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Abstract

Teaching practice is considered a professional development tool for boosting science, technology and mathematics graduate teachers' employability. This study examined Nigerian school administrators' perception of the skills central to the employability of preservice STM teachers in order to make them work-ready when they graduate and increase their marketability in the transition from learning to earning. The study adopted a blueprint of mixed-methods approach. This approach offered an in-depth, contextualised, and natural but more time-consuming insight of qualitative research coupled with the more efficient but less rich of compelling predictive power of quantitative research. Data were collected using the semi-structured interview (qualitative data) with a protocol that comprised four open-ended questions involving 20 school administrators majorly Principals and a survey comprising 39 five-point Likert scale statements (quantitative data) from 180 school administrators (Principal, Vice Principal, Head of STM and Senior STM teachers) in 20 randomly selected senior secondary schools in Lagos State, Nigeria who offered three months of teaching practice for 98 preservice STM teachers in one university in Nigeria. The results showed a satisfactory level of preservice STM teachers' performance during the teaching practice as most administrators were in support of recruiting the preservice STM teachers in future. Teaching skills were ranked most important next to personal attributes for enhancing employability and needing most improvement by preservice STM teachers. The school administrators perceived the duration of the teaching practice to be too short and suggested an extension to twelve months for preservice STM teachers to benefit maximally from the training. They equally suggested that the preservice STM teachers on graduation should be posted to schools during the period of their National Youths Service Corps to further enrich their professional teacher training.

Introduction

Interest in developing a definite list of generic skills for enhancing graduate employability has been on for over time (Anh, 2009; Ca, 2006; Lịch, 2009; Huyen, 2008; Mason, William, & Cranmer, 2009; MOET, 2008; Nguyen, 2009; Thang & Quang, 2005; Trung & Swierczek, 2009; Tuyet, 2010) and the effect of globalisation has widened the scope of skills needed for graduate employability (Tran, 2012). Employability skill is "a set of achievements - skills, understandings and personal attributes – that make individuals more likely to gain employment and be successful in their chosen occupations, which benefits themselves, the workforce, the community and the economy (Knight & Yorke, 2004, p. 4). Employability skills are those basic teachable skills necessary for getting, keeping, and doing well on a job (Robinson, 2000).

Terms such as transferable skills, soft skills, core skills, key skills, generic skills, basic skills, cross-curricular skills, behavioural competencies, employability skills, or, more recently, twenty-first century skills have been variously used to refer to skills needed by university graduates to be work ready (Bridges, 1993; Hager & Holland, 2006). In teacher preparation institutions, there is a current debate about the balance between preservice teachers' teaching knowledge and skills and skills required to function in the work place. Feedback from employers reveals the existence of gulf of knowledge and skills deficit in STM graduates coming into the teaching profession market (Fatade, Nneji, Awofala & Awofala, 2012). This has been traceable to improper tertiary institution (university) training (Fatade et al., 2012) and failure of the education programmes received by graduates to adapt to the changing realities and practices of (education) industry (Jamali, 2005).

In the world of work, aspirations and competitiveness are rising (Lee, 2010) and the workplace is constantly inundated with employers demanding more flexible and adaptable young employees (Bennett, 2002) in order to keep pace with the emerging global knowledge economy and changing market needs. One way of meeting this expectation in preservice STM teachers is to equip them with not just knowledge but a capacity to learn from their education. These attributes will not only facilitate and enhance employment opportunities (Kagaari, 2007; Maher & Graves, 2008) but help in developing the intellectual, personal and social resources (Lee, 2010) that will enable preservice STM teachers to flourish in a diverse and changing world. The acquisition of knowledge, skills and abilities often makes graduates more likely to be successful in their chosen occupation (Harvey, 2004). Thus, there is need for closer collaboration between teacher educators, employers and government, to help develop appropriate and functional teaching and training programmes (Clarke, 1997) for employability skills among preservice STM teachers. Employability skills are the skills almost everyone needs to do almost any job.

Some universities are aiming to implant employability skills within their teaching with the purpose of providing students with a variety of inter and extra-curricula opportunities alongside work experience that will enable them to enhance their employability. Employability skills are the wheels of our increasingly complex and interconnected workplace (Lee, 2010) and non-cognitive skills such as team working, communication, and assertiveness are part of the attributes required for employability. In general, Bowden, Hart, King, Trigwell and Watts (2000) cited in Yusof, Mohd Fauzi, Abidin and Awang (2013) propose three main attributes for graduate employability to include: qualities, skills, and understanding. Yorke and Knight (2006) maintained that personal qualities, core skills and process skills are the attributes considered germane for graduate employability. Personal qualities consist of self-awareness, self-confidence, willingness to learn, emotional intelligence, independence, and adaptability. Core skills include self-management; written and oral communication; and critical analysis. Process skills refer to problem solving; team working; computer literacy; integrity; work ethics; planning and prioritising; and coping with uncertainty. The collection of these attributes in addition to knowledge, values, attitudes, and desire which lead to effective, embodied human action in the world in a particular domain are called competence (Lee, 2010).

