

Advocating Mathematics Teacher Research Prowess for Improved Professionalism

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ABSTRACT

While serving in the field of practice, teachers have continued to hold to the view that research is an activity carried out by professional researchers based outside the basic schools. This is because traditionally, class teachers have never been expected to comment on the theory and practice of their work. However, recent push by the Teacher Research movement across the globe has emphasized teacher research as a process in which educators note problems in the context of their own schools and classrooms and propose investigative methods appropriate to address the problems. On this premise, this review first considers the ramification of mathematics teacher research in improving professionalism in the teaching and learning of mathematics. Secondly, teacher professionalism in mathematics education was given a detailed coverage. Thirdly, the task of mathematics teachers as researchers was considered. The role of higher education in nurturing fruitful collaborations with basic schools was discussed along with the implications of mathematics teacher research for classroom practice in Nigeria.

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1. INTRODUCTION

Research is the bedrock of progress in any vocation or discipline. The activities involved in the practice of research dissect the problems and prospects of a field of study into manageable bits that are capable of being comprehended. The outcome of research charts the pathways to development, evaluation, discovery, and refinement of methods of inquiry.

Research, by definition, is a logical way of finding solutions to an identified problem. It is an investigation for the determination of facts in order to know whether the facts should be retained as a satisfactory status quo or needed some amendments (Emaikwu, 2015). Based on this definition, six characteristics of research can be identified, that is (1) Research aims at solving problems, (2) Research is conducted in a systematic and objective manner, (3) Research is based upon accurate observable experience and descriptions, (4) Research emphasizes the development of generalizations, principles or theories that will be helpful in predicting future occurrence, (5) It demands patience on the part of the researcher, (6) It involves gathering and analysis of data.

In view of the significance of research, particularly in the field of mathematics education, graduating students are required to present and defend a written project work in partial fulfillment of the requirements for the award of their first degree, be it a Bachelor of Education (B. Ed) or a Bachelor of Science Education (B. Sc. Ed). This research work, which usually falls into the course listing of the final year of study, is a culmination of the students' learning experiences as undergraduates (Abah, 2017a). The research

project, as the course is often titled, carries the highest credit load in the entire Mathematics Education Programme as specified by the Benchmark Minimum Academic Standards (BMAS) of the National Universities Commission (NUC) (National Universities Commission, 2017). EDU 499 or EDU 599, as the course is often coded by different universities, is so important that there exist several preparatory courses targeted at making undergraduates good at research report writing. One of the most vital pre-requisites for Research Project in Educational Research Methodology, a course taken in the third year of the Mathematics Education Programme.

Marshall (2009) postulates three key reasons why the use of research projects and dissertations in undergraduate curricula has been seen as increasingly important. First, projects and dissertations have been seen as a means of encouraging more students to think about "staying on" as research students and thus contributing to the research productivity of departments and schools. By extension, after graduation, such practicing mathematics teachers can continue as teacher researchers. Second, projects and dissertations are deemed to be an important means of bringing about an effective research culture to underpin all undergraduate curricula. Third, projects and dissertations have come to be seen as an important component of degree programmes across the disciplines, because of the clear emphasis they place on learners taking responsibility for their own learning and engaging with the production of knowledge.

For the graduates of mathematics education in the field of practice, the research project is a vital journey into mastering research skills and techniques that are appropriate to the discipline

and a wider set of employment-related skills or high-level transferable skills. Ketteridge and Shiach (2009) identify this common skill set as the Joint Skills Statement (JSS) and list them as including research skills and techniques, research environment, research management, personal effectiveness, communication skills, networking and team working, and career management. The characterization of these skills by the mathematics teacher obviously depends on his or her conceptualizations of research and student identity claims while still an undergraduate.

