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Mathematics Teacher Education Training for Quality School Teachers: An Assessment of Mathematics Teaching Needs of Preservice Teachers'

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Abstract--*This paper presents the results of assessment of preservice mathematics teachers' teaching needs study, conducted with university mathematics teacher education training final year preservice teachers who were preparing to become secondary school mathematics teachers and undergo teaching practice exercise, and teaches mathematics at various secondary schools. The semi structure interview assessed preservice teachers' perspectives on their teaching needs, based on the experience and difficulties encountered during teaching practice. The qualitative results revealed that teaching practice experiences was interested and memorable event that provide preservice teachers with a lot of learning opportunities and gave them confidence to teach mathematics after graduation. The finding also revealed that there is disconnection between the training curriculum contents and school mathematics curriculum for which preservice teachers were being train to teach. A conclusion and suggestion on how the training should be run, and contents areas if included the quality of preservice teachers would be improve were discussed.*

Keywords:*Preservice teachers, teacher education, teaching needs, evaluation, school teachers, and training.*

1.1 Introduction

In view of the needs and aspiration of the society for quality education at all level of education, Nigerian government has viewed education as an instrument for national development and societal change(NPE, 2004). It's on the basis of viewing education as an instrument for national development and societal change, national policy on teacher education (NPE) states the objectives of providing teacher education training in the country as follows(NPE, 2004, p. 64):

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.
5. To enhance teachers commitment to the teaching profession.

Moreover, the government has declared to provide quality education at all level of education that is comprehensive, functional and relevant to the needs and aspiration of the society for mathematics education (FME, 2009). The policy has stated certain objectives to achieve at all level of education in the country as follows: "*The provision of*

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quality education at lower levels (primary and secondary schools) will only be achieved by preparing preservice teachers and to either upgrade or update the knowledge and skills of teachers who were already in the service" (FME, 2009, p. 6).

The declaration of providing quality education at all level of education, especially on the needs of preparing functional and effective school mathematics teachers who will shoulder the responsibility of providing quality education that is relevant to the needs and aspiration of the society. The declaration has lead to a new policy for teacher education training. The new policy stated that Nigerian 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*" (FME, 2009, P. 6).

The declaration of new policy has charge teacher training institution with responsibilities of grooming quality preservice teachers who would be employ to teach at secondary school. And the training should be based on the standard of teacher education, which will make their product adaptable to any changing situation (NUC, 2012). Despite the declaration of providing quality teacher education training in the national policy on education and responsibility reposed on teacher training institutions on preparation of quality and effective preservice mathematics teachers who shoulder the responsibilities of teaching mathematics at secondary school, the teacher training institution has neglected their studies of grooming quality and effective school mathematics teachers by producing teachers who are inadequate in terms of subject matter knowledge and pedagogical skills (Odia & Omofonmwan, 2007).

Okori and Jerry (2017); Udonsa, (2015) argued that teacher training institutions in the country were unable to trained, produce adequate and qualified mathematics teachers who would assist government in providing quality education at secondary school level. (Kuiper, Thomas, & Olorisade, n.d.) posited that teacher training institution has tended to produce mathematics teachers who are inadequate in their field of study and low level numerical value and literacy skills. Anaduaka & Okafor (2013); Omorogbe & Ewansiha (2013) have noted that many people have began to doubt about the process by which preservice teachers acquired the certificate they possess, due to lack of subject matter knowledge they display in their field of study. (Musa M, 2011)posited that some school mathematics teachers cannot be relied upon to teach mathematics at lower level due to their low level of understanding of subject matter.

2.1Mathematics Teaching Needs of Preservice Teachers'

For preservice teachers to practice and execute teaching task effectively, the training should provide and groom them with required knowledge and skills that are adequate, align with intended objectives of the training, and are design to equipped and stimulate the practice of their chosen profession. A considerable amount of literature has been published on satisfaction of students' basic needs for them to function effectively and provide better result. These studies areM.A, Ibrahim Wun, T. Y., & Nordin, (2018)who posited that individual are motivated to function effectively when their needs are satisfied. He further noted that the quality and effectiveness of any training is determined on how the training provided and satisfied needs of the trainees(M.A, Ibrahim Wun, T. Y., & Nordin, 2018).

