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Impact of practical work in the teaching of physics in secondary schools in rivers state

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Abstract
This study examined the impact of practical work on physics students performing in Rivers State's secondary schools. The sample size used for the study was 20 high school academic staff (10 physics teachers & 10 laboratory instructors) randomly selected from ten (10) high schools within Obio/Akpor Local Government. It formulated four (4) research questions and three (3) null hypotheses to guide the study. Data from respondents were gathered using sets of questionnaires structured in agreement rating scale of four points. Using mean and standard deviation, the data were analysed. The finding indicates that the respondents perceived practical physics work as an activity that helps teachers/students master the content through research and observations, fostering a better understanding of the topics among teachers / students. It also shows that practical physics makes scientific phenomena more real, has great potential to encourage social interactions that can add positively to teacher cognition of increasing attitudes. The findings also show that the restrictions influencing the effectiveness of practical work in physics include consistency of laboratory instruction use, inadequate and antiquated / disruptive resources, half-baked teachers / instructors, non-availability of laboratory facilities and equipment among others. The study suggested that physics teachers be qualified and holders of a degree in physics education, that each school be provided with a well-designed physics laboratory, that teachers be fully informed of the value of practical physics, that government made available instructional resources, and that continuous supervision be carried out in schools to ensure practical research.

Keywords: continuous, examined, supervision, practical

Introduction

Two of the distinguishing characteristics of science curriculum are that it involves practical work-activities in which the pupils monitor and evaluate concrete systems and materials (Abrahams and Miller, 2006). Practical work is also critical to teaching physics successfully in high schools. Several studies have documented the sculptures of realistic works in the teaching of science for over a century (Hofstein and lunetta, 2006). Practical job experience has long been seen as unique and fundamental in the science curriculum. It is an activity-oriented approach to instruction undertaken by a instructor or group of students for the purpose of engaging in personal appraisal of products, practices or activities through direct experience. Physics is in fact considered to be the root of all knowledge. All that means is that physics governs all aspects of technology. It further notes that every invention has evidence behind it. At high school level, physics is characterized as a branch of science that deals with matter, vigor, its relation and measurements. Practical solution is the teaching tool that teachers can use in tutoring physics effectively in senior secondary schools. Practical research can be defined as experimentation, study, specimen selection and even field work performed before or during a lesson in physics. This is from research on the road to differentiating a scientist from a non-scientist according to Opong (1980) [64]. Thus Abdullahi (1982) [1] explains experiment as operations or procedure used to test a hypothesis, to prove what is known, and to discover what is unknown. Experimentation and theory are therefore interdependent in the exploration of the unknown; one nourishes the other. "Science practically belongs to the laboratory as clearly as cooking belongs to the kitchen and gardening to the greenhouse," according to Solomon (1980) [67], "these represent the level of practical work in school laboratories. Experiment is an outstanding form of scientific work; it helps educate the mind to think objectively, rationally and scientifically without bias because science, by its very nature, deals with fact. Any assertion made must be checked to validate its authenticity and reliability. Physics tutors should aim to instill in their students a sense of objectivity. If students are able to collect items of their own, this will lead to better engagement and substantive learning, they appear to have a greater understanding of what they actually learned during the realistic lesson. This ultimately enhances the learning process.

According to Dikmenli (2009) [18], the primary purpose of laboratory research in science education is to give students the basic and abstract information to help them study practical principles and experimental techniques to understand the essence of science. Ndu (1980) [59] believed that realistic study is defined as any learning experience that requires students to be engaged in activities such as observing, measuring, weighing, checking, studying and carrying out fieldwork.

Therefore, in this article, functional physics experience is discussed by the researcher as the instructional tool by which the students are engaged in the learning process through the use of instruments to test, measure and analyze what was studied scientifically in class. The tutor's technological knowledge, skill, and personality in physics would concentrate on what physics students will like to know and be able to do to make a positive difference to life in a democratic society. Physics teacher knowledge base consists of three mechanisms: contextual knowledge,

pedagogic knowledge and pedagogical content knowledge (Etkina, 2005) [20]. Content knowledge itself is disciplinary material, which involves such things as functional procedures. Significant research indicates significant learning gains for students who are linked to recognizing teachers' subject matter (Darling-Hammond, 2000) [16]. Ideally the professor would have obtained basic knowledge of principles through testing methods and learned practical skills therein. The instructor should have had the ability to exercise the science analysis processes: analyze, ask questions, describe a problem; hypothesize without an evidence base; make predictions; construct an experiment; classify and form variables; gather, graphically reflect and evaluate experimental data; perform error analyses; draw conclusions.

