Science Teachers Association of Nigeria

TOWARDS EFFECTIVE APPLICATION OF STEM EDUCATION RESEARCH

56th Annual Conference 2015

Zephrinus Chidubem Njoku
Editor

PAPER 32

UTILIZING RESEARCH FINDINGS IN SCIENCE EDUCATION CURRICULUM FOR TEACHERS' CREATIVE SKILLS

Etiubon, Rebecca U.
Science Education Department, University of Uyo, Uyo
and
Okopide, Anyanime Akpan
State Universal Basic Education Board, Uyo.

Abstract

The study investigated the extent of utilization of research findings in science education curriculum for science educators' creative skills in three Local Government Areas of Akwa Ibom State. The study was a survey research design with four research questions guiding it. The population of the study was 326 science educators selected through purposive sampling technique. The sample size for the study was 120 science educators. Instrument for data collection was a questionnaire developed by the researchers and face-validated by two lecturers of Science Education Department of the University of Uyo. Descriptive statistics of mean (X) and standard deviation (SD) were used to analyze the data. Two lecturers of test and measurement and in curriculum validated the instrument. Cronbach alpha was used to obtain a reliability coefficient of .83. The findings of the study showed that there are abundant sources on research findings and science educators are aware of these sources, but hardly utilize these sources for instructional delivery. The findings also showed that the extent of teachers' knowledge on research findings is low as they hardly prepare their lessons using research findings materials to update their own knowledge. The findings also revealed that spread of information on research findings using different channels are not utilized in science education curriculum. Based on these findings, it was recommended amongst others that science educators should sponsor themselves to conferences and workshops to update their knowledge about current research findings and its integration in classroom activities.

Introduction

The contemporary world is becoming highly research-based and increasingly dependent on science and technology for economic growth and national sustainability. The practice in science education today is greatly informed by researches into science teaching and learning. Research in science education relies on a convergence of knowledge from a variety of sources that are constantly built on previous knowledge in order to go beyond what is currently known.

A general goal of science education is to prepare the individual to cultivate inquiry, knowing and rational mind for learning science processes and principles that will be applied to research in a technologically advancing world. This goal gives relevance to science education and encourages the application of researches that will help individuals acquire and build science process skills that will enable them make decisions for their lifelong careers.

Research is an art that involves the use of knowledge of a few uncomplicated research principles such as control, manipulation, critical reasoning and randomization to disseminate evidence of best practices. Research is the science -guided methodical and technology-facilitated human effort at expanding and deepening the needful knowledge-with-knowledge-application base (Cohen, Marion & Morrison, 2007) regarding life, work and leisure in any human sector. They are indispensable tools for enriching intellectual development and deepening skills that motivate teachers and students to engage in the acquisition of science process skills.

Current emphasis is on using science education researches to improve lives and nations; as such science educators are confronted with the need to rethink school science education programmes. Mayer (2000) opined that science instruction serve three purposes; preparing students to study science at the higher level, preparing students for the workforce and preparing them to become scientifically literate. These purposes cannot be achieved without aligning science instruction to sources and materials that enable valid researches. The sources and materials can deepen and enrich science knowledge via research findings. The sources and materials for research findings include pictograms, charts, flex advert printings, radio/television programmes, science publications, technical reports on researches, theses/dissertations, conference papers proceedings, workshops/seminars/conferences, journals, documentaries, phone/GSM/messages, printed and published science manuals, research bulletins, reviews, books and newsletters. For example, teachers could use pictorial aids from an internet source to visualize atomic structure during the teaching of atoms in chemistry and human anatomy in biology. When research findings are adequately integrated into classroom teaching and learning processes, using these sources and materials, teachers would master the theoretical and practical contents that can improve students' performance.

Inspite of the crucial role research finding is playing, scientific research about what works does not usually find its way into most classrooms as most science educators have little or no knowledge of current researches that could be used to improve classroom instruction and students' achievement. These teachers lack confidence in themselves as they have little understanding of how to select and modify concepts using research findings to enable learners gain broader perspective of science instruction. This hampers students' scientific knowledge and inhibits the acquisition of science process skills. Okoye (2002) and (Akpan, 2013) found that there are scanty research reports on the performance of science education programmes and schools lack the necessary resources to carry out experimental work in science education programmes. Ensuring research findings input into science education curriculum will improve teachers' knowledge and creative skills on science practice.

