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Modelling the Science Teacher Identity through the Enhanced-Microteaching among Pre-Service Science Teachers in Public Colleges of Education in Southwestern, Nigeria

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Abstract
The level of expectation and responsibility demands of a science teacher in today's society calls for a remodel of science teaching systems with respect to who teaches science and how it is taught. Consequently, science teachers need a deliberate social and identity transformation if they are to achieve the aim of science education in the world today. This view, calls for a rethink in teacher training programs to prepare pre-service science teachers for identities compatible with the new realities. The need to address this issue has given impetus to this experimental study on modelling the science teacher identity through Enhanced-microteaching among pre-service science teachers in public Colleges of Education in southwestern, Nigeria. The study adopted an embedded mixed method of one group pretest-posttest quasi experimental and survey research design. The study involved 133 pre-service teachers from intact classes of part II pre-service science teachers who were purposively selected from the three government owned colleges of education in south-western, Nigeria. Pre-service teachers were exposed to a specially Enhanced-Microteaching Procedure (r = 0.73). A Science Teacher Identity Rating Scale (r = 0.81) complemented with in depth interviews were used to collect data for answering the three research questions raised to guide the study. Treatment lasted 11 weeks. Quantitative data were analyzed using descriptive statistics, Pearson product moment correlation, Multiple regression analysis at 0.05 level of significance, while qualitative data were content-analyzed. Findings revealed that science teachers' identity among the pre-service science teachers in public Colleges of Education, southwestern, Nigeria was very poor. The study also revealed that modelling science teacher identity through Enhanced microteaching improved teacher identity ratings and transformed science teacher identity among the pre-service science teachers as confirmed by interviews with teachers. Therefore, adopting more vibrant strategies like enhanced micro teaching in teacher training will better prepare confident teachers who can cope with dynamic classroom situations.

INTRODUCTION

Science teaching is an important aspect of science education, and it should be by helping the learners to develop interest and gain more confidence in science and scientific investigations. Moreover, it is worthy of note that what students learn is largely influenced by how they are taught and so, science should not be taught in abstract or presented in an isolated way, but rather through activities that relates it with daily experiences. This agrees with Degi and Zangmu (2017) who discovered that achieving effective science teaching in the classroom should involve planning to meet the objectives of

the curriculum, showing the mastery of the subject matter with the support of different instructional strategies and materials to promote pedagogically complete lessons.

Furthermore, we are in the age when learners especially in basic science must have understanding of the dynamic contexts and contents of various scientific advancements in the world. This is not different from Ige and Ogunseemi (2016) who submitted that we are in a dynamic world where basic science classroom requires that every science teacher must be certain and confident of their job. However, the job of teaching is not without its challenges according to Ukaigwe and Adieme (2018), and it corroborates researchers such as Bhargava and Parthy, 2014; Frick, Carl and Beets (2010) who showed that teachers are faced with challenges of uncertainties in every classroom.

Moreover, Lawal (2012) listed the challenges of teaching profession in Nigeria to include but not limited to poor remuneration, poor conditions of service, and unfriendly school environment which he claimed to be a great challenge to teacher identity. It is also in line with Van Lankveld, Schoonenboom, Volman, Croiset and Beishuizen (2017) who highlighted the components of teacher identity to include but not limited to a sense of appreciation, connectedness, competence, commitment and forth sight in the job. In addition to this, teachers' emotional attachment, commitment, responsibility and professional satisfaction are indicators of teacher identity which can be a good remedy for teachers' challenges in every classroom (Kayapinar 2018).

However, every science teacher with job satisfaction, organizational commitment, self-efficacy, and motivation among others indicates a well-developed resilience for the job which according to Li (2016) is one of the requirements to measure up with the challenges of teaching science in the contemporary society. Additionally, the previous submission corroborates Khoza (2022) who established that developing science teacher identity early and particularly by pre-service science teachers is important because this can influence their perceptions about science teaching and learning. Consequently, teacher training institutions should begin to train the basic science teachers to develop the science teacher identity for effective teaching practices because of their dynamic roles in science classroom.

The previous demand is in line with the submission of Avraamidou (2018) who revealed that science teacher identity is an ongoing process which involves interpretation and re-interpretation of practices. Moreover, it is according to Mensah and Jackson (2018) who suggested that developing the science teacher identity of the pre-service science teachers must be a combined effort in teacher education programs either through microteaching experiences or all-inclusive approaches to teaching science. This is not different from Chen and Mensah (2018) who argued that science teacher identity is often greatly affected by the training experiences of the pre-service science teachers in teacher education program. It is not also divergent from Keiler (2018) who concluded that mastery in classroom teaching can be aided by identity formation in teacher education program.