In some educational settings in the USA, learning outcomes are embedded in complex projects designed to build soft skills as well as course content knowledge (Partnership for Twenty-First Skills cited in Lee 2010). Soft skills encompass a range of skills such as interpersonal skills, team working, negotiation skills, communication skills, time management, team management and delegation skills for enhancing business activities. Aside the fact that graduates are expected to be proactive and able to solve problems in a creative way (Zehrer & Mossenlechner, 2009), employers do look for graduates with communication skills, empathy, motivation, decision making abilities, planning abilities and improvisation abilities (Bagshaw, 1996). These skills are required to be taught through purposeful 'real-life' or realistic activities with a strong focus on discussion, explanation, decision making and problem solving. Cox and King (2006) identify skills sets of transferable skills and subject specific skills to embed employability in course design and suggest that the subset of transferable skills are communication, analysis, design, evaluation, ethics, project and process management skills.

In Nigeria, there is also some initial study investigating the shortage of work related skills of Nigerian university graduates. The investigation carried out in 2004 by the National Universities Commission (NUC) to assess the quality of graduates from the Nigerian university system through labour market surveys (Fatade etal., 2012; Okebukola, 2010) revealed that graduates from Nigerian universities across most disciplines lacked the required competencies needed to be work ready. A range of skills which includes analytical competency, ICT skills, entrepreneurial and problem solving/decision making skills, technical skills, practical skills, professionalism and professional ethics skills, creativity and critical thinking skills, and communication and literary skills were found lacking in Nigerian graduates.

However, this large scale study did not consider the work readiness skills of the Nigerian STM graduate teachers. This is in spite of the fact that the future of most disciplines lies in the hand of the teachers and the aphorism that science teacher education is the key to nation building cannot be underestimated. In the teaching profession, teaching skills are the technical skills amenable to the profession. A teaching skill is defined as a set of teacher behaviours considered effective in bringing about desired changes in students. Preservice STM teachers on graduation are expected to possess skill of lesson planning, skill of set induction, skill of presentation, skill of stimulus variation, skill of proper use of audio-visual aids, skill of reinforcement, skill of questioning, skill of silence and nonverbal cues, and skill of closure or summary. It should be noted that while the general teaching skills help in the different subject areas, specific teaching skills help to teach a particular

subject and the focus now has been to identify skills needed for a particular subject at a particular grade level (NCERT, 1981).

In addressing the skills deficit in STM graduates employability, scholars have recommended practice (training) in school, or professional teaching practice, as one of the strategies to enhance technical skills relating to the teaching profession among preservice STM teachers. Like the industrial training (Ab Rahman, Omar, Kofli, Mat, Osman, & Darus, 2009; Yusof et al., 2013) teaching practice aims to expose preservice teachers to the working environment. It is ascertained that at some point of their professional training, preservice teachers must be able to express their personal educational philosophies, theories and understandings (Kennedy, 1996). Teaching practice, notwithstanding the length or duration, is an excellent opportunity for preservice teachers to experiment and test their knowledge and skills in an authentic teaching and learning environment in tandem with their own understanding of their personal educational philosophies and theories (Kabilan & Izzaham, 2008). Teaching practice opens the window of opportunity for preservice teachers to authenticate the practicability of microteaching experience in a typical teaching and learning environment. Davis and Hall (2003) described teaching practice as a socializing experience into the teaching profession. The socialising experience during teaching practice often leads to higher confidence in improving preservice teachers' learning, satisfaction with their teaching career, and a higher sense of teacher efficacy (Oh, Ankers, Llamas & Tomyoy, 2005) when they enter real working life. The centrality of pedagogical skills acquisition in teacher preparation institutions has made teaching practice mandatory for preservice teachers.

Most studies on teaching practice do not explore employers' suggestions on how to improve preservice teachers' performance so that they are work-ready when they graduate. Rather, these studies pay attention to the benefits preservice teachers could derive from teaching practice and the challenges inherent in it. Teaching practice enables preservice teachers to question their beliefs and assumptions in developing pedagogical knowledge to avoid practices that are not founded on effective and critical pedagogical knowledge and theories (Kabilan & Izzaham, 2008). According to Chung (2002) the dialogue that ensues during teaching practice facilitates knowledge building and reflective collaboration between supervisor as an expert and preservice teacher as a novice to improve the understanding of teaching. Teaching practice enables supervisors to assist the novice teachers in identifying and evaluating the context of the problem or deficiency and establishing developmental goals or standards. The personal strengths and resources of the student-teacher may be used to improve plans for teaching (Chung, 2002). Besides, teaching practice enables graduate teachers to overcome entry shock when they enter the job market. Pomeranntz and Pierce (2004) led an inquiry into the challenges experienced by preservice teachers in the 'real world', and to what degree the "courses prepared them for those challenges" (p. 55). In addition, Kabilan and Izzaham (2008) investigated the challenges faced and the strategies adopted by a Malaysian English language teacher during teaching practice.

Little is known empirically regarding the skills that could enhance the preservice STM teachers' employability. The present study is needed to identify these skills preservice STM teachers should focus upon during professional teaching practice to improve their employability. School administrators (stakeholders in education), mainly secondary school principals, vice-principals and heads of STM are the professionals under whose control the preservice STM teachers are placed during teaching practice. The objective of this study is to seek the opinions of these administrators regarding the skills the preservice STM teachers should improve upon in order to increase their marketability in the transition from 'learning to earning'. This study is significant in that it will help in identifying skills that preservice STM teachers are lacking and need to improve. The study could offer suggestions on ways to increase preservice STM teachers' employability by identifying these skills. Suggestions could be made to help preservice STM teachers better prepare for their future career as professional teachers. Based on the above review, the following research questions were answered in this study.