In an elaborate study to show that conceptualizations of research and student identity claims differ widely, Ross, Dennis, Zhao, and Li (2017) explore the emergence of four ideal types of understanding of research. The first type of students views research as a means of problem-solving. In this perspective, research is deemed as an act of intervention carried out by a researcher, a means to solve problems through discovering, accumulating and evaluating knowledge. Research perceived in this way is also linked by students to a process involving structured steps or procedures and in which they see themselves as component part (Ross et al., 2017). The second type of research students considers the exercise of research as a form of expertise requiring specialized knowledge and skills. Students who conceptualize research in this way tended to position themselves as outsiders in relation to their profession, or at least novices standing at the edge of the professional boundary (Ross et al., 2017). Such teachers-in-training perceived researchers to be experts who receive specific training in reading literature, writing academic papers and developing knowledge in statistics.

The third type of student-teachers conceptualizes research as science and presents it as a process of testing hypotheses or acquiring evidence to prove or disapprove certain beliefs (Ross et al., 2017). Such a conception of research work is based solely on a scientific worldview and rationality, with emphasis on the notions of objectivity, scientific methods, numbers, experimentations, quantitative methods, and statistics. The fourth type of students conceptualizes research as situated practice in a community of researchers, within the process of peer review and critique in the public domain (Ross et al., 2017). For these students and would-be teachers, research entails a communicative action that involves more than one actor and is examined based on certain norms and standards created by a community of researchers. In contrast with the other conceptualizations, this perspective places less focus on outcomes or technical knowledge, but rather brings the researcher towards the center of the research practice and requires an ability to reflect on the practice itself. Ross et al. (2017) added that students, and eventually teachers, who conceptualize research in this way, did not position themselves as outsiders but rather as part of a community, even if they see themselves at its periphery in this stage of their lives.

In essence, practicing mathematics teachers must see themselves as indispensable partners in research, actively leveraging on their on-the-field experience to turn out research outcomes that are novel, versatile and reproducible. They must first consider themselves as trustworthy stakeholders in mathematics education who are needed to assess the prevailing situation, plan instruction, access materials, communicate research outcomes and direct interactions in the classroom for the optimum growth and development of the learner. Other players in the educational system have often erroneously pursued educational policies that attempt to control teachers through conceptualizing them as mere technicians who require taming and have resulted in the restructuring that was done to teachers rather than with teachers (Lingard, Hayes & Mills,

2003). This misconception has continued to belittle the prospects of mathematics teachers as active researchers and has created a wide chasm between outcomes of research and implementation at the classroom level. An obvious outcome of this existing gap is the looming obstinacy and eventual relegation of research outcomes to the dusty shelves of their authors (Abakpa, Agbo-Egwu & Abah, 2017).

Misconceptions about the multifaceted roles of the mathematics teacher, especially with respect to research, can be addressed through efforts aimed at bringing researchers, practitioners, and policymakers together in order to influence practice and install respect for their differences. In this sense, understanding what teachers do, how they do it, and why they do it is central to any effort at reshaping education policy around teacher education, teacher professional development and school reform (Rust, 2009). As a contribution to such ongoing efforts, this present exposition seeks to bring to the front burner the ramifications of teacher research in mathematics education. The discourse that follows intends to raise awareness on the need to train mathematics teachers as self-reliant investigators, research partners and important contributors to knowledge generation in mathematics education. This present study is premised on the observed absence of a research culture among mathematics teachers, particularly in Nigeria. It intends to serve as a clarion call to stakeholders within the mathematics education sub-sector to reorient the general mentality around mathematics teacher research.

2. LITERATURE REVIEW

2.1 Teacher Professionalism in Mathematics Education

Mathematics education is a field of study concerned with the tools, methods, and approaches that facilitate the practice of teaching and learning mathematics (Abah 2017; Winarso, 2018). Mathematics educators take a comprehensive view of how mathematics as a subject of study is learned, understood and used. Mathematics education looks beyond mere applications to ways in which people think about mathematics, how they use it in their daily lives, and how learners can be brought to connect the mathematics they see in school with the mathematics in the world around them (Abah & Anyor, 2018). As a field of practice, mathematics education is an ecosystem comprising the learners, mathematics teachers across all levels, mathematics educators in teacher-training institutions, school administrators, mathematics education policymakers and regulating agencies of government, all interacting together for the efficient transmission of mathematical knowledge. The target of these stakeholders, most of the time is the attainment improved achievement of pupils and students at the basic and secondary education level.