Abraham Maslow's theory of needs has highlighted on the quality and effectiveness of students when their basic needs are satisfied. He posited that individuals are motivated to function effectively and produce better results when their basic needs are provided and satisfied at appropriate time (Maslow, 1954). The above theory of needs establish the evidence that every preservice mathematics teacher has the capacity and potential of producing better result when their basic needs are provided and satisfied at appropriate time. To groom qualitative and effective preservice mathematics teachers, the task rest on the shoulders of trainers of the program, as large and growing body of literatures has investigated on the require mathematics teaching needs.

Shulman, (1986)who is the pioneer advocator of the require mathematics needs that each teacher should possess to qualify as effective classroom teacher. He identify content knowledge, curriculum knowledge and pedagogical contents knowledge as the require mathematics teaching that each preservice teacher should possess to qualify as effective classroom instructor (Shulman, 1986). There is a consensus among educationist and mathematics educationist in which they identified content knowledge(Danisman, 2017), comprehensive knowledge of mathematics (Wu Thiam Yew, Sharifah Norul Akmar Syed Zamri, & Lian, 2011), knowledge of learners, curriculum knowledge, knowledge of instructional strategies and resources, knowledge of measurement and assessment, content knowledge, knowledge of

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context, and knowledge of pedagogy (Hashweh, 2005) as the require mathematics teaching that each teach should possess in order to produce better result.

Moreover, There is large volume of published studies that described pedagogical content knowledge as the basic requirement of teaching (i.e. Subject matter knowledge, knowledge of students, knowledge of teaching strategies, knowledge of shaping and elaborating the content, knowledge of curriculum material, media for the instruction, instructional processes; knowledge of purposes, knowledge of curriculum, knowledge of assessment and knowledge of pedagogy) that each training should provide and equip preservice teachers in order to function effectively and produce better result (Fennema & Franke, 1992; Hill et al., 2008; Magnusson et al. 1999; Mark, 1990).

Consequently, based on the above literature reviewed the researcher deem it necessary to examine and assesses mathematics teaching needs of preservice teachers, to find out whether the training has provided and satisfied mathematics teaching needs of preservice teachers'.

2.2 Research Objective: The study was aims to explore mathematics teaching needs of preservice teachers.

2.3 Research Question: The research will provide answer to the below question:

1. What are the mathematics teaching needs of preservice teachers?

2.4 Methodology:A qualitative method were used in the course of data collection, in which 10 preservice mathematics teachers were interviewed on their mathematics teaching needs based on the experiences and difficulty encountered during teaching practice.

3.1 Outcomes of the Assessment

The discussion of mathematics teaching needs of preservice teachers' focuses on the six (6) themes generated from the analysis of information obtained from interview protocol. The six (6) themes generated from semi structure interview protocol are; teaching experience, difficulties encountered, relationship between the program curriculum and school mathematics curricular, how the program should be run, content areas if included the program objectives could be achieved, and Achievement of program objectives.

3.1.1 Teaching Practice Experience

Table 3.1

Teaching Practice Experience of Preservice Mathematics Teachers

Teaching Practice Experience	Preservice Mathematics Teachers
Interested	PMT1, PMT2, PMT8, PMT9, PMT10
Confidence	PMT1, PMT8
Memorable	PMT6, PMT8
So funny	PMT3
Adequate	PMT5
Appreciated	PMT5
Learn a lot	PMT7
Courageous	PMT9
Not Comfortable	PMT4
Phobia	PMT4

Table 3.1 shows the Teaching Practice Experience of Preservice Mathematics Teachers. Teaching practice provides preservice mathematics teachers with teaching opportunities in which they put into practice what they have learned in school. All the 10 PMT that responded to interview questions of this study have described their teaching practice experience as memorable event. To PMT 1, 2, 8, 9 and 10 the experiences was so interested that gave them confidence to teach mathematics in school after graduation. According to PMT 1

> My teaching practice was very interested, because I was happy when I teach successfully, and my students understand the topic I taught better than what their mathematics teachers taught them, and I

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also get confidence from outside when I meet with my friend, they told me Muhammadu Sani we hard your students saying you are good mathematics teacher that they never meet before.

PMT 2 sees the experience as quite interested, while PMT 1 and 8 described the experience as joyful event that boost their confidence in teaching school mathematics. To PMT 6 and 8 the experience was memorable event that provide them with opportunity to interact with different people. PMT 3 described the experience as very funny. He says "it is very funny as I learned a lot of things".

PMT 5 described the experience as well adequate and appreciated which encourage him to solve a lot of mathematical problems particularly general mathematics. He described the experience as follow: *" I find my teaching practice experience well adequate, because my principal always appreciate the effort I made, like they way I am teaching my students, this has gave more courage to double my effort"*. Moreover, PMT 7, has viewed his teaching practice experiences as memorable event, that provide him with opportunity to learned a lot about students individual differences, present lesson based on individual differences, stand in front of students to deliver a lesson, and opportunity to interact and share information with students and teachers,.