Research Questions

Research Question One: What is the level of skill performance of preservice STM teachers during teaching practice?
Research Question Two: What are the skills perceived by the school administrators as central to the employability of preservice STM teachers on professional teaching practice when they eventually become graduate STM teachers?
Research Question Three What role does teaching practice play in preservice STM teachers' professional development and do school administrators intend to recruit the preservice STM teachers after they graduate?
Research Question Four: What is school administrators perception regarding the university's teaching practice scheme and what suggestions can they give for improving current preservice STM teachers' skill performance?

Method

Research Design

The study employed the descriptive survey research design (Kerlinger, 1994) within the blueprint of a concurrent triangulation mixed-methods research (Borrego, Douglas, & Amelinka, 2009; Creswell & Plano Clark, 2007) which combined quantitative and qualitative (QUAN +QUAL) methods (Gay, Miles & Airasian, 2006). The mixed-methods approach offered an in-depth, contextualised, and natural but more time-consuming insight of qualitative research coupled with the more efficient but less rich of compelling predictive power of quantitative research. Mixing the datasets enabled the researchers to provide a better understanding of the problem under study. Conclusions obtained from analysis of the quantitative data were supported and enhanced through thick descriptions (Geertz, 1973) of some aspects of the qualitative data obtained from the open-ended interview than if either dataset had been used alone. Consequently, the study made use of qualitative techniques of data analysis to support conclusions reached through quantitative data analysis in relation to the perceptions of school administrators about enhancing the employability of preservice STM teachers through teaching practice.

Population, Sampling, and Sampling Techniques

The population consisted of all senior secondary school administrators in Lagos metropolis, Southwest Nigeria. The sample consisted of 180 senior secondary school administrators comprising 20 principals, 40 vice-principals, 60 head of STM, and 60 senior STM teachers purposively selected from 20 senior secondary schools that were randomly selected from 50 senior secondary schools in Lagos metropolis. Purposive sampling is a non-random method of sampling whereby the researcher selects information-rich cases for study (Ogunleye, 2000). Of the respondents, 97(53.9%) were male and 83(46.1%) were female. Altogether, the sample consisted of school administrators with varied years of administrative/teaching experience (Mean administrative/teaching experience = 23.4 years, standard deviation = 4.6). Their ages ranged from 35 to 59 years with a mean age of 43.4 years and a standard deviation of 7.8.

Instrumentation

Two instruments (semi-structured interview and survey) were employed in collecting quantitative and qualitative data for the study.

Semi-Structured Interview: In this study, the interview questions were planned to educe a broad range of detailed responses, lending depth to the information that school administrators furnished in their interview. Aside the fact that the semi-structured interview allowed for an efficient and comprehensive interviewing of the school administrators regarding preservice STM teachers' employability, this approach ensured asking the interview questions in an open-ended fashion to maintain neutrality, avoid leading the participants, and minimize the imposition of predetermined responses when gathering data (Patton, 2002). A semi-structured interview with a protocol that comprised four open-ended questions was developed to collect qualitative data. Below are the interview questions:

(1) What is the level of skill performance of preservice STM teachers during teaching practice in your school? (2) What are the skills and clusters of skills the preservice STM teachers should focus upon during professional teaching practice in order to enhance their employability when they become STM graduate teachers? (3) What role does teaching practice play in preservice STM teachers' professional development? (4) What is your perception regarding the university's teaching practice scheme and what suggestions can you give for improving current preservice STM teachers' performance?

Survey: In this study, a survey was constructed using 39 five-point Likert scale statements (quantitative data) anchored on: 1- not satisfactory, 2- less satisfactory, 3- satisfactory, 4- more satisfactory, and 5- excellent. Below are the samples of survey questions:

A. Rank order the personal skills of the preservice STM teacher on teaching practice in your school.
1. Not satisfactory ( ) 2. Less satisfactory ( ) 3. Satisfactory ( ) 4. More satisfactory ( ) 5. Excellent ( )
B. Rank order the core skills of preservice STM teacher on teaching practice in your school.
1. Not satisfactory ( ) 2. Less satisfactory ( ) 3. Satisfactory ( ) 4. More satisfactory ( ) 5. Excellent ( )

C. Rank order the process skills of preservice STM teacher on teaching practice in your school.
1. Not satisfactory ( ) 2. Less satisfactory ( ) 3. Satisfactory ( ) 4. More satisfactory ( ) 5. Excellent ( )
D. Rank order the teaching skills of preservice STM teacher on teaching practice in your school.
1. Not satisfactory ( ) 2. Less satisfactory ( ) 3. Satisfactory ( ) 4. More satisfactory ( ) 5. Excellent ( )

The validity and reliability of the instrument passed through two stages. First, the survey items were vetted by three specialists in STM education and evaluation and found that the survey was content valid. Second, the content validated survey was trial-tested using 30 school administrators (4 principals, 8 vice-principals, 12 heads of STM, and 12 senior STM teachers) in 8 senior secondary schools in Ijebu Ode, Ogun State, Nigeria. The analysis of the rankings of the school administrators on the items showed no ambiguity in the survey, and produced a Cronbach coefficient alpha (for internal consistency reliability) of 0.82. The completion time for the 39 item survey ranged between 20 and 28 minutes. The qualitative data were collected by using face to face semi-structured interviews conducted with 20 principals of the 20 senior secondary schools selected for the study. Each interview lasted 20-30 minutes and occurred once for each participant. Responses to interview were used to identify relevant themes that emerged from the answers and to identify patterns that existed across the responses of these school administrators. School administrators responded to the 39 items of the survey by focusing on their perceptions of the performance of preservice STM teachers during teaching practice and the skills central to the employability of preservice STM teachers. The survey was designed for participants to take between 25 and 35 minutes and surveying occurred only once for each participant. In this study, the researchers used "concurrent data analysis" (Cresswell & Plano Clark, 2007) in which both qualitative and quantitative data merged after they were analysed separately in order to provide a comprehensive analysis of the research questions. The qualitative data analysis involved an examination of principals' answers to open-ended interview questions. Quantitative data analysis consisted of examining the school administrators' responses to the 5-point Likert scale survey items. Two stages were involved in using the concurrent data analysis.