The importance of realistic research has long been recognized at the Secondary School level. Many teachers understand the importance of realistic thinking, not philosophy alone (Braund and Driver, 2002). According to Hodson (1990) [24], it is important to provide students with a mastery of the skills necessary for realistic practice to be ready for assessment. Hodson (1996) also noted that, in practical testing, the individual conducts convinced activities in order to find out something that is not yet known, to test a hypothesis or to verify an already confirmed fact. To undertake these duties, the candidate must acquire the expertise required for realistic research including the preparation and performing of studies and the study of the findings received. Woolnough and Allsop (2001) [70] noted that science teachers have understood the value of practical study. They believed students should have first-hand practical experience in labs and acquire skills in instrument handling, measure ideas and principles and explain them. Gaining first-hand experience will encourage students to apply the expertise they have gained when they become scientists through practical work in the future. Physics is, like religion, a exploration of truth. But physics for a beginner will be as sacred and mystical as a place for a devotee to pray. In reality learning physics helps young minds to prepare themselves for something higher and noble to dig for facts and unrevealed the mysteries of Nature. Experimental analyzes are important for understanding philosophy of science. Performing research by one's own self, though, is far more important, as learning through doing requires. It is important to note that the systematic and scientific teaching of young minds is a must for true laboratory practice. According to educational psychologists the mindset of the pupil plays an imperative role in his systematic and scientific study. Research is amazing intellectual know-how. The ferments that characterize the scientific endeavor are open-mindedness, curiosity, data gathering, willingness to explain and confirm mathematical reasoning, delayed hypotheses, acceptance of rational inference and the capacity to alter opinion in the light of new evidence.

Good practical preparation can be useful in helping teachers develop their knowledge, logical thinking and inquiry-expertise, problem-solving abilities, and can also help improve strategic awareness and observation. Practical physics has excellent potential for promoting good attitudes and offering incentives for students to improve skills. In this way, the research laboratory is an ideal learning venue, as it would provide opportunities for science teachers to adapt their teaching techniques. Ahiakwo (2002) [5] proposed that realistic research in a special social environment is extremely likely to improve social experiences and could positively lead to the growth of student cognition attitudes.

Nzewi (2008) [60] suggested that practical activities could be used as a strategy that should be practiced to make the job of a instructor more meaningful for the pupil as oppressed to theoretical towards the theoretical presentation of facts, principles and definitions of subject matter. It is important that the use of practical methodology for teaching physics be implemented in schools if we want to produce students who will be able to acquire the necessary knowledge, expertise and skills to fulfill the scientific and technical demands of the country.

A research by Owolabi (2004) [65] reveals that the performance of the Nigerian students in ordinary level physics was generally small. Jegede, Okota & Eniayeju (1992) [57] identified features that accounted for poor execution of realistic research in physics such as; poor laboratory facilities, inadequate learning facilities among others.

Physics as a research area needs trained technicians (instructors) and assistant laboratories. Because of the lack of these technicians and attendants in many classrooms, physics teaching was basically based on the expository teaching techniques which remind the rotation (memorization) of accurate facts with the least practical focus.

The students are actually conducting assessments for point's purposes and teachers have failed to realize that "practical testing" would help them to implement their lessons effectively. As a result, high school students are unable to analyze and draw inferences from their study, address issues logically and even treat basic apparatuses to test the theory and aid in learning. It has led to pitiful student performance in realistic physics leading to failure of their physics test. Therefore the purpose of this study is to examine the impact of practical work in teaching physics at Obio / Akpor local government in senior high schools in Rivers State.

Statement of the Problem

A longstanding goal in science education has been the desire for consistency and efficient implementation of instruction. The that concern for students ' poor performance in school science and its effect on the growth and development of future scientists, engineers and technology has led to the need for educational solutions to promote effective and improved science learning. Thus, science education has been a topic for study for two or more decades. The awareness of science is vast; its reach in every discipline is on the rise. Scientific educators have come to understand that seeking to teach science as a list of facts to be memorized rather than comprehended is a pointless practice. It was found that in the high school teaching of physics in Rivers State there is a lack of methodological emphasis on the effect of practical research which can improve the teaching and learning of physics concepts. Because of poor physics results, academic achievement by Physics graduates has been persistently low in practical study.

Purpose of Study

The main purpose of this study is to examine the impact of practical work in the teaching of physics in senior secondary schools. Specifically, this study intends to:

1. Decide the extent practical work enhance teaching of

physics in senior secondary schools.
2. Examine the constraints hindering the effectiveness of practical work in physics.
3. Ascertain the strategies to improve physics practical work in senior secondary schools.

Research Questions
1. What are the perceptions of physics teachers and instructors towards physics practical work in secondary schools?
2. To what extent does physics practical work enhance the teaching of physics in senior secondary schools?
3. What are the constraints hindering effectiveness of physics practical in senior secondary schools?
4. What are the strategies that could improve practical work in physics secondary schools?

Hypothesis
- There is no significant difference in the mean responses of physics teachers and practical physics instructors on their perceptions towards physics practical work.
- There is no significant difference in the mean responses of physics teachers and instructors on the extent practical work enhance the teaching of physics in secondary schools.
- There is no significant difference in the mean responses of physics teachers and practical physics instructors on the constraints hindering effectiveness of practical work in physics.