It is common knowledge that the success of basic education, to a large extent, rest on the shoulders of the teachers. The mathematics teacher is a key stakeholder in the implementation of the mathematics curriculum and is at the center of the running of the school plant, building real-life relationships with students, and coordinating students' learning experience in mathematics (Abah, 2016, Fonna, 2018a; Mursalin et al, 2018). In enviable educational climes like Finland, teaching is viewed as a very honorable profession and is held in very high regard, with teachers granted a great deal of autonomy in the education system (Mendaglio, 2014). However, in Nigeria, the professionalization of teaching is still beclouded by several challenges with enforcement of regulations a huge uphill task.

Simply put, professionalism is the quality of practice in any particular discipline. Professionalism refers to the manner of conduct within an occupation, the integration and the contracted and ethical relations with clients (Hoyle, 1980 in Chow, Chu, Tavares & Lee, 2015). Teacher professionalism is the commitment that pushes teacher to go beyond minimum expectations to meet the needs of students. Morrow and Goetz (1988) identify 13 key areas of teacher professionalism namely, independent practice, code of ethics, licensing, single major professional association, exclusive practice rights, body of specialized knowledge, application of knowledge in professional practice, collaboration among members, candidate selection, rigorous and protracted training period, high status, high compensation and lifelong commitment.

Teacher professionalism is about teacher's knowledge, their autonomy and their membership of peer networks (Kubacka, 2016). In this sense, different educational systems focus on different aspects of teacher professionalism. Some systems put more emphasis on supporting the teacher knowledge base through activities such as incentivizing teacher professional development, some focus on autonomy through giving more decision making over curricular and teaching contents to teachers, and some focus on peer networks through cultivating strong networks of teachers. With these components of professionalism in place, teachers are more satisfied and confident and have a higher perception of the value of the teaching profession in society. The outcomes of improving support to teachers in these key areas definitely impact the quality of teaching and learning, particularly in mathematics.

Mathematics teachers focused on professionalism are concerned with the school community and how they can work with their colleagues to create an environment that maximizes learning and bolsters achievement in mathematics (Masitoh, 2018). Many developed and developing educational systems require mathematics teachers to participate in ongoing professional development programmes to maintain certification (Zeigner, 2018; Setiawaty et al, 2018). Teachers committed to professionalism enthusiastically participate in training to stay abreast of advances in technology and emerging trends in education. They seek information on best practices and teaching strategies for all categories of learners. Considering the fact that teacher professionalism hinges on knowledge enrichment, the ability to reflect upon and improve one's own teaching practice, strengthened confidence in one's ability to initiate changes in school culture, and school curriculum design (Chow et al., 2015), some teachers conduct research to continually improve their teaching methods and support the performance of their students (Zeigner 2018). Additionally, many mathematics teachers attend educational conferences and belong to professional organizations (such as the Mathematical Association of Nigeria) to connect with others in the field. Engaging in these personal development endeavors implies teacher professionalism in mathematics education communicates confidence, competence, and dedication to helping all students fulfill their potential.

Mathematics teachers need to innovate, to be able to support children and young people's learning through an ever-changing society. According to the Association of Teachers and Lecturers (ATL) (2012), this innovation is driven by a professionalism based on critical and effective self-reflection, professional autonomy and respect for the role. Specifically, in line with the ATL (2012), teacher professionalism is based on the following principles:

1. The teaching profession is a learning profession, continually developing deep knowledge of learning; how the brain works;

subjects and the relationship between them; pupils as individuals, and their interests; and the broader context (political, economic, technological, social, cultural and environmental).