Data Analysis

First, the initial data analysis for each of the qualitative and the quantitative databases included coding, theme development, and the interrelationship of analysis of qualitative data and descriptive analysis of quantitative data. Second, the author merged the two sets of data and used the concurrent data analysis for a complete picture of the study (Figure 1). Triangulation design is one of the approaches used for concurrent data analysis, and in bringing together complementary methods (quantitative and qualitative) or data sources (interview, survey, etc).

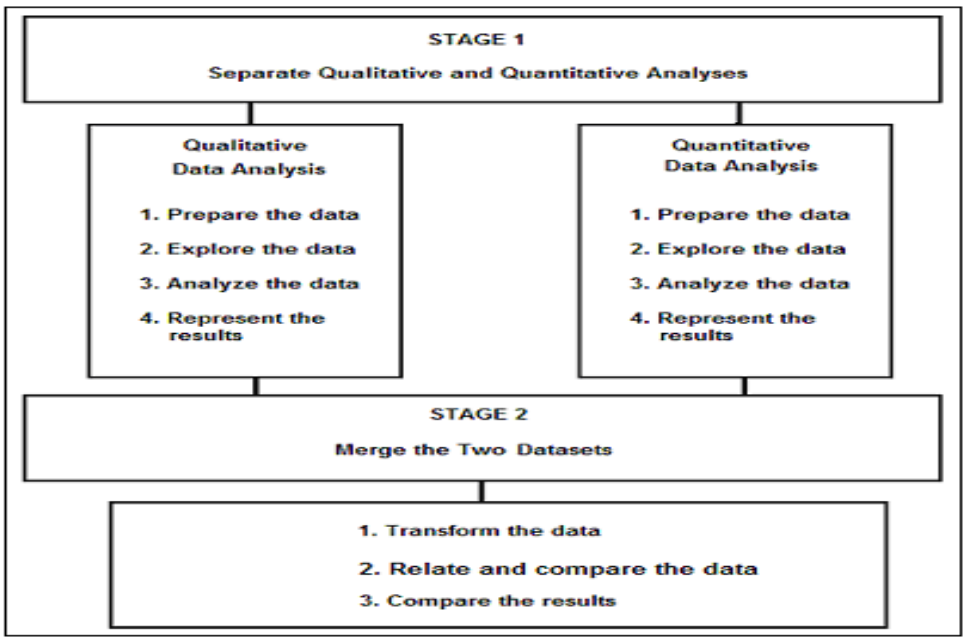

Figure 1. Concurrent Data Analysis
Source: Diagram Adopted from Cresswell and Plano Clark (2007, p. 127)

The use of triangulation strengthens the ethical need to confirm the validity and reliability of the process (Tellis, 1997) and using multiple methods in a research design would also help to "give a fuller picture and address

many different aspects of phenomena" (Silverman, 2000, p.50). In the present study both quantitative and qualitative data were collected and this allowed the author to combine the strengths of each form of data. Subsequently, data were merged and the results of analyses were compared and used concurrently to comprehend the research questions with a view of making informed conclusions about the problem of the study. The present study transformed the qualitative data into quantitative data through counting codes and counting themes which allowed the mixture of data during the analysis stage to enhance the comparison, interrelation, and further analysis of the two data sets. The transformation of data (Figure 2) used the procedure described by Cresswell and Plano Clark (2007, p. 138): 1. Qualitative data were analysed for themes. 2. The number of occurrences of themes was counted and computed. 3. These numbers were entered into SPSS (Statistical Package for the Social Sciences) to generate data reports. 4. A table, which is a matrix with data transformation, was generated to portray the results in order to compare quantitised qualitative data with the quantitative data. However, the responses to the 4 open-ended interview questions were categorized based on emergent sub-themes (Table 1).

Table1. Categories and sub-themes that emerged from the open-ended questions of the interviews

Categories and Sub-themes	Number of quotes
Personal skill	(N=54; 36.24%)
Interpersonal	5
Self-awareness	8
Self-confidence	5
Willingness to learn	6
Emotional intelligence	4
Independence	8
Adaptability	4
Enthusiasm	4
Team working	4
Integrity	5
Negotiation	3
Resilience	2
Core skills	(N=31; 20.81%)
Self-management	8
Written and oral communication	3
Critical analysis	2
Numeracy	4
Time management	4
Team management	4
Delegation	6
Process skills	(N=21; 14.09%)
Problem solving	5
Computer literacy	5
Work ethics	5
Planning and prioritising	4
Coping with uncertainty	2
Teaching skills	(N=43; 28.86%)
Writing instructional objective	4
Introducing a lesson	3
Managing classroom	2
Using black-board	3
Increasing pupil participation	4
Silence and non-verbal cues	2
Reinforcement	3
Stimulus variation	2
Illustration with examples	3
Explaining	2
Probing questioning	3
Fluency in questioning	2
Recognising attending behaviour	5
Using audio-visual aids	4
Achieving closure	4