Literature Review

Practical research, according to Science Group Representing Education (SCORE), means 'a z "hands-on" learning environment that encourages one to talk about the world we live in' (Score, 2008). However, realistic research can also be described as. ".. Learning experience in which students refer to materials or secondary data sources to investigate and understand the natural environment" (Lunetta, Hofstein, & Clough, 2007) [30]. Another way to term it realistic research is through laboratory study and empirical studies (Ramnarain, 2011) [51, 42]. Students must master the idea of science by doing experiments in the laboratory which is a complex approach from the process "Chalk and Chat" (Bruner, 1990) [11]. Laboratory testing is also one example of realistic research at the high school level (Musasia *et al*., 2012) [35]. The conventional approach to teaching is described as; teaching is entirely based on textbooks where the teacher teaches the material and students only sit down, read, do assignments and take notes (Ates & Eryilmaz, 2011) [10]. Current teaching classes look like a one-person sequence which usually regulates direct and one-party guidance (Abida & Muhammad, 2012) [6]. Around the same time, students only accede unresponsively to the information of the teachers (Liu, 2014) [29] and without consulting the teacher (Stofflett, 1999). According to a 1996 study published in Malaysia by the Federal Schools Inspectorate (Jemaah Nazir Sekolah Persekutuan, as quoted in Salmiza & Afik, 2012), teachers in Malaysia were mostly professional, comfortable with the teaching material and using a range of teaching techniques, yet the teacher-centered preparation approach continued. This teaching strategy persists after the 15-year publication of the study, where the teaching methods are already a one-way, teacher-centered technique that lets students behave passively in classroom (Salmiza & Afik, 2012) [45, 54]. In constructivistic-based learning (Ng & Nguyen, 2006) [37] 'Hands-on' methods were suggested. Another alternative constructivist approach to study is using analytical experience in scientific tutoring and analysis. By providing real-life experiences (Ng & Nguyen, 2006) [37], students are given the ability to evaluate and quantify their viewpoints and advance understandings before the learning process. Practical study offers an outstanding learning environment that lets students improve their expertise; strengthen their analytical, investigation, and psychomotor skills (Mashita, Norita, & Zurida 2009) [32]. Therefore, conceptual research offers students an immersive environment in which they can extend the reach of constructivist thinking (Umar, Ubramaniam, & Ukherjee, 2005). The school system in Malaysia is still very exam-oriented, focused on examination scores and marks (Sharifah Fauziah, Farah, & Ismin Izwani, 2012). The use of constructivism in education is also new to Malaysian students. Therefore, teaching should be more of a teacher-centered approach than a student-centered one, but constructivism is difficult to attain (Arlina & Melor, 2014) [9].

This is assumed that learners' knowledge can be improved by doing realistic practice to understand the real world (Millar, 2004) [33]. We recognize that students can gain knowledge of personal insight and participation in realistic research according to Ozdener 's analysis (as quoted in Tüysüz, 2010). Teaching targets can be easily achieved by doing practical work particularly in physics teaching (El-rabadi, 2013) [21]. In fact, it would include first-hand knowledge of physics theory so that students can grasp the abstract ideas that are difficult to explain during the course (Osborne, 2002) [40, 49]. Students can also grasp theories and models better (Millar & Abrahams, 2009) [34]. According to Inal's research (as quoted in Musasia *et al*., 2012) [35], while conducting the experiment on their own, students are quicker to grasp the principles of physics because they can reach the materials and apparatuses that make them believe in it.

Methodology

The study used a descriptive survey design to seek the opinion of the respondents regarding the impact of practical work in teaching secondary school physics in Obio-Akpo Local Government Area, Rivers State. The work population consisted of physics teachers as well as laboratory supervisors in public high schools in the Obio-Akpo local government district of Rivers State. The sample size was twenty (20) students, and tutors were actual.

(1 Physical trainer from 10 schools picked at random and 1 coaches each).

For data collection configured in a 4-point relationship ranking system a well-structured questionnaire has been used. The tool was inspected using Cronbach Alpha's reliability coefficient, and found to be reliable at 0.82. The tests collected were analyzed using mean and standard deviation with a mean acceptance value of 0.2.50 while the experimental t-test approach was used to verify the independent t-test hypothesis at a point of significance of 0.05 per cent.

Results and Discussion of Findings

Research Question 1: What are the perceptions of physics teachers and instructors towards practical work in physics?