2. Teachers' professional role is based on care for pupils and responsibility for their learning. As part of that, teachers need to build relationships with pupils, families, communities and other professionals.
3. The teaching profession draws on theoretical understanding and knowledge in order to adapt teaching practices and methods to pupil need.
4. Teacher professionalism is about exercising judgment on curriculum, assessment, and pedagogy
5. Teachers have to balance their own professional values against their responsibilities to the organizations in which they work. Further, there has to be a balance between teacher autonomy and appropriate accountability measures prescribed by the government.
6. Teachers have a responsibility to debate education practice.

Eyeballing the practice of the teaching profession in Nigeria through the lens of existing paradigms of teacher professionalism unveils several discrepancies and shortfalls. For instance, the issuance of teaching license by the Teachers Registration Council of Nigeria (TRCN) has not been comprehensively co-ordinated to regulate teaching practice in Nigeria. Teaching has become the profession for every job seeker in the country, irrespective of qualification. With the changing tides in employment and the education sector (private sector-driven) rapidly becoming a major employer of labor in the country, most graduates of hitherto "marketable" disciplines are now ending up as classroom teachers (Abah, 2017). According to Abah (2017), this class of graduates resorting to teaching for a living often rush into further Post Graduate studies in education, just to secure their jobs and obtain the teaching license. These irregularities have continued to deflate the prestige of the teaching profession in the country and denying duly trained teachers exclusive practice rights.

A plethora of challenges in compensation for teachers has depreciated the status of the teaching profession in Nigeria. With the lackadaisical attitude of the government and even private school proprietors, there has been a continuous downward trend in the level of commitment of teachers in general. This has transform teaching into a "transiting profession", a temporal position and awaiting ground for "greener pastures". The ramifications of the rampant inadequacies of the teaching profession in the country are truly beyond the scope of this present piece of work. Despite the obvious difficulty in staying committed to the profession, mathematics teachers who intend to distinguish themselves are indeed standing out in their field of practice.

Beginning from the apprenticeship exercise embarked upon by undergraduates of mathematics education within the teaching practice course framework, mathematics teachers can build the right mentality of research to reflect on their personal practice (Abah 2016). A good teaching practice exercise is supposed to highlight the school as the appropriate environment for translating educational methodologies and theories into real-life success stories. As the pre-service teacher becomes a full-time teacher, the mathematics classroom can then be seen as an active hub where the mathematics teacher engages himself or herself in a theory-building process through teacher research. Engagement in teacher research raises the sense of self-worth for the mathematics

teacher and ultimately redefines teacher professionalism for the school, the community, and the nation.

2.2 Mathematics Teachers as Researchers

The mathematics teacher is an individual trained to deliver instruction in mathematics with the aim of bringing about learning and acquisition of skills in mathematics. The trained mathematics teacher is that individual entrusted with the all-important job of curating rich learning experience for pupils/students in mathematics. This individual continually leverages his or her training to deploy instruction techniques that are expected to raise and sustain students' perception of their abilities to attain good results in mathematics. Effective mathematics teaching involves active engagement, ongoing discourse, and reflection in all actions within the context of mathematics. The job of the mathematics teacher is to sequence curricular content to bring about improvement in learners' conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, and productive disposition.

While immersed in the task of organizing knowledge delivery, the teacher often finds himself or herself in need of systematic inquiries with outcomes that may better enhance key decision making in the teaching-learning process. Following such needs broadly lead to teacher research. Cochran-Smith and Lytle (1999) define teacher research in the broadest possible sense to encompass all forms of practitioner inquiry that involve systematic, intentional and self-critical inquiry about one's work in basic education, secondary education or continuing education classrooms, schools, programmes, and other formal educational settings. Rust (2009) observes that because it is intimately embedded in practice and in the time frames of teachers' lives in classrooms, teacher research describes a form of qualitative inquiry that draws on techniques that are generally already part of the instructional toolkit of most practitioners. Teacher research includes inquiries that others may refer to as action research, practitioner inquiry, teacher inquiry, and teacher or teacher educator self-study. Through teacher research, mathematics teachers with the research skills to share and critique their practice become key collaborative professionals in the change processes within school communities (Gray & Campbell-Evans 2002).