Therefore, teacher education program in Nigeria according to Ukaigwe and Adieme (2018) demands for a review in order to meet up with the challenges of global development in education. This review is in line with the initiative of the Federal Republic of Nigeria (FRN, 2014) to train pre-service teachers through innovations that can reposition the teacher education programs in Nigeria. Although, traditionally, pre-service teachers are prepared through microteaching which is an empowerment technique for teachers and a critical component of the teacher education program in Nigeria and world over. Microteaching is an opportunity for pre-service teachers to practice teaching in a small class size and in a short time for a microscopic view of teaching actions in a teach, and re-teach cycle (Kumari and Naik (2016).

Recently, base line data on the status of microteaching in Colleges of Education in Nigeria has shown variations in the basic microteaching procedure compared with the National Commission for Colleges of Education (NCCE) approved format (NCCE, 2012). It ranges from over population of microteaching groups where at times an entire class of twenty, or even twenty-five are used as microteaching group. In addition, the probabilities of pre-service teachers to try-out teaching in a mock classroom without having to worry about low grades and failure seems to be impossible.

The inadequacies in microteaching may be as a result of internal or external factors such as; time, and personnel to handle simultaneous sessions result in passive supervisees because of the large number of lessons that each pre-service teacher will take turns to teach. It also means that each pre-service teacher will have no opportunity for thorough supervision. Microteaching laboratory is gradually losing the value of effective feedback in spite of the use of video tape recorder which is supposed to be the actual picture of the pre-service teacher's teaching, and also the evaluative feedback from the supervisor and peers due to improbability of re-teaching the same topic in similar condition.

The problems of inadequacies in microteaching had been confirmed by Al-Humaidi and Abu-Ramah (2015) who noted a sudden display of indifferent behavior, and lack of interest in microteaching activities by pre-service teachers. The problems identified feasibly necessitates various strategies and innovations to enhance the microteaching processes in teacher education program. This is similar to Thabane (2019) who also used a reflective practice of professional sharing in a lesson study group as an initiative to enhance microteaching among pre-service teachers in the Department of Educational and Professional Studies, Central University of Technology, Free State, South Africa.

Pow and Lai (2021) in an attempt to ensure pre-service teachers' effective feedback from peers conducted a study in Hong Kong Baptist University to enhance the quality of pre-service teachers' reflective teaching practice through building a virtual learning environment. This kind of practice according to Paul, Doughty, Thompson and Hartley, (2019) is an important strategy in learning how to become science teachers because it strengthens interaction and feedback to enhance the teaching skills of the pre-service teachers. It is also consistent with Ige and Kareem (2011) who claim that reflective practice is particularly important in science classroom activities where learners are encouraged to take charge of their learning.

Reflective practice is a teacher training strategy that has changed the mode of learning how to teach especially in the fast changing world. It is a paradigm shift to teacher education programs where pre-service teachers are allowed to interpret experiences through group discussions (Farrel, 2018). However, in situations where group discussions are purposely set up to improve teaching and learning, reflective practice particularly in such group discussion will enable practitioners to make sense of that situation and as well understand how it has affected them, in order to improve (Enochson, 2018). Therefore, through the reflective discussions this study seeks to assist the pre-service science teachers to be autonomous in practice by effective monitoring of the teaching processes with a view to close the gaps between systems of practice.

STATEMENT OF THE PROBLEM

Science teacher is important towards the attainment of science teaching and learning in schools. Particularly, in the teaching and learning of basic science which is to build capacity in learners to face challenges of uncertainties in the world today. The responsibility of science teacher includes but not limited to effective lesson planning, other actions that can stimulate learners' attention and interest in science, and as well relate science concepts to real world activities. However, it is clear that there are much to be done in Nigeria to assist science teachers to develop mastery of the subject matter and as well adapt their teaching methods to accommodate different learning styles and abilities that can provoke scientific breakthroughs in our clime. This is evident in poor funding of scientific research, lack of appropriate teaching materials, poor attitudes of the society to science and scientific investigations. Additionally, lack of structures and science teaching environment that connects basic science to the real world are factors which is definitely working against the several indicators of science teacher identity in Nigeria. Therefore, it is against these gaps that this study investigates modeling the science teacher identity through the enhanced microteaching among pre-service science teachers in public Colleges of Education in southwestern, Nigeria.