Table 1: Perceptions of physics teachers and instructors towards practical work in physics

S/N	Statements	Teachers N=10 X	S.D	Decision	Instructors N=10 X	S.D	Decision
1	Practical work in physics helps slow learners understands the content better, master the content through investigations and observations.	3.00	1.05	Agreed	3.20	1.03	Agreed
2	Much more is learned in student's experiments than teacher demonstrations.	3.40	0.96	Agreed	3.20	0.63	Agreed
3	Practical work proves theory in physics, and makes physics an interesting subject.	2.80	1.13	Agreed	3.40	0.96	Agreed
4	Performing practical work in physics promotes learners understanding of the topics better, and stimulates interest in the subject.	3.30	0.82	Agreed	2.80	0.91	Agreed
5	The teacher does not have relevant instructional materials for practical teaching of physics.	2.90	1.00	Agreed	2.90	1.19	Agreed
6	The time allotted for the subject on the time-table is too small.	3.20	0.78	Agreed	2.90	1.00	Agreed
7	Develop learners' skills on handling and organizing apparatus and materials.	2.70	1.05	Agreed	3.70	0.48	Agreed
8	Practical work in physics yield better results in physics and prepare learners to answer questions in paper 3 at the national level.	3.00	1.05	Agreed	3.10	1.00	Agreed
	Grand Mean & S.D	**3.03**	**0.98**		**3.15**	**0.90**	

Research question 1 results show the attitudes of physics teachers and laboratory instructors about practical physics research. This reveals that respondents view realistic study in physics as an endeavor that: lets sluggish learners better understand content; improves content through analysis and experiences (3.00 & 3.20), learns even more in student studies than instructor presentations (3.40 & 3.20), explains philosophy in physics, and renders physics an fascinating topic (2.80 & 3.40), encourages learners Such results were in line with SCORE (2007), which stated that experimental research shows abstract theories, teaches learners in the laboratories on how to perform and use different instruments. The results were also in line with the opinions of Toplis & Allen (2012) that realistic research allows students to do science rather than only hearing about it.

Research Question 2: To what extent does practical work enhance the teaching of physics?

Table 2: Extent practical work enhance the teaching of physics

		Teacher N=10			Instructors N=10		
	Statements	**Mean**	**S.D**	**Decision**	**Mean**	**S.D**	**Decision**
1.	Practical work enables the teachers to						
	produce students that will be able to			High			High
	Acquire the necessary knowledge.	2.80	1.13	Extent	3.30	0.82	Extent
2	Much more is learned in students'						
	Experiments than teacher			High			High
	Demonstrations.	2.90	1.00	Extent	3.40	0.69	Extent
3	Physics practical work helps teachers			High			High
	And students in other areas of sciences.	3.10	1.00	Extent	2.80	1.13	Extent
4	It enhances students' skills and competence needed to meet the						
	scientific and technological demands of		High			High	
	The nation. 2.90	0.73	Extent	3.00	0.94	Extent	
5	Practical work in Physics motivate						
	students' precise observation	And			High		High
	Description.	3.10		1.00	Extent	3.20 0.78	Extent
6	It helps to inculcate scientific reasoning						
	Among teachers and students.				High		High
		3.30		0.82	Extent	3.40 0.69	Extent
7	It makes scientific phenomena	more			High		High
	Genuine.	3.50		0.70	Extent	3.30 1.05	Extent
8	Practical work on physics helps to						
	arouse and maintain teachers/students'				High		High
	Interest in physics.	2.90		0.87	Extent	3.30 0.67	Extent
9	Makes the charge of a teacher more real to the students as oppressed to abstract on						
	Theoretical presentation of facts,				**High**		**High**
	principle and concept of subject matters	2.90		1.00	**Extent**	3.10 1.10	**Extent**
10	Practical work has great potential in						
	enhancing social interactions that can						
	Add positively to developing				**High**		**High**
	attitudes cognition in teachers.	3.10		0.87	**Extent**	3.40 0.84	**Extent**
	Grand Mean & S.D	**3.05**		**0.91**		**3.22 1.07**	

That can contribute positively to developing attitudes cognition in teachers (3.10 & 3.40). These findings were in agreement with Vilaythong and Popou (2008) who stated that practical activities enhance the understanding of physics theory and phenomena. The findings also relate with Nzewi (2008) [60] opined that practical activities can be regarded as a strategy That could be adopted to make the duty of a teacher more real.

Also, the finding agrees with Mustapha (2002) [58] which state that practical physics provides learners with the opportunities to use scientific equipment to develop basic manipulative skills and practice inquiry activities and extend problem solving attitudes needed for future work in science.

Research Question 3: What are the constraints hindering effectiveness of practical work in physics?