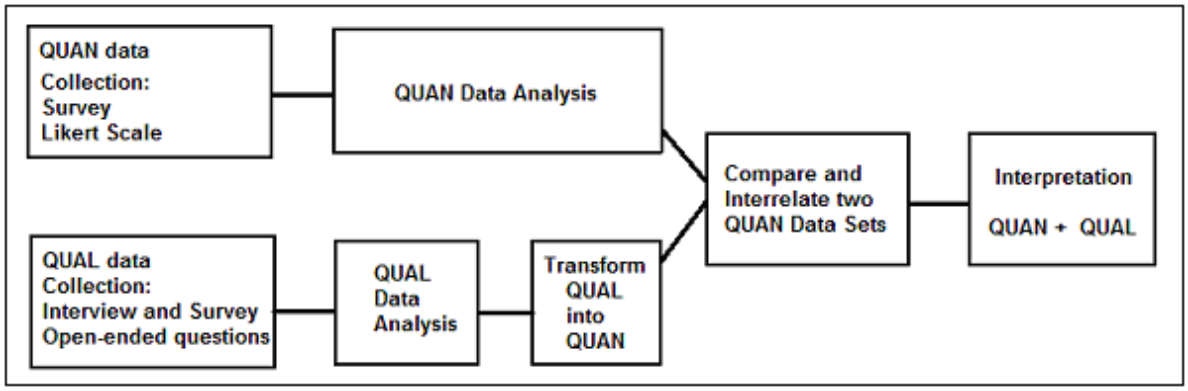

Figure 2. Data Transformation Model of the Triangulation Design
Source: Triangulation Design (Creswell & Plato, 2007, p. 63)

The sub-themes that emerged from this source of qualitative data represented a rich description of how principals and school administrators perceived skills central to the employability of preservice STM teachers were organized into thematic categories. However, the interview transcripts were again reviewed to code statements belonging to these themes (Table 2) in order to ensure the validity of categorisation.

Table 2. Thematic Categories

Qualitative measure	Thematic categories			
	Personal skills	Core skills	Process skills	Teaching skills
Interview open-ended questions	54	31	21	43

In line with the qualitative data gathered from the interview questions, four qualitative themes were identified and these themes were personal skills, core skills, process skills, and teaching skills.

Results and Discussion

Research Question One: What is the level of skill performance of preservice STM teachers during teaching practice?

The mean score for preservice STM teachers' skill performance during teaching practice related to four main dimensions, namely personal qualities, core, process, and teaching skills, was estimated using descriptive statistics in SPSS software (Table 3). The overall mean score was 3.48 indicating that the preservice STM teachers' performance was satisfactory; implying that in general the preservice STM teachers' performed well during the teaching practice. The four dimensions: core skills, process skills, and teaching skills were rated as satisfactory with mean values of 3.44, 3.39 and 3.49 respectively while personal quality was rated more satisfactory with a mean value of 3.53.

Table 3. Mean scores for preservice STM teachers' skill performance in teaching practice

Skill dimension	No of items	Mean Value	Rate of performance
Personal quality	12	3.53	More satisfactory
Core skills	7	3.44	Satisfactory
Process skills	5	3.39	Satisfactory
Teaching skills	15	3.49	Satisfactory
Overall skills	39	3.48	Satisfactory

1.00-1.49=Not satisfactory; 1.50-2.49=Less satisfactory; 2.50-3.49= Satisfactory; 3.50-4.49=More satisfactory; 4.50-5.00=Excellent.

This quantitative finding is supported by the qualitative data from the open-ended interview questions, which revealed that the majority of school administrators rated the preservice STM teachers to have performed satisfactorily during the teaching practice. One school administrator stated that "these preservice STM teachers

are wonderful and their performances in teaching are commendable. They show prowess in teaching skills and relate easily with other members of staff and are able to communicate the content knowledge to the students". Another school administrator affirmed that, "I am satisfied with the performance of these preservice STM teachers. They are dedicated and intrinsically motivated to teach as they show understanding in what they teach the students and our students enjoy their teaching". İn addition, one school administrator recounted that ''these preservice STM teachers are not only dynamic and resilient but that they are good communicators who show enthusiasm in working as part of a team. We are blessed for having them in our school''. While the preservice STM teachers were being commended for satisfactory performance during their teaching practice, this commendation suggests that the preservice STM teachers need to be adequately equipped with skills and attributes that will enable them to function effectively in the workplace when they eventually become STM graduate teachers. This is in line with the submission of the Department of Education (2006) that all young people need a set of skills and attributes that will prepare them for both employment and further learning. In general employers need reliable, responsible workers with job readiness skills who can solve problems and who have the social skills and attitude to work together as team members (Srivastava & Khare, 2012).

Research Question Two: What are the skills perceived by the school administrators as central to the employability of preservice STM teachers on professional teaching practice when they eventually become graduate STM teachers?

