

## SECONDARY SCHOOL PHYSICS TEACHERS' PERCEPTION OF EFFECTIVE TEACHING OF PHYSICS FOR SUSTAINABLE FUTURE

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### **Abstract**

This study employed a descriptive survey design to investigate secondary school physics teachers' perception of effective teaching of physics for sustainable future. The sample size for the study was 89 Senior Secondary School physics teachers from Umuahia Education zone of Abia State. Two research questions and one null hypothesis guided the study. The instrument for data collection is a researchers' developed structured questionnaire of the Likert type. The instrument was validated and the reliability coefficient was obtained as 0.82. Data collected was analyzed using mean for the research questions and chi-square ( $X^2$ ) test for the hypothesis. The study revealed that six main principles of effective teaching of physics for sustainable future were identified by physics teachers. They include first dealing with students' existing ideas and conceptions. A recommendation that physics teachers should put into consideration all these factors in their physics teaching for sustainable future was made.

Education has been described as the bedrock of every society and tool for nation building. The development of any nation is found to be linked to the quality of its education system. This has made quality of education an issue of global concern. Adegbesan (2011) opined that for quality education to be achieved in a nation, the principal actors of learning which are the teachers, learners and the environment must be cooperatively organized. The implication of this is that the teacher must be adequate both in quality and quantity. Education today must have the effect of making it possible for a country to have a steady supply of highly creative citizens who help to keep improving the

living conditions of the general citizenry and to solve problems that exist from time to time. According to Okobia (2012), the minds of the young need to be exposed to critical thinking, analysis and problem-solving strategies in a fast-changing world. Education is the most effective means that society possesses for confronting the challenges of the future. Indeed, education will shape the world of tomorrow. Progress of the citizenry increasingly depends upon the products of educated minds: upon research, invention, innovation and adaptation. Of course, educated minds and instincts are needed not only in laboratories and research institutes, but in every walk of life. It can be said that access to education is very essential and necessary for effective participation in the life of the modern world at all levels.

Science as the study of living and non-living things in the environment covers nutrition, health, transport, farming and other aspects of human endeavour. It is an intellectual activity carried out by humans to discover facts about events and the natural world in which we live (Gothlieb, 2008). Science plays a major role in all human activities arising from our daily living for us to cope and adapt to our environmental demands. Physics which is one of the sciences is very crucial to understanding the world around us, the world inside us and the world beyond us. Physics is an international enterprise which plays a key role in the future progress of humankind. For a nation to develop a sound basis for modern technology, the study of physics which enhances an understanding of the interplay of forces which forms veritable armour

against superstition anywhere is essential and very much needed. The implication is that Nigeria cannot develop technologically if the quality of the teaching and learning of physics in her secondary schools is not assured. Obioma (2012) is of the view that quality of teaching and learning is determined by the quality of instructional materials used by the teachers and teachers' adequate use of daily lesson plan among other factors.

Quality teaching and learning of physics requires a unified and comprehensive approach relying on teachers professionally trained and equipped with requisite knowledge and skills. The role of the teachers in any educational system cannot be over emphasized. The teachers are responsible for the translation and implementation of educational policies and curriculum together with the all-round achievement of the child. Effective teaching according to Gmer (2004) requires teachers to check continuously the development of students understanding and give detailed positive feedback in order to make sure that students correctly integrate new knowledge into the existing knowledge structure. Teachers also need to continuously monitor and evaluate students' understanding in order to identify and correct their mistakes early enough before they become too deeply embedded (Hipkiri, Bolstad, Baker, Jones, Barker, Bell, Coll, Cooper, Forret, France, Haigh, Harlow and Tayhor, 2002). The physics teacher needs to understand his subject matter in ways that promote learning. He needs to help students acquire knowledge within the subject area in order that they meet the challenges of a scientific technological world. The availability of high quality physics teachers in adequate number is a necessity if the goal of our developing technologically is to be realized. The adoption of student centred instruction strategies like inquiry method, discovery method, discussion role play, games and other similar strategies have been shown to enhance active participation of students

in the teaching and learning of physics. Consequent to this, the teacher's ingenuity in improvising, adapting and maximizing the utilization of the scarce and often insufficient instructional materials can have tremendous impact in the successful teaching and learning of physics.

The emphasis on physics education is on the delivery of physics knowledge and skills. This implies that the quality assurance of physics education is focused on how well physics teaching and learning are organized to deliver the necessary knowledge and skills to the students; how well physics teachers' teaching can be improved in a given time period and how well the delivery of physics knowledge and skills to the student can be ensured through the improvement of teaching and learning. It is therefore not an over statement to say that physics education must be a vital part of all efforts to imagine and create new relations among people and to foster greater respect for the needs of the environment. Physics education can ensure that all citizens, young and old, are knowledgeable about the changes that are needed, capable of envisioning alternative futures, committed to democratic ways of achieving them, and sufficiently skilled and motivated to work actively for change. This is Physics Education for Sustainable Future.