Table 3: Constraints hindering effectiveness of practical work in physics

	Statements	Teacher N=10 Mean	S.D	Decision	Instructors N=10 Mean	S.D	Decision
1.	Quality of instruction use in the laboratory.	3.30	0.82	Agreed	3.60	0.69	Agreed
2	Inadequate and antiquated facilities	2.90	1.00	Agreed	3.20	0.78	Agreed
3	Poor attitudes of students towards physics.	2.80	1.22	Agreed	3.30	0.94	Agreed
4	Non-availability of laboratory and equipment.	3.20	1.03	Agreed	3.60	0.51	Agreed
5	Inadequate space for practical laboratory.	3.40	0.84	Agreed	3.00	1.24	Agreed
6	Insufficient number of competent teachers.	3.20	0.91	Agreed	3.10	1.00	Agreed
7	Lack of proper supervision.	3.20	0.78	Agreed	2.90	0.73	Agreed
8	Poor power supply.	3.50	0.97	Agreed	3.40	0.96	Agreed
9	Lack of seriousness by teachers and students.	3.10	1.10	Agreed	3.70	0.48	Agreed
10	Inadequate exposure of teachers and instructors of physics on the latest innovations in teaching of physics practical work.	3.50	0.52	Agreed	2.90	1.10	Agreed
	Grand Mean & S.D	**3.21**	**0.91**		**3.27**	**0.84**	

(2013) who stated that the fundamental constraints hindering practical work in physics comprise curriculum content, tutoring method and quality of teachers. Also Adebayo (2013) [3, 56] indicated that the fear of mathematical skills involved and poor method of teaching greatly affects learners' interest to the study of physics. Adeyemo (2012) [4], Onah and Ugwu (2010) [63] indicated that that laboratory facilities and quality teachers supply have constructive influence on the execution of practical physics. Also the findings agreed with Olufunke (2012) [61] who opined that physics laboratory with ample equipment was a critical variable in deciding the quality of output that will be produced.

Research Question 4: What are the strategies that could develop practical work in physics?

Table 4: Strategies to improve practical work in physics Field work 2018.

	Statements	Teachers N=10 Mean	S.D	Decision	Instructors N=10 Mean	S.D	Decision
1.	Physics teachers should be professionals and holders of B.Sc.Ed in physics.	3.10	1.00	Agreed	3.10	1.00	Agreed
2	Every school should have well equipped physics laboratory.	3.40	0.51	Agreed	2.90	1.19	Agreed
3	Repositioning teacher preparation institutions for qualitative physics teachers' production.	2.90	0.87	Agreed	3.00	1.05	Agreed
4	Secondary schools should be adequately funded.	3.20	0.78	Agreed	3.10	0.56	Agreed
5	Teachers should be adequately sensitized on the importance of physics as a subject.	3.00	0.94	Agreed	3.30	0.48	Agreed
6	Government should make available Instructional aids.	3.10	1.19	Agreed	3.30	1.05	Agreed
7	Teachers should be sound in concepts and pedagogy.	3.00	1.05	Agreed	2.90	1.28	Agreed
8	Physics teachers should be adequately motivated through improved working conditions.	3.20	1.03	Agreed	2.90	1.00	Agreed
9	Regular supervision should be carried out in schools to ensure practical work is implemented.	3.00	0.81	Agreed	3.00	1.03	Agreed
	Grand Mean & S.D	**3.10**	**0.90**		**3.05**	**0.96**	

Research Question 4 revealed that the respondents agreed that physics teachers should be professionals and holders of B.Sc.Ed in physics (3.10 & 3.10), every school should have well equipped physics laboratory (3.40 & 2.90), repositioning teacher preparation institutions for qualitative physics teachers' production (2.90 & 3.00), secondary schools should be effectively funded (3.20 & 3.10), teachers should be successfully sensitized on the significance of physics as a subject (3.00 & 3.30), Government should make accessible Instructional aides (3.10 & 3.30), Teachers should be sound in concepts and pedagogy (3.00 & 2.90), Physics teachers ought to be effectively motivated through enhanced working conditions (3.20 & 2.90) and Regular supervision should be carried out in schools to guarantee practical work are carried out (3.00 & 3.00).

Table 5: t-test analysis on the mean responses of physics teachers and practical instructors on their perceptions towards practical work in physics.

	Mean	STD	N	DF	Level of t-cal	t-crit	Decision	Sig.
Teachers	3.03	0.24	8	14	0.05	1.06	1.76	Accepted
Instructors	2.90	0.27	8					

Table 5 shows that the teachers' mean and standard deviation scores were 3.03 and 0.24 respectively, while instructors' mean and standard deviation scores were 2.90 and 0.27 correspondingly. The t-cal value was 1.06, while the t-crit was 1.76 at 0.05 level of significance for independent t-test. This result shows that t-cal was less than t-crit, which means the null hypothesis was accepted. Thus, there is no major difference in the mean responses of physics teachers and practical instructors on their perceptions towards practical work in physics.

Table 6: t-test on the mean responses of physics teachers and instructors on the extent practical work enhance the teaching of physics.

	Mean	SD	N	DF	Level of t-cal	t-crit	Decision	Sig.
Teachers	3.05	0.21	10	18	0.05	-1.82	1.73	Accepted
Instructors	3.22	0.19	10					

Result in table 6 shows that teachers' mean and standard deviation scores of 3.05 and 0.21 while instructors' mean and standard deviation scores was 3.22 and 0.19 correspondingly. The t-cal value of -1.82 was less than the t-crit value of 1.76 at 0.05 level of significance for independent t-test. Therefore, the null hypothesis of no significant differences in the mean responses of physics teachers and instructors on the extent practical work augment the teaching of physics was accepted.