Science education curriculum represent the important knowledge, skills and attributes schools require teachers to use for teaching students to enable them acquire productive learning outcomes that will sustain them for life. The National Policy on Education (FGN, 2014) emphasize that the teaching and learning of science should lead to the acquisition of science processes and principles that aims at providing knowledge, skills, capacity for self-reliance and intellectual development. This represents the desired direction for science education and should influence the nature of textbooks, curriculum efforts at national and local levels, and teaching practices over the next decade and beyond (Osisioma, 2012). With the use of research findings, teachers can communicate ideas, add value and improve their problem-solving skills. Research findings therefore, are needed to give science education curriculum meaning, quality and

relevance. With evolving trends, it is observed that the science education curriculum is no longer meeting the needs of the populace and therefore needs to be reviewed. Akpan (2012) opined that the curriculum is outdated, not relevant, not-content-driven, and overloaded, as it does not prepare students for the world of employment or for further education. When teachers are fully engaged in using research findings during classroom instructions, they initiate creative skills that are appropriate to cognitive demands.

Teachers have the responsibility to design lessons that stimulate students' interest as they become effective users and interpreters of research findings. Teachers' creativity, mastery of content knowledge of subject, good knowledge of methods/techniques, willingness to adapt research findings relevant to local needs to teach, and taking into account available materials enhances a teacher's effectiveness to initiate creative teaching. Modern day education is largely driven by creativity to stem the tide of unemployment. Teachers need to equip and rediscover themselves by tapping into their creative talents and innate abilities. Gersten (2001) posited that teachers tap into their own interest and hobbies and begin to think of themselves as creative teachers and individuals when they work with researches. Teachers therefore, need creative skills like critical thinking, ingenuity, resourcefulness, manipulation and research reporting skills to incorporate research finding activities in classroom discussions. Teachers can do this to sustain learners' interest in the face of changing curriculum needs. As new learning concepts evolve through research findings, teachers can facilitate the learning of concepts and make them meaningful to individual learners rather than just providing them as knowledge and skills.

There is declining interest in the use of creativity in teaching among science educators. They fail to utilize research findings to improve their teaching skills that can enhance students' understanding and performance. They lack the knowledge to utilize research findings on how to handle learning materials which facilitate creative skills. Most teachers consider science subjects as abstract; and as such have difficulty relating science to every day life thus limiting the use of appropriate strategies for teaching creatively. They should therefore, constantly be looking for methods, tools and ways to help their students understand the basic underlying principles of concepts in science. One way of doing this, is to utilize research findings to improve and enhance their capacity and skills in teaching science.

Despite the knowledge research finding brings, most science educators resist change because they are not equipped with the skills of educational research and how to use them. Abimbade (2005) found that teachers are unable to make use of research findings because they lack the time needed to fully prepare and research materials for teaching. For instance, most teachers lack clear direction on what and how to teach because they feel lazy going through journals where researches are documented to update their notes. Some who have the opportunity to attend conferences where research findings are used for presentation within and outside the country hardly involve their peers in knowledge-sharing as they are busy with overloaded academic schedules that they forget they attended a conference of that nature. This militates against adequate preparation of science educators to acquire creative skills.

Information spread of research findings is very important and finds expression through viable outlets such as the internet, peer-review interaction, verbal discussion, audio and video tapes, radio broadcast, symposia and refresher courses. Information spread determines to a large extent access to research findings that broadens knowledge, nurture and empowers a teacher to try new things. This spread keeps the teacher abreast of current research findings, thus improving

creative skills. Teachers exposed to institutions where researches are carried out with access to information, spread these findings to a wider student audience who carry it to their families and peers (Acholonu, 2010). Achieving overall classroom success greatly depends on responsive spread of research findings. Teachers must therefore learn how to imagine and explore these outlets for research findings to fit into concept phenomena in creative ways. Currently, information spread on research findings is mostly foreign and does not meet the prerequisites to equip learners effectively. National Research Council (NRC, 2009) found that the background knowledge of teachers on research findings utilization is very poor, resulting in the lack of spread of information on research findings. This hinders teachers and students' experimental and participatory interest.

Statement of the Problem

Awareness and integration of research findings contribution in many sectors is growing, but science educators in Nigeria are yet to acknowledge this reality as they do not adapt and integrate research findings into classroom instructions using creative skills. This leads to waste of knowledge.