In the view of Chow et al. (2015), teacher research is a process in which educators note "problems" in the context of their own schools and classrooms and proposes investigative methods appropriate to address the problems. Educators also systematically observe and analyze results in the light of their professional knowledge and share the results with others, while enacting change in their own classrooms. Teacher research is thus a means to facilitate the professional growth of both pre-service and in-service teachers, while promoting critical reflection, change, and reform in basic education. It makes use of qualitative data, including journals, oral inquiries, and observational data and is often reported in narrative forms of representation (see Abah, 2017b for example). Teacher research enables mathematics teachers to carry out research projects and reflect on their own practice during and after the projects, aside just acquiring knowledge from university experts outside their basic school. This has positive effects on the professional competence of mathematics teachers since action research is a necessary and integral part of the process of developing teaching as an evidence-based process.

Teacher research as a research paradigm diffuses the gap between research outcomes and classroom implementation. In this perspective Griffiths (2004) developed a typology of teaching

research links around four key categories:

1. Teaching can be research-led in the sense that the curriculum is structured around subject content, and the content selected is directly based on the specialist research interests of the teaching staff. Along with this axis the emphasis tends to be on understanding research findings rather than the research process.
2. Teaching can be research-oriented in the sense that the curriculum places emphasis as much on understanding the processes by which knowledge is produced as on learning the certified knowledge that has been achieved. The research experiences of teaching staff in this sense are brought to bear a more diffuse way.
3. Teaching can be research-based in the sense that the curriculum is largely designed around inquiry-based activities, rather than the acquisition of subject content. In this mode, the experiences of staff in processes of inquiry are highly integrated into the student learning activities. Here, the division of roles between teacher and student is minimized and the scope for two-way interactions between research and teaching is deliberately exploited.
4. Teaching can be research-informed in the sense that it draws consciously on the systematic inquiry into the teaching and learning process itself.

Drawing on Griffiths' first three categories, Healey (2005) adds a further one and expresses their relationship diagrammatically along two axes, one from an emphasis on research content to an emphasis on research processes and problems, and the other from a student-focused approach to a teacher-focused approach (Fig. 1).

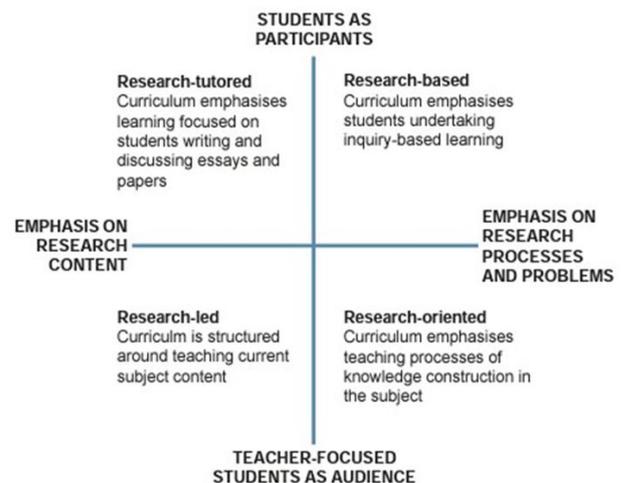


Figure 1. Curriculum Design and the Research–Teaching Nexus (Healey, 2005)

Teacher-researcher originates in the disposition of the teacher towards inquiry. The inquiry is a relational stance of outward motion, a seeking of understandings, both of the world and of other people (Lysaker & Thompson, 2013). For pre-service teachers, this means actively reaching out, adopting a stance of curiosity, and questioning their assumptions about teaching and learning. On this basis, Lysaker and Thompson (2013) suggest a non-linear and recursive inquiry cycle, to support the relational stance:

1. *Provocations*: This is a term used to describe something in the environment that arouses interest or curiosity, and which may create a sense of discomfort. Provocation is a moment of not knowing, a feeling of uncertainty that is embraced and explored

as a point of departure for learning. In teacher research these provocations often come from children and lead to classroom investigations.