Table 7: t-test on the mean responses of physics teachers and practical physics instructors on the constraints hindering effectiveness of practical work in physics.

Groups	Mean	SD	NDF	Level of Sig.	t-cal	t-crit	Decision
Teachers	3.18	0.23	10	18	0.05	0.74	1.73	Accepted
Instructors	3.27	0.29	10					

Result in table 7 shows that teachers' have mean and standard deviation scores of 3.18 and 0.23 while instructors' have mean and standard deviation scores of 3.27 and 0.29 respectively. The t-cal value of 0.74 was less than the t-crit value of 1.73 at 0.05 level of significance for independent t-test. Therefore, the null hypothesis of no significant differences in the mean responses of physics teachers and practical physics instructors on the constraints hindering effectiveness of practical work in physics was established.

Summary

Based on the findings, the study concludes that much more is learned in student's experiments than teacher demonstrations. Practical work in physics helps slow learners comprehend the content better, it yield better results

in physics and prepare learners to answer questions in physics practical examination at the national level.

The study also conclude that practical work enables the teachers to produce students that will be able to attain the necessary knowledge, it enhances students' skills and competence needed to meet the scientific and technological demands of the nation. It helps to inculcate scientific reasoning among teachers and students and also makes scientific phenomena more real.

Finally, the study also concludes that quality of tutoring use in the laboratory, insufficient and antiquated facilities, insufficient numbers of capable tutors among other are the constraints to the effectiveness of practical physics.

Conclusion

Unpractical physics lesson is like making a planet of men, without women, or vice versa. This argument illustrates the importance of functional mechanics in physical study. Science teaching in the school needs to be revisited if the goal of science is to be achieved in Nigeria.

Recommendations

- Teachers in physics should be professionals and holders of a Bachelor's degree in physics education.
- Any school should have a physics laboratory that is working well.
- Students would be alert enough to the importance of practical physics.
- Government should make Instructional aides available.
- Daily training should be conducted in schools to ensure realistic work is carried out.

References

1. Abdullahi A. *Science teaching in Nigeria*. Ilorin: Atto Press, 1982.
2. Abrahams I, Miller R. Does practical work really work? A study of the effectiveness of practical work as a teaching and learning method in school science. *International Journal of Science Education. 2015;* 30(14):1945-1969.
3. Adebayo OA. *Process of learning Science*. Ibadan: Pacesetter Publishers Ltd, 2013.
4. Adeyemo SA. The teachers' supply and the provision of laboratory facilities on students' achievement in physics. *European Journal of Educational Studies*, 2012, 4(3).
5. Ahiakwo DF. Attitude to social implication of science: Us measurement in Ogha/Egbema/Ndonni local Government Areas of Rivers State. Proceedings of the 43'd Annual Conference and inaugural conference of CASTME Africa, 2002.
6. Abida K, Muhammad A. Constructivist Vs Traditional: Effective instructional approach in teacher education. *International Journal of Humanities and Social Science*. 2012; 2(5):170-177.
7. Adesoji FA, Olatunbosun SM. Student, Teacher and School Environment Factors as Determinants of Achievement in Senior Secondary School Chemistry in Oyo State, Nigeria. *The Journal of International Social Research*. 2008; 1(2):13-34.
8. Angell C, Guttersrud O, Henriksen EK, Isnes A. Physics: Frightful, but fun - Pupils' and teachers' views of physics and physics teaching. *Science Education*. 2004; 88(5):683-706.
9. Arlina AZ, Melor MY. Strategies Used by Local ESL Teachers in Malaysia to Create a Constructivist Classroom. *In Proceeding of Symposium of International Language & Knowledge* SiLK, 2014; 14:9.
10. Ates Ö, Eryilmaz A. Effectiveness of hands-on and minds-on activities on students' achievement and attitudes towards physics. *Asia-Pacific Forum on Science Learning and Teaching*. 2014; 12(1):1-22.
11. Bruner J. *Acts of Meaning*. Cambridge, Massachusetts, London, England: Harvard University Press, 1990.
12. Buthelezi N. Inside efforts to turn the tide on South Africa's poor Maths and Science performance. Retrieved, 2017.
13. Cardak O, Onder K, Dikmenli M. Effect of the usage of laboratory method in primary school education for the achievement of the students' learning. *Pacific Forum on Science Learning*, 2007; 8(2):1-11.
14. Curriculum Development Centre. Integrated Curriculum for Secondary Schools, Physics Form 4. Retrieved, 2005.
15. Curriculum Development Centre. Integrated Curriculum for Secondary Schools Curriculum Specifications, 2005.
16. Darling-Hammond L. Teacher quality and student achievement: A review of state policy evidence. Education Policy Analysis Archives. Available, 2000.
17. Dare EA, Roehrig GH. "If I had to do it, then I would": Understanding early middle school students' perceptions of physics and physics-related careers by gender. *Physical Review Physics Education Research. 2014;* 12(2):1-11.
18. Dikmenli M. Biology students teachers ideas about purpose of laboratory work. Asia-Pacific Forum of Science Learning and Teaching, 2009, 10.
19. Driver, Braund. Five Easy Lessons: Strategies for successful physics teaching. San Francisco, CA: Addison Wesley, 2002.
20. Etkina E. Physics teacher preparation: Dreams and reality. *Journal of Physics Teacher Education Online*. 2005; 3(2):3-9.
21. El-rabadi EGS. The Effect of Laboratory Experiments on the Upper Basic Stage Students Achievement in physics. *Journal of Education and Practice*. 2013; 4(8):62-71.
22. Fatin AP, Salleh A, Bilal A, Salmiza S. Faktor penyumbang kepada kemerosotan penyertaan pelajar dalam aliran sains: satu analisis sorotan tesis. Medc2012. https://doi.org/10.14221/ ajte.2011v36n3.2.
23. Gambari AI, Obielodan O, Kawu H. Effects of virtual laboratory on achievement levels and gender of secondary school Chemistry students in individualized and collaborative setting in Minna, Nigeria. *The Online Journal of New Horizons in Education*. 2017; 7(1):86-102.
24. Hodson D. A critical look at practical work in school science. School Science Review. 1990; 71(256):33-40.
25. Hodson RC. Physics at the Crossroads. College Park, MD: American Association of Physics Teachers, 1996.
26. Hirschfeld D. Interest in science careers wanes in Latin America. Retrieved, 2012.
27. Josiah MM. Effects of Practical Physics Knowledge on Students' Academic Achievement: A Study of Pankshin Local Government Area of Plateau State, Nigeria.