Education for Sustainability is a lifelong learning process that leads to an informed and involved citizenry having the creative problem solving skills, scientific and social literacy, and commitment to engage in responsible individual and co-operative actions. These actions will help ensure an environmentally sound and economically prosperous future. Sustainability requires knowledge and understanding of past events as well as the ability to make informed predictions of future events. Education for Sustainability has the potential to serve as a tool for building stronger bridges between the

classroom and business, and between schools and communities. Solving environmental problems and preventing new ones from arising will require an understanding and appreciation of the linkages between environmental well-being and human well-being. According to Ayodele (2007) Education for sustainable development represents a catalytic process for social change that seeks to foster through education training and public awareness- the values, behaviour and lifestyles required for a sustainable future. Physics education for sustainable future is to make equitable decisions and to conduct activities so that human health and well-being, the environment, and the economy can be improved and maintained for future generations. It requires understanding not just of social environmental and economic issues, but of their ongoing interrelationship and interdependence. The process of sustainable decision making involves a critical examination of our priorities, habits, beliefs, and values. Physics education therefore becomes very crucial in bringing environmental and developmental concerns to people's notice, enabling them to understand the linkages between the two, encouraging them to take appropriate action, and equipping them with the skills necessary for taking the required action. Physics education can play a major role in supporting national development and meeting the needs and aspirations of a society. While the relationship between physics education and sustainable development is complex, education is the key to a nation's ability to develop and achieve sustainable development, especially when it is directed to providing skills for work in new industries, enhancing the status of women, promoting environmental protection, developing capacities for informed and ethical decision-making, and improving the quality of life for all. This study therefore investigated secondary school teachers' perception of effective teaching of physics for sustainable future.

### **Research Questions**

The following research questions guided the study.

1. What are the mean scores of physics teachers' perception of effective teaching of physics for sustainable future?
2. What are the mean scores of male and female physics teachers' perception of effective teaching of physics for sustainable future?

### **Hypothesis**

The following null hypothesis was tested at 0.05 level of significance guided the study.

1. There is no significant difference in the mean scores of male and female physics teachers' perception of effective teaching of physics for sustainable future?

### **Methodology**

The study adopted descriptive survey design. A sample of eighty-nine (89) physics teachers was used for the study. The instrument for data collection was a researcher's developed structured questionnaire of the Likert type on the secondary school physics teachers' perception of effective teaching and evaluation. The responses are Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD) weighted 4, 3, 2, and 1, respectively. It is a six-item questionnaire that is made up of principles that can be used for effective teaching and evaluation in physics to help students acquire scientific skills and knowledge. The instrument was evaluated by one expert in test and measurement and two others who are physics education specialists. The reliability index was determined by cronbach alpha and found to be 0.82. The questionnaires were distributed by the researcher and collected back to ensure 100 percent return. The research questions were answered using mean while the hypothesis was tested using chi-square statistics at 0.05 level of significance.

**Findings**

The results got from the study are presented in the tables below.

**Table 1: Mean Scores of Teachers Perception of Principles of Effective Teaching of Physics for Sustainable Future**

S/N	ITEM	SA	A	D	SD	Mean(X)
1.	Dealing with students' existing Ideas and conceptions.	64	15	8	2	3.19
2.	Encouraging students to new concepts of skills into different contexts.	60	22	7	-	3.20
3.	Encouraging students participation in lessons.	65	19	4	1	3.26
4.	Encouraging student inquiry	78	8	2	1	3.41
5.	Encouraging co-operative learning amongst students.	69	10	9	1	3.25
6.	Offering continuous assessment and providing corrective feedback	60	28	1	-	3.26

Result in table 1 above shows that all the items have mean between 3.19 and 3.41 which is greater than 2.5 being the mean of the four point scale used. This shows that all the physics teachers agree that all these activities will contribute to effective teaching of physics for sustainable future.

**Table 2: Mean Scores of Male and Female Teachers Perception of Principles of Effective Teaching of Physics for Sustainable Future**

	SA	A	D	SD	TOTAL
Male	57 (268)	287 (59)	45	10	- 342
Female	22	84	37	11	- 132

(103) (53) (6)  
**Total** 371 82 21 474  
 $X^2_{cal} = 22.52, X^2_{tab} = 7.82, df = 3$

Since  $X^2_{cal}$  is more than  $X^2_{tab}$ , the null hypothesis of no significant difference in the mean scores of male and female physics teachers' perception of effective teaching of physics for sustainable future is rejected. This means that there is a significant difference between the opinion of males and females as to the principles for effective teaching and evaluation in physics.

**Discussion**

From table 1, all the items had mean values above 2.5 showing that all the physics teachers opined that all the items are principles for effective teaching and evaluation in physics. This is in agreement with Trowbridge, Boybee and Powell (2000) who opined that for effective learning to occur, teachers should first identify students' prior ideas, make students aware of them and, in the light of these ideas help students construct their own understanding after which teachers are to provide opportunities for students to apply their newly acquired knowledge to different situations. This is also in agreement with Amos (2002) who is of the opinion that student – centred learning has promoted and brought about greater student participation and involvement and this can be achieved by taking into consideration the course of the lesson. Also this is in line with Stepanek, (2000) who suggested that for cognitive conflict to be fostered in students, they need opportunities to pose questions about physics, to work with others, to conduct investigations, present and defend their ideas, solutions and findings and assess their own and other students' reasoning. From table 2, it is observed that the hypothesis was rejected and the alternative accepted which means that gender played a role.

### Conclusion

The study revealed that for effective teaching of science and physics to occur teachers have to be exposed to six principles of effective teaching in physics which are dealing with students existing ideas and conception, encouraging students to apply new concepts or skills into different contexts, encouraging students participation in lesson, encouraging students inquiring, encouraging co-operative learning among students and offering continuous assessment and providing corrective feedback.

### Recommendations

For the accomplishment of these principles, the following recommendations are made.

1. Classroom teachers are advised to use teaching methods and activities as question and answer, discussions which can be either for small groups or the whole class, practical work and ICT facilities.
2. Students should be encouraged to participate fully in the learning process.
3. There should also be continuous assessment of students' understanding by the teachers and students should be provided with detailed performance feedback in order to improve students understanding and learning.

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