2. *Personal and Social engagement in pursuing questions that arise from provocations:* Pre-service teachers learn to view their own interests, questions and discomforts in and around teaching as provocations for their learning.
3. *A process of revisiting, reflecting and revisiting both thinking and practice.*
4. *Assessment and reporting:* Through the personal and social engagements of teacher research, teachers work at pursuing the provocations, continually revisit and reflect on their experience through discussion and writing and finally assess and report on the outcome of their Inquiry.
5. *New inquiry.*

In teaching practice, a teaching notebook may be all that the mathematics teacher requires to begin teacher research. Teaching notebooks clearly benefit mathematics teachers as they collect and reflect on classroom experiences. Mathematics teachers can continue to improve with the holistic, reflective view of their teaching that the notebook offers. In choosing a process, some teachers may prefer to jot down, briefly, reflections at the end of every day. Others might find daily journals burdensome and would prefer a once-in-a-week journal. It is also important for the mathematics teacher to choose a focus. This focus could be on the teaching strategies and general outcomes, or on lesson plans, how students progress, and teaching effectiveness. The specific details of the focus are often described in the journal over a period of time and then later revisited. Reading the journal may help the mathematics teacher identify and emphasize strengths and recognize and improve weaknesses.

Evidently, mathematics teacher research starts with a commitment to examine an aspect of teaching and learning and is carried out through the intentional and systematic collection and analysis of classroom data. Mathematics teacher researchers choose research questions that matter to them. Because they determine their own questions and the course of their research journey based on their own learning needs, their research is responsive to those needs. Teacher research requires a description of the context for teaching and learning. Rather than attempt to control for variables, mathematics teacher researchers strive to identify, define, articulate and elucidate the context as a whole, to reveal the assumptions at work within the context, and to uncover the connections as well as tensions among elements of that context. By implication, mathematics teacher research both shapes and is shaped by its context. Their research questions reflect the mathematics teachers' current understanding of their topics, their students and their teaching context. In a sense, mathematics teacher research is contextual because it is context-dependent, context-relevant and context-responsive.

If the traditions of teacher research are examined, McLaughlin (2004) observes that the following purposes and conceptions can be seen:

1. For a practitioner to develop their own practice through understanding particular or general aspects of practice or solving pedagogical problems.
2. To address issues of power and injustice through critiquing policy, promoting equity and seeking to optimize the social conditions of practice for practitioners and learners.
3. Contributing to public knowledge about education, teaching, and learning.

Similarly, the effects and benefits of mathematics teacher research, according to McLaughlin (2004) are:

1. It resulted in a renewed feeling of pride and excitement about teaching and in a revitalized sense of oneself as a teacher.
2. The research experience reminded teachers of their intellectual capability and the importance of that capability to their professional lives.
3. The research experience allowed teachers to see that the work that they do in school matters.
4. The research experience reconnected many of the teachers to their colleagues and their initial commitments to teach
5. The research experience encouraged the teacher to develop an expanded sense of what teachers can and ought to do.
6. The research experience restored in teachers a sense of professionalism and power in the sense of having a voice.

The idea of mathematics teachers doing research will only be sustainable if teachers themselves want to embark on it. Here, Salleh (2014) observes, the school leadership plays a very important role in enabling them to do so, by building capacity through appropriate professional development.

2.3 The Role of Higher Educational Institutions

Whenever classroom teachers look to research as a guide to action, there is always a problem of coverage and content. Published educational research, emanating from higher educational institutions, simply does not provide comprehensive answers to many of the issue that teachers face on a daily basis (McAleary, 2016). Specific school teaching activity has never been subject to rigorous extensive research, raising questions relating to how teachers use evidence in the classroom and what they feel are the most effective approaches to engaging with research and using it to inform their practice (Judkins, Stacey, McCrone & Inniss, 2014). Outside the stand-alone and degree programmes offered by institutions of higher learning, there is the need for the intellectual citadels to take up more responsibility in mentoring, peer observation, conference organization and networking at the Basic Education Level (Roux & Valladares, 2014).