RESEARCH QUESTIONS

The following research questions were raised to guide the study:
1. What is the status of science teacher identity among pre-service science teachers in public Colleges of Education in southwestern, Nigeria?
2. What relationship exists between the enhanced-microteaching actions and science teacher identity among pre-service science teachers in public Colleges of Education in southwestern, Nigeria.
3. What are strategies to enhance the science teacher identity among pre-service science teachers in public Colleges of Education in southwestern, Nigeria.

METHODOLOGY

The study was anchored to an embedded mixed method of one group pretest-posttest quasi experimental and survey research design. The study involved 133 (A; 43, B; 53, and C; 37) pre-service teachers from intact classes of part II pre-service science teachers who were purposively selected from the three government owned colleges of education in south-western, Nigeria. Pre-service teachers were exposed to a specially Enhanced-Microteaching Procedure which was validated using scott Pi's inter-rater reliability index and the value 0.73 was obtained which shows substantial agreement among raters, and to make the instrument reliable for use. A Science Teacher Identity Rating Scale which consists of sections (A and B) while A are the demographic information of participants and B which was divided into two parts contains 20 items to elicit information about pre-service science teacher identity. The instrument was modified on a 4 point likert scale of 1 to 4 Strongly Agree = 4, Agree = 3, Disagree = 2, and Strongly Disagree = 1. Therefore, every participant can score as low as 1, and as high as 4 in each case. The pilot test run to ascertain the reliability of the instrument established Cronbach alpha value of 0.81 which made it reliable for the study. It was complemented with in depth interviews were used to collect data for answering the two research questions raised to guide the study. Treatment lasted 11 weeks. Quantitative data were analyzed using descriptive statistics, Pearson product moment correlation using the criterion Mean of 2.50, and Multiple regression analysis at 0.05 level of significance, while qualitative data were content-analyzed.

RESULTS

Table 1 showed the answer to research question 1, and participants responses to all indices of teacher identity raised in the study for Colleges A ($\bar{x}$ = 0.91; 0.86), B ($\bar{x}$ = 0.96; 0.97) and C ($\bar{x}$ = 0.89; 0.80) were low against the criterion mean of 2.50. Furthermore, the analysis of responses as shown by the highest and lowest Mean values of 0.11 and 2.27 respectively affirmed that about 70 % of participants scored below average in all the indices of teacher identity as specified with measuring intervals of Very Poor = 0.00 – 0.99, Poor = 1.00 – 1.99, Average = 2.00 – 2.99, High = 3.00 – 3.99, Very High = 4.00 – 5.00. Consequently, it can be deduced that there was a low status of science teacher identity among pre-service science teachers in public Colleges of Education in Southwestern, Nigeria.

Table 2 showed the answer to research question 2, and participants responses on the relationship between science teacher identity and enhanced microteaching actions were positive as indicated; lesson plan (r = 0.39; p>0.05), lesson note (r = 0.37; p>0.05), preparation skill (r = 0.31; p>0.05), presentation skill (r = 0.27; p>0.05), classroom management (r = 0.25; p>0.05), closure (r = 0.21; p>0.05). The Mean and SD Values of lesson plan (9.08; 1.98), lesson note (8.33; 2.19), preparation skill (8.62; 2.16), presentation skill (9.90; 1.70), classroom management (9.69; 1.55), and Closure (9.67; 2.15)

further affirmed a significant relationship between enhanced microteaching actions and teacher identity. Resultantly, there was a relationship between the enhanced microteaching actions and science teacher identity among the pre-service science teachers in public Colleges of Education in south western, Nigeria. It also implies that all the enhanced microteaching actions such as lesson plan, lesson note, preparation skill, presentation skill, classroom management and closure were considered to be positively related to science teacher identity.

Table 1 Mean and standard deviation analyses of the status of science teacher identity among pre-service science teachers in public Colleges of Education in South western, Nigeria

S/N	Items	College A (n=43) $\bar{x}$	S.D	Remarks	College B (n=53) $\bar{x}$	S.D	Remarks	College C (n=37) $\bar{x}$	S.D	Remarks
1	I am not sure of my identity as a science teacher	0.24	0.05	Very Poor	1.35	0.37	Poor	0.11	1.23	Very poor
2	Trained teacher uses time effectively in the lesson.	1.18	1.41	Poor	0.18	0.19	Very poor	1.12	1.84	Poor
3	I feel I am a teacher every time I am called to teach	0.17	0.89	Very Poor	1.26	0.67	Poor	0.34	0.67	Very poor
4	Teaching is a difficult profession	1.22	1.76	Poor	0.63	1.48	Very poor	1.48	1.13	Poor
5	I feel comfortable and confident whenever I am asked to teach.	1.16	0.78	Poor	2.15	0.89	Average	1.19	1.27	Poor
6	It takes a good teacher to control his/her emotions during lessons.	2.27	0.52	Average	0.33	1.16	Very Poor	1.63	0.95	Poor
7	I feel confident that I can be a teacher	0.23	0.27	Very poor	1.32	2.11	Poor	0.44	0.27	Very poor
8	I actually do not want to be a science teacher	0.37	1.26	Very poor	0.19	0.52	Very poor	0.16	1.35	Very poor
9	I can use appropriate teaching strategies to teach any lesson	1.32	0.76	Poor	1.27	0.74	Poor	0.14	0.23	Very poor
10	Science teachers must be dynamic in teaching	1.23	0.89	Poor	0.83	1.56	Very poor	2.25	1.03	Average
	Grand Mean	0.91	0.86		0.96	0.97		0.89	0.80	