According to the University of Sydney Careers Centre (2010), every graduate of the University is expected to have developed graduate attributes. The list of graduate attributes developed by the university in consultation with employers and professional groups includes professional and technical skills, generic skills, and employability skills. In the present study, majority of the school administrators perceived personal attributes, core skills, process skills, and teaching skills as clusters of skills that are central to the employability of preservice STM teachers when they eventually become graduate STM teachers (Table 4). Among these clusters of skills, personal skills were rated more important (M=3.5283, SD=0.3834) to increasing the employability of preservice STM teachers when they eventually become graduate STM teachers. Teaching skills were rated next and perceived important (M=3.4855, SD=0.3934) to increasing the employability of preservice STM teachers when they eventually become graduate STM teachers. The core skills (M=3.4437, SD=0.4574) which include: interpersonal, self-awareness, self-confidence, independence, emotional intelligence, willingness to learn, enthusiasm, adaptability, resilience, integrity, negotiation, and team working were all rated important to the employability of preservice STM teachers when they eventually become graduate STM teachers. The process skills (M=3.3900, SD=0.4628) which include problem solving, computer literacy, work ethics, planning and prioritising, and coping with uncertainty were also rated important to the employability of preservice STM teachers when they eventually become graduate STM teachers. This quantitative finding is supported by the qualitative data from the open-ended interview questions, which revealed that the majority of school administrators identified personal attributes, core skills, process skills, and teaching skills (Tables 2 & 3) as clusters of skills that are central to the employability of preservice STM teachers when they eventually become graduate STM teachers.

One school administrator stated that "these preservice teachers are time conscious. They possess literacy skills and numeracy skills, and show enthusiasm and commitment to teaching. We are happy having them in our school and after their graduation we expect them to have developed a more sophisticated job-related set of skills including team-working skills, problem-solving skills, writing instructional objective, and classroom management and control." Another school administrator avowed that "...although the discipline-based knowledge learned at university often takes time to become fully active in individuals these preservice teachers are expected to be equipped with generic competencies such as self-confidence in teaching, classroom management, team-working, fluency in communication, and time management that are needed immediately and are often what secure a graduate teaching job". Another school administrator maintained that "...failure to equip young preservice STM teachers with the job readiness skills crucial to teaching job success is corresponding to placing employability obstacles in their path". In line with this submission, Robinson (2000) maintained that job readiness skills are clustered into three skill sets: basic academic skills, higher order thinking skills, and personal qualities. School administrators maintained that suitable work related experience was another factor central to the employability of graduate STM teachers and that employers expected to find graduate STM teachers who had adequate professional knowledge in the area of content, teaching pedagogy, and pedagogical content knowledge skills. It was recommended that this would not only help new graduate STM teachers become more productive in a shorter time but that learning on the job would be easier and faster to deal with.

Table 4. General perception of school administrators regarding the skills the preservice STM teachers on teaching practice should develop for increased employability

Qualities/skills	Not/least important N(%)	Important N(%)	More/most important N(%)	Mean	SD
Personal attributes					
Interpersonal	7(3.9)	59(32.8)	114(63.4)	3.64	.71
Self-awareness	6(3.3)	43(23.9)	131(72.8)	3.72	.62
Self-confidence	11(6.1)	43(23.9)	126(70.0)	3.62	.79
Independence	24(13.3)	56(31.1)	100(55.5)	3.35	.99
Emotional intelligence	4(2.2)	54(30.0)	122(67.8)	3.68	.56
Willingness to learn	9(5.0)	75(41.7)	96(53.3)	3.48	.71
Enthusiasm	9(5.0)	54(30.0)	117(65.0)	3.63	.63
Adaptability	38(21.1)	57(31.7)	85(47.2)	3.17	.97
Resilience	31(17.2)	57(31.7)	92(51.1)	3.36	.83
Integrity	5(2.8)	70(38.9)	105(58.3)	3.57	.57
Negotiation	25(13.9)	45(25.0)	110(61.1)	3.46	.87
Team working	10(5.6)	40(22.2)	130(72.2)	3.67	.61
Sub-total				3.53	.38
Core skills					
Self-management	27(15.0)	49(27.2)	104(57.8)	3.40	.87
Written and oral commtn	11(6.1)	39(21.7)	130(72.2)	3.67	.68
critical analysis	15(8.3)	52(28.9)	113(62.7)	3.5	.81
Numeracy	43(23.9)	52(28.9)	85(47.2)	3.14	1.08
Time management	12(6.7)	64(38.8)	104(57.8)	3.50	.73
Team management	23(12.8)	75(41.7)	82(45.5)	3.33	.78
Delegation	9(5.0)	69(38.8)	102(56.7)	3.51	.61
Sub-total				3.44	.46
Process skills					
Problem solving	13(7.2)	54(30.0)	113(62.8)	3.53	.77
Computer literacy	41(22.8)	54(30.0)	85(47.2)	3.16	1.00
Work ethics	15(8.3)	67(37.2)	98(54.5)	3.45	.75
Planning and prioritising	23(12.8)	81(45.0)	76(42.2)	3.28	.76
Coping and uncertainty	8(4.4)	71(43.9)	101(56.1)	3.52	.65
Sub-total				3.39	.46
Teaching skills					
Writing instructional Objectives	6(3.3)	69(38.3)	105(58.3)	3.56	.69
Introducing a lesson	3(1.7)	48(26.7)	129(71.7)	3.73	.58
Managing classroom	16(8.9)	44(24.4)	120(66.7)	3.51	.85
Using black-board	21(11.7)	61(33.9)	98(54.4)	3.33	.96
Increasing pupil Participation	4(2.2)	53(29.4)	123(68.3)	3.68	.55
Silence and non-verbal cues	9(5.0)	77(42.8)	94(52.2)	3.47	.71
Reinforcement	8(4.4)	55(30.6)	117(65.0)	3.61	.57
Stimulus variation	35(19.4)	57(31.7)	88(48.9)	3.22	.99
Illustration with example	30(16.7)	58(32.2)	92(51.1)	3.34	.76
Explaining	6(3.3)	70(38.9)	104(57.8)	3.56	.61
Probing questioning	23(14.4)	48(26.7)	106(58.9)	3.42	.85
Fluency in questioning	8(4.4)	42(23.3)	130(72.2)	3.68	.56
Recognising attending Behaviours	11(6.1)	54(30.0)	115(63.9)	3.56	.71
Using audio-visual aids	43(23.9)	54(30.0)	83(46.1)	3.12	1.00
Achieving closure	11(6.1)	67(37.2)	102(56.6)	3.51	.70
Sub-total				3.49	.39
Total				3.48	.38