The gap in the translation of research findings into classroom practice is mainly due to the inadequacy of present provision for interpreting research findings to help inform decision making and action. If basic schools are to use academic research to improve their practice, it is clear that becoming informed about relevant research and interpreting it in relation to a basic school's needs has to be integrated into the processes of generating and implementing the school's development plans (McIntyre, 2004). Higher educational institutions leading research in basic schools will have to work hard to find evidence relevant and useful in their contexts and will need to exercise skill in judging the quality of the research that does exist (McAleary, 2016).

In implementing the teacher-as-researcher paradigm, educational reforms, especially those championed by higher educational institutions, must encourage grassroots practitioner research. Much has happened to make the teacher feel powerless and disinclined to take the initiative towards classroom research. There is now a need for creativity with regard to establishing promising "points of entry" for teacher research in a climate of imposition (Hancock 1997). Given that research is an extra layer of work for teachers, it is important to provide support that will enable lift off, if possible through hands-on help to be provided by academic researchers in higher educational institutions. With this

form of support in place for many teachers, teacher research will offer the possibility of border crossing, of bridging the gap between academic research and knowledge derived from practice (Rust, 2009). Such a support system should be aimed at breaking down the discourse barriers in published research reports and increasing teacher's confidence and skills to critically review current policy (Gray & Campbell-Evans, 2002). In essence, teacher education programmes in higher education need to develop a framework for the collaborative reflective inquiry to assist a deep understanding of informed teaching in response to student learning.

A robust framework for institutional strategies to link teaching and research is provided by Jenkins and Healey (2005). The framework comprising seventeen strategies was structured around four (4) broad areas namely, developing institutional awareness and institutional mission, developing pedagogy and curricula to support the nexus, developing research policies and strategies to support the nexus and developing staff and university structures to support the nexus. Similarly, Chow et al. (2015) present a model of interaction between university experts and frontline teachers which suggest that the ideal collaboration between university and schools is one in which teachers work closely with university experts in discovering new knowledge instead of relying on them. In this mode, the frontline teachers partner with the university experts in generating mathematical knowledge and theorizing their practice via consistent renewal and revision

2.4 Implications for Classroom Practice in Nigeria

Very often action research is a collaborative activity where practitioners work together to help one another design and carry out investigations in their classroom. Mathematics teacher research is designed, conducted and implemented by the mathematics teachers themselves to improve teaching in their own classrooms, sometimes becoming a staff development project in which teachers establish expertise in curriculum development and reflective teaching. Thus, the research-engaged school is one manifestation of evidence-informed professionalism.

Mathematics teacher research is needed for Nigeria because it is probably both unrealistic and undesirable to think that mathematics teaching can be entirely based on findings from academic research. As McAleary (2016) observes this would marginalize insights from experience, craft knowledge and small scale practitioner research. It is surely better for schools in Nigeria to strive for evidence-informed professionalism, which values lessons from formal research alongside other guides to act on. Just as the research of individual teachers has been most commonly aimed at their own professional development, and thus the improvement of both their educational understanding and their professional practice, so the dominant concern of basic schools as research institutions is with their institutional learning and thus with the improvement of both their policies and their practice (McIntyre, 2004). As individual teachers aspire to go beyond development of their own thinking and practice via teacher research, to challenge and enhance existing understandings, settlements, policies and practices more widely, there should be some aspiration at the school level for schools not just to be concerned in their own improvement but also to become "knowledge creating" institutions.