Scale: 0.00 – 0.99: Very Poor, 1.00 – 1.99: Poor, 2.00 – 2.99: Average, 3.00 – 3.99: High, 4.00 – 5.00: Very High

Table 2 Correlation Matrix showing the relationship between the enhanced-microteaching actions and science teacher identity among pre-service science teachers in public Colleges of Education in South western, Nigeria

Variables	Teacher identity	Lesson plan	Lesson note	Preparation skill	Presentation skill	Classroom management	Closure
Teacher identity	1						
Lesson plan	0.388* 0.000	1					
Lesson note	0.372* 0.000	0.425* 0.000	1				
Preparation skill	0.309* 0.000	0.397* 0.000	0.283* 0.001	1			
Presentation skill	0.226* 0.009	0.007 0.935	-0.108 0.215	0.353* 0.000	1		
Classroom management	0.248* 0.586	-0.101 0.250	-0.130 0.135	0.012 0.891	0.482* 0.000	1	
Closure	0.210* 0.905	0.078 0.374	0.028 0.748	0.041 0.640	0.272* 0.002	0.513* 0.000	1
Mean	54.45	9.08	8.33	8.62	9.90	9.69	9.67
STD.D	11.14	1.98	2.19	2.16	1.70	1.55	2.15

* denotes significant at $p>0.05$

Table 3 showed the answer to research question 3, with participants responses to all the strategies raised to enhance science teacher identity were fixed at the Grand Mean and SD scores from Colleges A ($\bar{x}$ = 2.63; 0.84), B ($\bar{x}$ = 2.79; 1.66) and C ($\bar{x}$ = 2.81; 1.16) against the criterion mean of 2.50. Furthermore, the analysis of responses as shown by highest and lowest Mean values 3.88 and 2.01 respectively affirmed that a significant number of participants agreed to all the strategies listed to enhance science teacher identity as specified with measuring intervals of Very Poor = 0.00 – 0.99, Poor = 1.00 – 1.99, Average = 2.00 – 2.99, High = 3.00 – 3.99, Very High = 4.00 – 5.00. Consequently, it indicated that all the various strategies listed could be used to enhance the training modes to promote science teacher identity among pre-service science teachers in public Colleges of Education in Southwestern, Nigeria.

Table 3 Mean and standard deviation analyses of the strategies to enhance science teacher identity among pre-service science teachers in public Colleges of Education in South western, Nigeria

S/N	Items	College A (n=43)		Remarks	College B (n=53)		Remarks	College C (n=37)		Remarks
		$\bar{x}$	S.D		$\bar{x}$	S.D		$\bar{x}$	S.D	
1	Reflective practice by feedback mechanism in microteaching	2.24	0.03	positive	2.09	1.64	positive	2.10	1.03	positive
2	Face-to-face reflective discussion	2.65	1.21	positive	3.17	0.83	positive	3.35	1.91	positive
3	Face-to-screen reflective discussion	2.78	0.99	positive	2.58	1.34	positive	2.68	0.73	positive
4	Asynchronous feedback	2.18	1.99	positive	2.64	2.15	positive	2.79	1.05	positive
5	Synchronous feedback	3.23	0.84	positive	3.89	1.78	positive	2.63	1.34	positive
6	training and re-training on the use of Technology to enhance teaching	2.56	0.42	positive	2.28	2.89	positive	3.88	0.87	positive
7	Provision of adequate teaching materials	2.34	0.17	positive	2.73	1.34	positive	2.74	0.17	positive
8	Provision of structure and enabling environment for science teaching and learning	3.56	1.24	positive	2.86	0.97	positive	3.36	1.55	positive
9	Adequate fund for scientific research	2.28	0.66	positive	3.56	1.42	positive	2.54	1.86	positive
10	Scientific plan strategy to relate science to real world activities	2.45	0.88	positive	2.05	2.27	positive	2.01	1.08	positive
	Grand Mean	2.63	0.84		2.79	1.66		2.81	1.16	