Purpose of the Study

The study was carried out to investigate the extent of utilization of research findings in science education curriculum for classroom instruction among secondary school science educators. Specifically, the objectives were:

1. To assess the extent of utilization of sources available for research findings in science education curriculum for teachers' creative skills.
2. To examine the extent of teachers' knowledge on research findings in science education curriculum for their creative skills.
3. To assess the extent of information spread on utilization of research findings in science education curriculum for teachers' creative skills.

Research Questions

1. What are the sources available for research findings in science education curriculum for teachers' creative skills?
2. What is the level of teachers' knowledge on research findings in science education curriculum for creative skills?
3. What is the extent of information spread on research findings in science education curriculum for teachers' creative skills?

Research Procedure

The study was a survey design. The population of the study comprised all the science teachers in three Local Government Areas of Akwa Ibom State. A sample of 120 teachers of (chemistry, biology, physics and basic science and technology) was obtained during a science teacher capacity building workshop. Simple random sampling technique was used to obtain the

sample size. A questionnaire on Research findings utilization for Teachers' Creative skills was the instrument used to gather data for the study. Instrument had 25 items. It had a rating scale of strongly agreed (SA=4), agreed (A=3), disagree (D=2), strongly disagree (SD=1). Two lecturers of test and measurement in science education and in curriculum studies department, from the Faculty of Education, University of Education validated the instrument. The instrument was subjected to trial-testing and Cronbach alpha was used to obtain a reliability coefficient of .83. The rating scale elicited information on teachers' responses on research findings utilization. Copies of the rating scale were all administered, filled and collected the same day. The data generated were analysed using mean (X) and standard deviation (SD). Items with response mean of 2.50 and above were accepted while those below 2.50 were not accepted.

Results

Table 1: Mean ratings of sources of research findings in science education curriculum for teachers' creative skills

S/N	Sources of research findings	X	SD	Decision
1.	pictograms/charts/flex advertising	2.84	0.97	agreed
2.	radio/television/print media	2.53	0.58	agreed
3.	science publications in bulletins/journals	2.56	0.74	agreed
4.	documentaries in archives/libraries	2.64	0.63	agreed
5.	reports/ newsletters	2.38	0.64	disagreed
6.	research bulletins /videos	2.70	0.66	agree
7.	conference proceedings/science manuals	2.58	0.81	agree
8.	printed and published science leaflets/flyers	2.32	0.61	disagree
9.	reviews/textbooks	2.84	0.93	agree
10.	workshops/seminars/conferences	2.88	0.96	agree

Data in Table 1 indicates that items 1 to 10 have mean scores of 2.50 and above which was the cut-off mean. This showed that science teachers agreed on all the items as sources of research findings except for items 5 and 8 on reports /newsletters and printed and published science leaflets/flyers which were below the cut off point.

Table 2: Mean ratings of extent of teachers' knowledge of research findings for creative skills

Science teachers knowledge of research findings		X	SD	Decision
11.	manipulative skills for practicals are explicitly explained	2.34	0.62	disagree
12.	critical reasoning for taking initiative	2.39	0.79	disagree

13.	some researched studies are difficult to conduct in the laboratory	2.78	0.72	agree
14.	do not consider shared-knowledge on researches important	2.60	0.73	agree
15.	cannot comprehend research findings adequately	2.74	0.73	agree
16.	have clear guidelines on research findings implementation	2.19	0.78	disagree
17.	lack background knowledge of current research findings	2.68	0.72	agree
18.	published research findings used for classroom instruction	2.58	0.74	agree
19.	few teachers spend time to go through published research findings	2.80	0.74	agree
20.	research findings are replicated with ease	2.17	0.78	disagree

Table 2 showed that items 13, 14, 15, 17, 18 and 19 had mean scores above the cut-off mean of 2.50. This showed that teachers have knowledge of research findings for science education curriculum for their creative skills except for items 11, 12, 16, and 20 on manipulative skills for practicals, critical reasoning skills for taking initiative, having clear guidelines on research implementation and easy replication of research findings which had mean score below 2.50.

Table 3: Mean ratings of teachers' responses on extent of information spread on research findings

		X	SD	Decision
21.	frequent attendance to trainings/workshops	2.24	0.78	disagree
22.	peer review/ verbal interaction	2.36	0.75	disagree
23.	radio and television broadcast	2.43	0.73	disagree
24.	internet	2.39	0.89	disagree
25.	symposium/refresher courses	2.18	0.87	disagree

In Table 3 above, all the items had mean responses below 2.50 indicating that all the respondents disagreed on the extent of information spread on research findings was low in science education curriculum for teachers' creative skills.