World Educators Forum, 2013, 2(1).
28. Kibirige I, Tsamago H. Learners' Performance in Physical Sciences Using Laboratory Investigations. International Journal of Educational Sciences. 2013; 5(4):425-432. https://doi.org/10.1080/09751122.2013.11890104
29. Liu S. Implementing Project-Based Learning in Physics and Statics Courses. In I121st ASEE Annual Conference & Exposition. Indianapolis, Indiana, 2014, 1-117.
30. Lunetta VN, Hofstein A, Clough MP. Learning and teaching in the school science laboratory: An analysis of research, theory, and practice. Handbook of Research on Science Education, 2007, 393-431.
31. Makgato M, Mji A. Factors associated with high school learners' poor performance: a spotlight on mathematics and physical science. South African Journal of Education. 2006; 26(2):253-266.
32. Mashita A, Norita M, Zurida HI. The effect of an individualized laboratory approach through microscale chemistry experimentation on students' understanding of chemistry concepts, motivation and attitudes. Chemistry Education Research and Practice. 2009; 10:53.
33. Millar R. The role of practical work in the teaching and learning of science. Paper prepared for the Committee: High School Science Laboratories: Role and Vision, National Academy of Sciences, Washington, DC, 2004.
34. Millar R, Abrahams I. Practical work: making it more effective, 91(September), 2009, 59-64.
35. Musasia AM, Abacha OA, Biyoyo ME. Effect of practical work in Physics on girls' performance, attitude change and skills acquisition in the Form Two-Form Three Secondary Schools'. International Journal of Humanities and Social Science. 2012; 2(23):151-166.
36. Musasia AM, Ocholla AA, Sakwa TW. Physics practical work and its influence on students' academic achievement. *Journal of Education and Practice. 2016;* 7(28):129-134.
37. Ng W, Nguyen VT. Investigating the integration of everyday phenomena and practical work in physics teaching in Vietnamese high schools. *International Education Journal*. 2006; 7(1):36-50.
38. Odubunmi O, Balogun TA. The effect of laboratory and lecture teaching methods on cognitive achievement in integrated science. *Journal of Research in Science Teaching. 1991;* 28(3):213-224.
39. Okam CC, Zakari II. "Impact of laboratory-based teaching strategy on students' attitudes and mastery of Chemistry in Katsina Metropolis", Katsina State, Nigeria. *International Journal of Innovative Research and Development*,. 2017; 6(1):112-121.
40. Osborne J. Science without literacy: A ship without a sail? *Cambridge Journal of Education. 2002;* 32(2):203-218.
41. Pett MA. *Nonparametric statistics for health care research: Statistics for small samples and unusual distributions*. USA: Sage Publications, 2016.
42. Ramnarain U. Teachers' use of questioning in supporting learners doing science investigations. *South African Journal of Education*. 2011; 31(1):91-101.
43. Rose AAR, Sattar R, Azlin NM, Zarina O, Lyndon N. Inculcation of science process skills in a science classroom. *Asian Social Science. 2013;* 9(8):47-57.
44. Sabri KS, Emuas AHM. The relationship between school laboratory experiments and academic achievement of Palestinian students in introductory university science courses. *Research in Post-Compulsory Education*. 1999; 4(1):87-96.
45. Salmiza S, Afik A. Teaching Practices among secondary school teachers in Malaysia. *International Proceedings of Economics Development and Research. 2012;* 47(14):63-67. https://doi.org/10.7763/IPEDR. 2012. V47. 14
46. Sani SS. Teachers' purposes and practices in implementing practical work at the lower secondary school level. *Procedia - Social and Behavioral Sciences. 2014;* 116(1996):1016-1020.
47. Odubunmi O, Balogun TA. The effect of laboratory and lecture teaching methods on cognitive achievement in integrated science. *Journal of Research in Science Teaching*. 1991; 28(3):213-224.
48. Okam CC, Zakari II. "Impact of laboratory-based teaching strategy on students' attitudes and mastery of Chemistry in Katsina Metropolis", Katsina State, Nigeria. *International Journal of Innovative Research and Development*. 2017; 6(1):112-121.
49. Osborne J. Science without literacy: A ship without a sail? *Cambridge Journal of Education*. 2002; 32(2):203-218.
50. Pett MA. *Nonparametric statistics for health care research: Statistics for small samples and unusual distributions*. USA: Sage Publications.
51. Ramnarain U. Teachers' use of questioning in supporting learners doing science investigations. *South African Journal of Education*. 2011; 31(1):91-101.
52. Rose AAR, Sattar R, Azlin NM, Zarina O, LyndonN. Inculcation of science process skills in a science classroom. *Asian Social Science*. 2013; 9(8):47-57
53. Sabri KS, Emuas AHM. The relationship between school laboratory experiments and academic achievement of Palestinian students in introductory university science courses. *Research in Post-Compulsory Education*. 1999; 4(1):87-96.
54. Salmiza S, Afik A. Teaching practices among secondary school teachers in Malaysia. *International Proceedings of Economics Development and Research. 2012;* 47(14):63-67. https://doi.org/10.7763/IPEDR. 2012. V47. 14
55. Sani SS. Teachers' purposes and practices in implementing practical work at the lower secondary school level. *Procedia - Social and Behavioral Sciences*. 2014; 116:1016-102.
56. Jegede SA, Adebayo JO. Enriching Physics Education in Nigeria towards Enhancing Sustainable Development. *Greener Journal of Educational Research*, 2013, 3(2).
57. Jegede OJ, Okota OE, Eniayeju PA. Raising the standard of performance in public examination in science, technology and mathematics. STAN Position, 1992, 4.
58. Mustapha MT. *Integrated Science lectures perception of practical NERDC, workshop on difficult concepts physics group report.* Nigerian Educational Research and Development Council, Lagos, 2002.
59. Ndu FOC. Planning and organization of practical work in biology in secondary schools. *Journal of Science Teachers Association, Nigeria IJSTAN*. 1980; 18:59.