According to PMT 7: "*I learned about individual differences of students and I can tackle the problem, I can successfully write a good lesson plan, and I have knowledge of student' behavior"*. PMT 9 described the experience as life time experience which provides him with opportunity to meet a lot of people. He says: "*it is a life time experiences. It helps me to stand in front of students to deliver a lesson without any fear. The teachers and students are very friendly*". PMT 4 sees the experience as horrible event that make him uncomfortable throughout the period. He further noted that the students are not actively participated in the lesson because of the fear of mathematics.

3.1.2 Difficulties Encountered

Table 3.2

Difficulties Encountered by Preservice Mathematics Teachers

Difficulty Encountered	Preservice Mathematics Teachers
Lack of Interest	PMT1
Phobia	PMT1, PMT8, PMT10
Lack of Instructional Materials	PMT1, PMT2
Over Population	PMT3, PMT5, PMT8
Difficult Topics	PMT3, PMT5
Teaching aids	PMT4, PMT5, PMT6, PMT7, PMT9
Subject Matter Knowledge	PMT4
Communication Problem	PMT4
Students Corporation	PMT6
Classroom Management	PMT7
Poor Students Background	PMT8, PMT9
Indiscipline	PMT9

Table 3.2 shows the difficulties that preservice mathematics teachers encountered during their teaching practice. All the 10 preservice mathematics teachers that are been interviewed on their mathematics teaching needs had a different encountered with difficulties during teaching practice. According to PMT 1, he sees lack of interest and mathematics phobia among his students as the major difficulty encountered. PMT 1, states that: "*my difficulties during teaching practice is that the students does not have interest in mathematics lesson, because of the persistent phobia of the subject, that is why they don't have mathematical set"*. To PMT 1, 8 and 10, they described mathematics phobia among their students as the difficulty they encountered.

PMT 1, and 2, viewed lack of instructional materials as the difficulty encountered, which has "*seriously affected*" their classroom instruction. PMT 1 says "*the problem of instructional materials has seriously affected my teaching and students*

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learning". PMT 3, 5 and 8, sees number of students in class as the difficulty encountered, which prevent them to controlled their students and provide effective teaching and learning process. According to PMT 3 and 5 they viewed difficult mathematics topics that are not relevant to their program curriculum as the difficulty they encountered. To PMT 4, 5, 6, 7 and 9, they described lack of instructional materials as the difficulty they encountered.

PMT 4 noted that if he has the courage to speak in public before teaching practice, his teaching performance could be better. Therefore, he views his inability to speak in public and lack of subject matter knowledge that is not relevant to his program curriculum as the difficulties encountered. PMT 4 says: "*I never speak in public that is why I am not comfortable with students*". PMT 6, views lack of students' cooperation as the difficulty he encountered. According to PMT 8, and 9, the difficulty they encountered is students' poor background in mathematics which has seriously affected their classroom instruction. PMT 9, described indiscipline among his students as the difficulty he encountered.

3.1.3 Relationship between the Program Curriculum and School Mathematics Curricular

Table 3.3

Relationship between the Program Curriculum and School Mathematics Curricular

Relationship between the Curriculums	Preservice Mathematics Teachers
Objectives	PMT1
Purpose of the Study	PMT1
Syllabus	PMT1
Different	PMT2, PMT5
Partially Related	PMT3
Irrelevant	PMT4, PMT6, PMT7
No Relationship	PMT8
Entirely Different	PMT9
Not the same	PMT10

Table 3.3 shows the relationship between mathematics teacher education training curriculum and secondary school mathematics curricular in which the preservice teachers are being train to teach after graduation. Based on the information gathered from the 10 preservice mathematics teachers that are been interviewed, seven (7) out of the 10 preservice teachers believed that, their training curriculum is totally different from school mathematics curricular, only three (3) of the interviewers that believed the curriculum of teacher education training and school mathematics curricular are related in terms of objectives, purpose of the study and syllabus.

According to PMT 1, teacher education training curriculum is related with school mathematics curricular in terms of objectives of the study. He says: "*I can relate my program curriculum with school mathematics curriculum by considering the objectives, purpose of the studies and syllabus*". PMT 2, and 5, sees mathematics teacher education curriculum as something that is totally different with school mathematics curriculum, which is more of engineering mathematics, while school mathematics curriculum is more of general mathematics. PMT 2 says: "*the curriculum is totally different, because the training curriculum is more of engineering mathematics, while school mathematics curriculum is general mathematics that deals with algebra*".