Research Question Three: What role does teaching practice play in preservice STM teachers' professional development and do you intend to recruit the preservice STM teachers after they graduate?

The school administrators were asked what roles does teaching practice play in professional development of preservice STM teachers. One school principal noted that "the professional teaching practice scheme grants preservice STM teachers experience in the real teaching and learning environment". This view is expounded in the literature that teaching practice affords student teachers experience in the actual teaching and learning environment (Marais & Meier, 2004; Ngidi & Sibaya, 2003; Perry, 2004) and a student teacher is given the opportunity to try the art of teaching before actually getting into the real world of the teaching profession (Kasanda, 1995). Another school administrator remarked that "teaching practice provides the real boundary between student-hood and membership of the teaching profession as it is a stage in learning in which preservice STM teachers are exposed to a wide range of experiences in the normal classroom setting." Contributing to this view, Perry (2004) points out that, although preservice teachers gain much specialised knowledge by attending lectures and doing assignments, teaching practice adds meaning to this knowledge when a student teacher comes into contact with the real classroom situation. It is during teaching practice that knowledge is affirmed. One school administrator asserted that "teaching practice allows preservice teachers to replicate their experiences in a school environment. Teaching practice allows preservice teachers to contextualise their theoretical knowledge gained during training". This relates to the view that teaching involved many experiences that simply could not be replicated in a non-school environment (Buchner & Hay, 1999).

The school administrators were asked about their intention to recruit the preservice teachers after they graduated. Out of 180 school administrators, nearly 98% said they would recruit the preservice STM teachers while only 3 (2%) school administrators would not.

Research Question Four: What is your perception regarding the university's teaching practice scheme and what suggestions can you give for improving current preservice STM teachers' skill performance?

School administrators were asked for their perceptions about teaching practice; whether the scheme should be continued; and their suggestions for improvement. From a total of 180 school administrators, 46.80% described the professional teaching practice as very good/good and 16.45% as satisfactory. Suggestions on how to improve teaching practice were provided by 34.75% and 2% did not answer the question. School administrators who noted that professional teaching practice was good gave the following reasons: teaching practice exposes the preservice STM teachers to the real teaching environment; teaching practice exposes the preservice STM teachers to practical teaching issues rather than theory; and preservice STM teachers are able to garner teaching experience from the teaching practice. Since the school is an industry, these findings agreed with the findings of Ayarkwa, Adinyira and Osei-Asibey, (2012) who found that the largest benefit of industrial training lay in exposure to the work environment and that employers considered that industrial training benefitted students when applying theory to practice. Students can better understand what they learn when they experience the job themselves.

With regard to improving the teaching practice, 91.8% of school administrators said that the duration of 3 months (an equivalent of one academic term) was too short and should be extended to 12 months (an equivalent of one academic year) and that graduate STM teachers should be posted to schools during the period of their National Youths Service Corps (NYSC) to further enrich their professional teacher training. The NYSC is a one year mandatory training programme given to all graduates from the Nigerian universities and polytechnics to make them work ready and for acculturation. The school administrators were of the opinion that this longer period of teaching practice would be more valuable, giving more exposure to the preservice STM teachers to enable them to comprehend the teaching profession. The shorter duration was not workable for school administrators to let the preservice STM teachers teach more methodically. A longer duration would give them more time to explore and experience real teaching in the classroom. The extended time would aid the preservice STM teachers in making practical the theory learnt in the university. It would help them extend their knowledge of the teaching profession to gaining maturity in classroom management and control processes.

School administrators' suggestions for preservice STM teachers' improvement concerned personal attributes, core skills, process skills, and teaching skills. Among the suggestions was that method for enhancement should focus on problem solving, decision making, self-confidence, computer literacy, emotional intelligence, team management, written and oral communication, managing classroom, and using instructional materials which are critical for preservice STM teachers to be successful. One school administrator noted that "...these preservice STM teachers need to enhance their written and oral communication skills for effective classroom delivery and they must be emotionally stable to deal with myriads of punishable offences which occur daily in the

classroom". Another school administrator stated "the preservice STM teachers should be more ICT complaint and be punctual to work. The male preservice STM teachers should be more cautious in their dealings with the students, most especially the female students, because cases abound of male preservice teachers trying to woo the female students and this may dent their integrity. They should focus on their primary assignment in the school which is teaching for meaningful understanding."