60. Nzewi UM. Practical approach to the effective teaching of ecological concepts for sustainable development. *Science Teachers' Association of Nigeria (STAN) Biology Panel Series*, 2008, 1-6.
61. Olufunke BT. Effect of availability and utilization of Physics laboratory equipment on students' academic achievement in senior secondary school Physics. *World Journal of Education*, 2012, 2(5).
62. Omeodu MD. Impact of practical work in the teaching of Physics in secondary school in Rivers State. *International Journal of Education and Evaluation*, 2018, 4(5).
63. Onah DU, Ugwu EI. Factors which predict performance in secondary school physics in Ebonyi north educational zone of Ebonyi State, Nigeria. *Pelagia Research Library Advances in Applied Science Research*. 2010; 1(3):255-258.
64. Opong IK. Science education in Nigeria, the product of science. *Science Teachers Association of Nigeria*, 1981, 19(2).
65. Owolabi T. A diagnosis of students' difficulties in physics. *Educ. Perspectives*. 2004; 7:15-20.
66. Science Community Representing Education (SCORE). Practical Work In Science: A Report And Proposal For A Strategic Framework, 2009. http://www.score-education.org/media/3668/ report.pdf
67. Solomon J. Teaching children in the laboratory, unpublished Dissertation, University of Port Harcourt Nigeria, 1980.
68. Toplis R, Allen M. 'I do and I understand?' Practical work and laboratory use in United Kingdom schools. *Eurasia Journal of Mathematics, Science and Technology Education*. 2012; 8(1):3-9.
69. Vilaythong T, Popou O. The situation with practical work in physics Education in Laos's paper for xiii LOSTE symposium, 2008.
70. Woolnough R, Allsop F. Reconstructing theory from practical experience. In B.E. Woolnough, (Ed). *Practical science,* Milton Keynes: Open University press, 2001, 67-77.