To PMT 5, "*my program curriculum contents is mostly further mathematics, and some aspect of engineering mathematics, whereas school mathematics curriculum is mostly general mathematics*". To PMT 3, mathematics teacher education training curriculum is partially related with school mathematics curriculum. PMT 4, 6, and 7, noted that mathematics teacher education training curriculum is totally irrelevant with school mathematics curriculum, in which the preservice mathematics teachers are being train to teach after graduation. PMT 7, says: "*Mathematics teacher education training curriculum contents is irrelevant to school mathematics curriculum, because the whole contents are not the same and has no any relationship with school mathematics curriculum*".

According to PMT 8, "*our program curriculum contents has no any relationship with the curriculum contents that was given to us to teaches during our teaching practice, that is why we find it very difficult in teaching some topics*". Moreover, PMT 9 described mathematics teacher education training curriculum contents as entirely different with school mathematics curriculum contents. He says: "*the curriculum is entirely different with school mathematics curriculum, only*

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few topics that can be related with some topics of secondary school mathematics". To PMT 10, mathematics teacher education training curriculum contents are not the same with school mathematics curriculum. He says: "*actually the curriculums are not the same, because my program curriculum is irrelevant to school mathematics curriculum*".

3.1.4 How the Program should be run

Table 3.4

How the Program should be run

How the Program Should be run	Preservice Mathematics Teachers
Student Encouragement	PMT1
Regular Exercise	PMT1
Curriculum Relevant to School Curriculum	PMT2, PMT10
Include School Curriculum	PMT3, PMT8
Add School Curriculum	PMT4
Rich Educational Courses	PMT5
Students Motivation	PMT6
Curriculum Similar to School Mathematics	PMT9

Table 3.4 present preservice mathematics teachers' views and recommendations on how mathematics teacher education training should be run in order to achieved the intended objectives of the training. Based on the information gathered from preservice mathematics teachers that are been interviewed on their mathematics teaching needs. The interviewers had a different perception, on how the training should be run, in order to achieve the intended objectives of the training. According to PMT 1, lecturers of the program should encourage preservice teachers to read beyond their training content areas by given regular assignment and exercise on school mathematics curriculum; this could enhance and consolidate preservice teachers' effectiveness. PMT 2, 3, 4, 8, 9, and 10, believed that, if mathematics teacher education training could include secondary school mathematics curriculum contents, the objectives of the training can be achieved as stated in the national policy of education.

According to PMT 2, "*the program should be run in such a way that the curriculum is related with what is taught in secondary school*". PMT 3 says: "*my opinion is that, mathematics curriculum contents of secondary school should be injected into teacher education training*". He further, explained that, if the training program includes "*general mathematics*" in their curriculum the "*objectives of the training can be achieved*". To PMT 4, and 8, the training program should prepare preservice teachers with curriculum contents that contains all secondary school mathematics curriculum, and the trainers of the program should give more emphasis on teaching aids, by providing presrvice teachers with skills of how, and when to improvise the teaching aids. To PMT 4; "*my opinion is that, the training supposes to add courses that include all contents of secondary school mathematics. Most of us we can't' teaches secondary school mathematics curriculum, because we were not taught in our program*".

PMT 5 says: "*lecturers should provide students with skills of teaching aids, in order to know how and when to use it, and improvise it*". PMT 6, emphasized on the important of motivation as a means of engaging students for active learning. He suggested that the training should encourage preservice mathematics teachers to motivation as a means of engaging students for effective classroom instruction.

3.1.5 Content Areas in Included the Program Objectives could be achieved

Table 3.5

Content Areas if Included the Program Objectives could be achieved

Content Areas to be Included	Preservice Mathematics Teachers
Arithmetic	PMT1, PMT10
Algebra	PMT2
General Mathematics	PMT3, PMT8

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School Mathematics Curriculum	PMT4, PMT5
Modern Instructional Material (i.e. Computer)	PMT6
Contents Relevant to School Mathematics	PMT7
Geometry	PMT9
Trigonometry	PMT9, PMT10

Table 3.5 shows some of the contents areas if included in the training the intended objectives of the training could be achieved. Based on the information gathered from interview protocol, all the preservice teachers that are been interviewed had a similar perception on the contents areas if included, the objectives of the training could be achieve. All the ten preservice teachers believed that, if the training included general mathematics curriculum, the objectives of the training could be achieved. According to PMT 2, 3, and 8, the training should include general mathematics curriculum and algebra that are related with secondary school mathematics curriculum contents, to enable preservice teachers to effectively teach mathematics in school.