Explicit teaching and teacher demonstration of skills, such as listening and questioning have been found to be effective (Wegerif, Littleton, Dawes, Mercer, & Rowe, 2004) in classroom delivery. This is the same for skills inherent in 'learning how to learn' sessions, such as communication, reflection, self-awareness, resilience and self confidence (Black, McCormick, James, & Pedder, 2006). However, suggestions offered in this study by the school administrators regarding integrity in teaching, preservice STM teachers' performance in decision making, problem solving, and written and communication skills agreed with those suggested by Zehrer and Mossenlechner (2009), who indicated that students need to be skilled in these attributes to allow them to cope with the changing environment. Besides process skills, core skills, and personal attributes, most school administrators in the present study indicated that students should improve their teaching skills for all round development.

Conclusion

The construct of employability skill is currently been investigated, and has frequently been used to classify graduates into two categories: those that have high employability skills and will therefore be versatile and work ready employees vs. those that have low levels of employability skills and will therefore be low skilled employees with low potentials to be work ready. With the introduction of employability skills in some educational settings (Lee, 2010), a new perspective with which to close the skill deficit gap in preservice STM teachers and make them work ready is in the offing. To address the skills deficit in STM graduate employability, teaching practice is often used to increase the requisite skills needed by preservice STM teachers in the hopes that this will influence their marketability and make them work ready. Experience has shown that placing the emphasis on content and methodology courses in the university, in the hopes of ensuring that preservice STM teachers will have positive future STM teaching experiences, is not enough. Preservice STM teacher educators need a shift in thinking that looks forward to the preservice STM teachers' future STM teaching and teaching practice is one way of looking into this future. While little is known empirically regarding the skills that could enhance preservice STM teachers' employability, this study has shown that the preservice STM teachers needed the personal attributes, teaching skills, core, and process skills to be work ready. The present study showed that preservice STM teachers' performance in professional teaching practice was at a more satisfactory level regarding their personal attributes, and satisfactory level regarding teaching skills, core and process skills. Majority of the school administrators perceived these skills as clusters of skills central to the employability of preservice STM teachers when they eventually become graduate STM teachers. Most employers were willing to recruit the preservice STM teachers after their graduation from the university. The school administrators suggested, nevertheless, that preservice STM teachers need to enhance their personal attributes, core and process skills and teaching skills for all round development. The school administrators anticipated that the period of teaching practice should be extended to cover 12 months and that graduate STM teachers should be posted to schools during the period of their NYSC to further enrich their professional teacher training. These results implied the importance of close collaboration between the university and the education industry, in particular to make the preservice STM teachers work-ready when they graduate and increase their marketability in the transition from learning to earning.

Recommendations

Increasing the marketability of preservice STM teachers has been a persistent hurdle for all faculties of education in the universities around the world. This is because most STM graduate teachers lack the requisite skills needed for employability and the education industry is in dire need of graduates who are work ready and who can transform the theoretical knowledge gained in the university into practical experiences for the students they teach in schools. In Nigeria when graduate teachers are employed, they are first made to undergo special training in the core courses they are to teach and the pedagogy for teaching the courses. This lends credence to the skill deficits in Nigerian graduate teachers. Thus, the Nigerian economic growth and recovery attempts may be limited by skill shortages as the labour market reacts to employer requirements. This training may range from one month to two years before the graduate teachers are finally absorbed into the mainstream of teaching. Upon employment, graduate teachers are connected to experienced senior teachers for tutelage and mentorship and to

acquaint them with the workings of the school. This mentoring as a form of social learning may be used to scaffold the transition from university to the world of work for the preservice STM teachers. Education mentors for the graduate teachers may help them comprehend and learn about the realities of a school and the intended teaching profession. To be successful in teaching is to create an enabling environment that will inspire students to learn meaningfully and record success in their learning. Accomplishing this task for preservice STM teachers is daunting. They need confidence in teaching that will reduce their teaching anxieties to the barest minimum and this can be made possible by engaging them with teaching practice where all the theoretical content knowledge and pedagogy gained in the university can be put to practical use. In the present study teaching practice is seen as a means of socializing the preservice STM teachers in the modus operandi guiding teaching in schools and to make them acquire functional skills needed for their growth and development in the art of teaching. The present study has shown that the preservice STM teachers required cluster of skills such as personal qualities, teaching skills, core, and process skills to be functional and work ready when they graduate. For these skills will promote their marketability in their transition from learning to earning. The school administrators in the study argued that the period of three months was not sufficient for the preservice STM teachers to gain maximally from their teaching practice experience. Thus, they suggested an extension to one full year for the preservice STM teachers to have a first class hands-on experience in the art of teaching. İf this suggestion is to be imbibed by teacher training institutions in Nigeria then the preservice teachers on teaching practice should enjoy the full complement of the exercise by being remunerated for the exercise as done with Student Industrial Work Experience Scheme (SIWES) in the country. To start with, governments, corporate organisations, and private individuals whose schools are used by the preservice teachers for professional teaching practice exercise should see the need of paying each preservice teacher a minimum wage of ₦18,000 per month. By engaging these preservice teachers for one year could be a way of tackling the insufficient manpower needs often experienced in most schools in Nigeria and for checking the proliferation of quacks in the education industry. Employers may be engaged in the graduate recruitment process by being part of the university's careers events and offering work placements for graduate STM teachers. Professional associations such as the Science Teachers' Association of Nigeria, Mathematics Association of Nigeria etc. can engage the preservice STM teachers in career talks for employability. On a final note it is recommended that preservice STM teachers can engage in part-time employment while studying or learning full-time as this can provide them with opportunities to move into full-time careers in the same industry.

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