, and algebraic process with mean scores (**M=42.20, SD=14.39; M=44, SD=5.66; M=46.83, SD=18.52; M=54.83, SD=13.76; M=55.88, SD=14.52; M=62, SD=14.39**), which is lower than the overall mean (**M=62.92; SD=12.57**) of all the topics in the test. This indicates that the pre-service mathematics teachers were very weak in the topics. Since they have not scored above the overall mean scores of all the topics for which they have been preparing to teach. Therefore, the pre-service mathematics teachers cannot be relied upon to teach these topics with confidence.

Research finding has shown that the effectiveness of teaching has largely depends on the level of mastery of the subject matter attained by teachers (Darling-Hammond, 2006). The level of mastery of the subject matter possess by each teacher has been identified as a tool which determines the quality and effectiveness of classroom instruction (Ngugi & Thinguri, 2014). This provides the evidence that the pre-service mathematics teachers cannot effectively teach the topics and influence students learning. Hence, for the pre-service mathematics teachers to effectively teach these topics and influence students learning at secondary school level there is need to undergo special training to bridge the gap they might need to effectively guide their students. By doing so the pre-service mathematics teachers could possess adequate level of knowledge of the topics.

Discussion of the Findings

Among the plausible explanations for these finding is that the final year pre-service mathematics teachers are the prospective schoolteachers in which they have been preparing to teach all secondary school mathematics topics immediately after graduation. The prospective teachers are expected to exhibit higher level of knowledge of school mathematics subject matter more than their students, unfortunately the finding of this study shows that over 51.43% of the final year pre-service mathematics have not answer correctly 80% of the test items that was administered to them on secondary school mathematics subject matter. The finding was consistent with the previous study by Aluede and Idogho (2014) who argued on the quality of the training for which the pre-service teachers have been exposed to. Similarly, Odia and Omofonmwan (2007) posited that the teacher training institution in the country has tended to neglect their duties by producing teachers who have inadequate knowledge in their subject area and pedagogical skills.

This finding reflects the findings of Anakwue (1997) who examined the effectiveness of mathematics teacher education program in Nigeria, in grooming quality school mathematics teachers, the study shows that "*the level of understanding of subject matter by prospective teachers in Nigeria is low. Over 30% of student teachers cannot be relied upon to teach the school mathematics syllabus with confidence*" (Anakwue, 1997, p. 2). The findings from the present study agrees relatively with that from Anaduaka and Okafor (2013), Ibrahim et al. (2018a), Musa (2011), Okori and Jerry (2017), Omorogbe and Ewansiha (2013), and Udonsa (2015) who all posits that the teacher training institution has tended to neglect their studies by producing teachers who are inadequate in subject matter, literacy skills and numerical value, that many stakeholders doubt about the process in which they acquired their certificate.

CONCLUSION

This study was undertaken to assess final year pre-service mathematics teachers' level of knowledge of secondary school mathematics subject matter as a basis of teaching secondary school mathematics. One of the more significant findings to emerge from this study is that over 50% of the final year pre-service mathematics teachers cannot be relied upon to teach secondary school mathematics subject matter with confidence, since more than 51% of the final year pre-service mathematics teachers have not answered correctly 80% of the test items that was administered to them on secondary school mathematics subject matter.

The results of this investigation show that over 65% of the pre-service mathematics teachers were able to correctly answer all items in the test that require general knowledge skill, process skill, and problem solving and applications skills in solving secondary school mathematics topics, which signifies their mastery of the skills and expertise in solving any mathematics question that require the skills at secondary school level. The present study, however, makes several noteworthy contributions to the body of knowledge that the teacher education training in the country particularly mathematics education fail to discharge their obligation of producing quality and competent school mathematics teachers who master their subject area.

This research has thrown up many questions in need of further investigation. Further work need to be done to establish whether the inadequate level of subject matter knowledge displayed by the final year pre-service mathematics teachers was associated with inability of teacher training institution in discharging their duty, training curriculum contents or quality of pre-service mathematics teachers who have been admitted at the beginning of the training. All these factors need to be further investigated, in order to find out whether these factors are associated with the final year pre-service mathematics teachers' inadequate level of knowledge of secondary school mathematics subject matter.

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Declaration of interest: No conflict of interest is declared by authors.

Data sharing statement: Data supporting the findings and conclusions are available upon request from the corresponding author.

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