Scale: 0.00 – 0.99: Very Poor, 1.00 – 1.99: Poor, 2.00 – 2.99: Average, 3.00 – 3.99: High, 4.00 – 5.00: Very High

DISCUSSION

The study revealed that that science teachers' identity among pre-service science teachers in public Colleges of Education, southwestern, Nigeria was very poor. This result validates Lawal (2012) who showed that poor remuneration, poor conditions of service, and unfriendly school environment constitutes a great challenge to teacher identity in Nigeria. It is obvious in the result that there are issues with science teacher identity as confirmed in the participants' responses to indicators. This is in contract with Van Lankveld, Schoonenboom, Volman, Croiset and Beishuizen (2017) who submits that absence of sense of appreciation, connectedness, competency, commitment and forth sight in the job of teaching can be equal to very poor teacher identity.

The study also revealed that modelling science teacher identity through the enhanced microteaching supported the teacher identity ratings among the pre-service science teachers in public Colleges of Education, southwestern, Nigeria. the result is definite on Thabane (2019) who used a reflective practice of professional sharing in a lesson study group as an initiative to enhance microteaching among pre-service teachers in Central University of Technology, Free State, South Africa. It is also in agreement with Pow and Lai (2021) enhanced the quality of pre-service teachers' feedback through building a virtual learning environment in Hong Kong Baptist University. It also established Paul, Doughty, Thompson and Hartley, (2019) who sees this kind of practice as an important strategy in learning how to become science teachers because it strengthens interaction and feedback to enhance teaching actions among the pre-service teachers.

Furthermore, the result can be confirmed by interviews with the pre-service science teachers and for instance;

Participant from College A (microteaching group 1):
I think I am more than ready and confident to be a teacher.

Participant from College A (microteaching group 3):
As we discussed after our microteaching today I was made to understand that my student will always make different meaning from whatever I say.

Participant from College B (microteaching group 2):
It is so interesting to discuss the outcome of our teaching on WhatsApp because it gives me opportunity to express myself more and to take my time to attend to other things.

Participant from College B (microteaching group 5):
What interests me most are videos of our teaching which was posted during our discussions and you need to see grammatical blunders of people and errors being made while teaching but anyway we are still learning to teach and we can be better next time.

Participant from College C (microteaching group 1):
Now I know that if I continue like this, I will be able to handle any type of students and even anywhere.

Participant from College C (microteaching group 4):
Teaching is made simple by all that we have done today and I believe that everyone of us must have learnt what it takes to be a good teacher especially in the kind of society we are in today.

The study particularly exposed some vibrant and more innovative strategies *to* enhance the science teacher identity among pre-service science teachers in public Colleges of Education in southwestern, Nigeria. It includes; Reflective practice by

feedback mechanism in microteaching, Face-to-face reflective discussion, Face-to-screen reflective discussion, Asynchronous feedback, Synchronous feedback, training and re-training on the use of Technology to enhance teaching, Provision of adequate teaching materials, Provision of structure and enabling environment for science teaching and learning, Adequate fund of scientific research and Scientific plan strategy to relate science to real world activities.

CONCLUSION
Based on findings, the study concluded;

1. that there are challenges to science teacher identity formation among pre-service science teachers in public Colleges of Education in south western, Nigeria. This is due to issues with several indicators of teacher identity formation such as; indecision, empathy, determination and modelling.
2. that there is a strong and positive significant relationship between enhanced microteaching actions (lesson plan, lesson note, preparation skill, presentation skill, classroom management and closure) and science teacher identity. This is an indication that more often than not, identity formation in teacher profession can be a function of effective teacher preparation.
3. that strategies such as; reflective practice, technology enhanced training, adequate funding of scientific research and provision of enabling environment for teaching among others can be some vibrant strategies in identity formation among teachers at all levels of education. Therefore, adopting more vibrant strategies like enhanced micro teaching in teacher training will better prepare confident teachers who can cope with dynamic classroom situations.

RECOMMENDATIONS

1. Government should be more committed to welfare of teachers by increment in salaries, provision of equipment and resources for effective teaching in public schools.
2. Government should empower teacher training institutions by provision of state of the art equipment for training and re-training of teachers in line with current development in teaching and learning worldwide.
3. Teacher training institutions should adopt or adapt more vibrant strategies to enhance teacher identity among pre-service and in-service teachers.

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