Discussion of Findings

Results of findings in Table 1 showed that science educators agreed that there are many sources for research findings but these sources are not available in schools so they are not utilized

by teachers for classroom instructional delivery. In situations where they are found, they are torn or worn out. This poses serious threat to evolving research findings that would aid teachers' creative skills for science education curriculum implementation. This finding is in agreement with Okoye (2002) and (Akpan, 2013) who found that there are scanty research reports on the performance of science education programmes and schools lack the necessary resources to carry out experimental work in science education. A resourceful teacher could find some of these sources and use them to build research activities that will enable students acquire relevant scientific skills and knowledge. Science educators will do better if they make use of available sources for research findings to internalize creative and science process skills. Table 2 revealed that the extent of teachers' knowledge on research findings is poor as most science educators do not know about current researches not to talk of integrating them in the subject content during lesson delivery. This finding is in agreement with Abimbade (2005) who found that teachers are unable to make use of research findings because they lack the time needed to fully prepare and research materials for teaching. Teachers who do not have in-depth knowledge to master and equip themselves with knowledge of evolving researches will be giving outdated information to students in the name of teaching. This affects students' performance in the subject. Findings in Table 3 indicated that information spread channels abound but are never utilized to spread information on research findings even among colleagues. This retards teachers' knowledge and impedes the development of creative skills. This finding is in line with(NRC, 2009) which posited that the background knowledge of teachers on research findings utilization is very poor, resulting in the lack of spread of information on research findings. This shows very unserious and laissez-faire attitude of some teachers and their inability to use information channels. This affects students' knowledge output in science.

Conclusion

It was concluded, based on the findings, that the use of research findings from science education curriculum will enhance science teachers creative skills.

Recommendations

Teachers should be trained by experts on use of evolving research findings to facilitate their creative skills for effective implementation in science education curriculum.

Curriculum planners should preview and integrate research findings into science curriculum for adoption by teachers to facilitate learning at all levels of education.

Resource centres should be located within school environments to stem the excuse for lack of knowledge for teachers' acquisition of creative skills.

The Government should come out with practical solutions to encourage more research findings by giving grants to researchers.

References

Abimbade, A. (2005). Gender differences in instructional media utilization, learners' achievement and attitudes towards the use of some educational media among higher education students, workshop on media utilization, October 3-6, 2005.

Acholonu, V. A. (2010). Transforming Agricultural Education for a changing world. A Nigerian Perspective through Undergraduates of Agricultural Science Education. Conference Proceedings of the 51st Annual Conference of Science Teachers Association of Nigeria, in Nsikak-Abasi Udofia (Ed.). Heinemann Publishers, Ibadan, 177-181.

Akpan, B. B. (2012). Science Education in Nigeria. Education in Nigeria: From the beginning to the future. *A book of Readings*, 77- 104.

Cohen, L., Marion, L. & Morrison, K. (2007). Research methods in Education, 6th Ed. London: Routledge, 5-77.

Federal Republic of Nigeria (2014). National Policy on Education. Lagos: NERDC Press.

Gersten, R. (2001). Sorting out the roles of research in the improvement of practice. Learning Disabilities: *Research and Practice, 16 (1), 45-50.*

Mayer, R. E. (2000). What is the place of science in educational research? *Educational Researcher,* 29 (6), 38-39.

National Research Council (NRC, 2009). Transforming Agricultural Education: A report from the NRC, U.S.A.

Okey, S. (2012). Teacher training/retraining: A vital tool for professional development in Nigeria. Education in Nigeria : From the beginning to the future. *A Book of Readings,* 257-266.

Okoye, N. S. (2002). Promoting STM Education as Indices of Development in Africa. Proceedings of the Inaugural conference of CASTME Africa, Ibadan.

Osisioma, I. N. (2012). Moving from theory to practice: Applying research on student learning to science education. From the beginning to the future. In U.M.O. Ivowi (Ed.). *A book of Readings, 269-302.*

Shuaibu, O.G. (2011). Information and Communication Technology as a tool for sustainable educational development in Nigeria. *Journal of occupation and training,* 5(1), 120-125.