Teachers have a duty to use research-derived evidence but it will not give a precise script for every situation, so mathematics teachers in particular also have to use experience-based judgment. Teachers and school leaders cannot be seen simply as technicians who must passively accept and act upon directives from academic

researchers in institutions of higher learning. In the view of McAleary (2016), teachers are professionals who must adopt research-derived guidance to meet the particular circumstances they face, using judgment and lessons from experience. In addition to research findings, other sources of evidence such as student and parent voice must be taken into account. The research-engaged school uses formal research findings but also much more informal modes of inquiry and reflection along with outcomes of teacher-research. The Nigerian Basic School system must understand the importance of personal insight derived from experience and good analysis of other forms of management information such as test results and feedback from students and parents. McAleary (2016) observes that five activities characterize the research-engaged school in action, namely, the research-engaged school:

1. Promotes practitioner research among its staff,
2. Encourages its staff to read and be responsive to published research
3. Welcomes (as a learning opportunity as well as a responsibility to the wider educational community) being the subject of research by outside organizations.
4. Uses research to inform its decision making at every level
5. Has an outward-looking orientation including research-based links with other schools or universities.

Mathematics teachers who do research activities in a long lasting quest for updated information about the approaches and trends to deal responsibly with the issues raised as part of their practice, with permanent activities of reflection and assignment always framed by the policies stated by the government (Vasquez, 2017). Should they find inconsistencies between their practice and the applicable government regulation, they could propose changes with the appropriate authorities and by doing that, teachers will grow as professionals and as active and responsible members of one's practice in purposeful, collegial forums enables a refining of practice that strengths both the individual and the group (Rust, 2009). In such an environment, teacher research offers the possibility of translation between the academy of mathematics education and the world of practice and between research, policy, and practice.

Judkins *et al.* (2014) put forward key findings on the perceived benefits of engagement in research evidence, including:

1. Overall, engaging in research evidence encourage practitioner reflection and open-mindedness.
2. Teachers' openness to adopting different pedagogical approaches is considered to make lessons more engaging for earners and engaging with research is seen to encourage this.
3. Teachers benefit from research evidence through its use to inform professional development and through the confidence acquired from implementing new approaches.
4. Teacher research has the ability to drive school improvement initiatives, to substantiate the reasons behind the change and to underpin staff professional development.

The outcome expected from research should ideally be the solution to the problem initially observed or the improvement of the conditions which originally made teachers reflect on the problematic situation or at least the establishment of a path to perform a longer or deeper research attempt (Vasquez, 2017). This process, once started and sensibly and responsibly supervised, generates the need to engage the whole educational community in it. This situation makes members of staff committed to their duties by becoming reflective and critical on their performance, improving the

basic school's profile through constant self-reflection in general. The implication here is that apart from the mathematics teachers, head teachers and school principals are deemed to play an integral part in the establishment of a school culture that encourages teachers to carry out research in their classrooms (Chow et al., 2015). Aside from collaboration among the teaching staff, parents' attitudes towards and support for research are vital since their consent must be obtained before any form of classroom intervention can take place.

Most Local Education Authorities (LEAs) across the country may have a number of support, advisory and inspection staff who can do much for the cause of teacher research. Hancock (1997) suggests that such staff can provide an important service to class teachers by drawing attention to any exciting and innovative practice that they see from the "privileged" position of a peripatetic observer. Such systematic collaboration will bring to bear on Basic Education the full benefits derivable from mathematics teacher research.

3. CONCLUSIONS

This review has attempted to advocate mathematics teacher research as a tool for improved professionalism in mathematics education. Pertinent issues surrounding teacher research and its relationship to professionalism among basic school teachers have been given detailed consideration. The role of higher educational institutions in fostering teacher research in mathematics education has been unveiled as that of collaboration, mentorship and hands-on practice involving the experts and front-line teachers. The implications of mathematics teacher researcher were considered along with the need to create the right environment to nurture a culture of evidence-informed practice within basic education.

Achieving mathematics teacher research prowess entails a conscious effort by both school management and mathematics teachers to translate research into practice in the classroom and nurture staff confidence by allowing them to take risks with practice informed research. The basic school system must make it easy for mathematics teachers to engage in research by creating the time and space through a special form, saving teachers' time where possible, making research findings accessible, identifying context-specific evidence for teachers and using appropriate internal and external support.

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