PMT 2 says: "*algebra should be included in the program, so that it relate with school mathematics*". PMT 4, 5 and 7, posited that the training should include courses which will reflect all secondary school mathematics curriculum contents, and equip preservice teachers with secondary school mathematics subject matter knowledge. To PMT 6, the objective of the training could be achieve, if secondary school mathematics curriculum is incorporated into teacher education training, and provide prservice teachers with basics skills and knowledge of using modern instructional technology.

PMT 6 says: "*the only thing to be included into teacher education training is the course, which will provide preservice teachers with knowledge and skills of using instructional"*. According to PMT 7, "*the training should add Geometry topics to enable preservice mathematics teachers to master secondary school mathematics curriculum*. PMT 9, and 10, posited that the program should include secondary school mathematics trigonometry topics in the training, to enable preservice teacher to effectively teach school mathematics.

3.1.6 Achievement of Program Objectives

Table 3.6: *Achievement of Program Objectives*

Achievement of Program Objectives	**Preservice Mathematics Teachers**
Not Achieved	PMT1, PMT7, PMT8, 9, 1o
Fairly Achieved	PMT2
Partially Achieved	PMT3
Achieved	PMT4, PMT5, PMT6

Table 3.6 present preservice mathematics teachers' views on whether the intended objectives of mathematics teacher education training have been achieved or not, based on their teaching practice experienced. The information gathered from preservice mathematics teachers that responded to interview questions, the preservice mathematics teachers had a similar view on the achievement of objectives of the training. Five (5) of the PMT (1, 7, 8, 9, and 10) posited that the objectives of the training are not achieved, three (3) of the PMT (4, 5, and 6) viewed the objectives of the training are achieved, while two of the PMT (2, and 3) perceived the objectives of the training are partially achieved.

According to PMT 1, 7, 8, 9, and 10, that view the intended objectives of the training are not achieved, have noted that, the curriculum contents of the training is different from what is been taught in school, the training is more of preparation PMT for "*academic pursuit*", and most of the PMT cannot teaches all the topics that is been given to teach in school, because all the curriculum contents they have learned, was totally different from what is been presented them. PMT 8 says "*the objectives of mathematics teacher education training are not achieved, since the training is geared toward M.Sc. curriculum, rather than secondary school mathematics curriculum*".

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PMT 9, believed that: "*the objective of mathematics teacher education training could only be achieved, when the curriculum contents of the training is related with what is taught in secondary school mathematics curriculum*". PMT 2, and 3, has argued that the objectives of the training are not achieved, because training curriculum is different from secondary school mathematics curriculum, and PMT cannot teaches all secondary school mathematics curriculums with confidence. Consequently, they asserted that the objectives of the training are partially achieved. PMT 2 says: "*ideally what is taught in the program is different with secondary school curriculum, the teaching practice students must study secondary school curriculum before he/she present his/her lesson. Hence the objective is fairly achieved*". According to PMT 3, "*it is partially achieved since there are content areas which are needed to be included into program curriculum, so that teachers cannot face with problem of learning secondary school curriculum at instant of presentation of the lesson in school*".

According PMT 4, 5, and 6 who perceived the intended objectives of the training have been achieved, they posited that the objectives are achieved, since the training have provided them with required teaching skills, and they have successfully teaches secondary school mathematics curriculum during their teaching practice. Therefore, they are qualified as professional teachers, because they have master their subject area, and discharge their teaching practice exercise effectively, which is the objectives of the training, to groom professional teachers, who are competent to teaches secondary school mathematics curriculum after graduation.

4.1Conclusion

The present study was designed to explore mathematics teaching needs of preservice teachers, based on their teaching practice experiences and difficulties encountered. One of the more significant findings to emerge from this study is that, the curriculum content of teacher education training was totally different from school mathematics curriculum, for which the preservice teachers were being train to teach after graduation. Its however, revealed that the teaching practice exercise were organized in a such a way that all the preservice teachers have described the experience as so interested, and memorable event that provide them with a lot of learning opportunities and boost their confidence of teaching mathematics. Considerable, more curriculum contents that is relevant to school mathematics curricular will need to be included in the training, in order to provide and satisfy preservice teachers needs to them to function effectively and produce better result.

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