

Full Length Research

# Teachers' Knowledge and Utilization of 5E Instructional Model in Science Classrooms in Gindiri School for the Blind, Mangu LGA, Plateau State

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## Abstract

The study examined teachers' knowledge and utilization of 5E instructional model in Science classrooms in Gindiri School for the Blind, Mangu LGA, Plateau State. The descriptive survey research design was adopted for the study. The sample of the study comprised of all primary school teachers of Gindiri School for the Blind, Mangu LGA, and Plateau State. The total number of 14 teachers of pupils with visual impairment made up the sample of the study. The instrument used for this study was the Teachers Knowledge and Use of 5E Instructional Model Questionnaire. It is a five point attitude scale questionnaire where respondents will be required to tick the option (strongly agree, agree, undecided, disagree and strongly disagree). The research questions were answered using mean. Among the major findings of the study indicates that teachers are not conversant or knowledgeable with the 5E instructional model do not utilize it in teaching science to pupils with visual impairment. It was however recommended teachers of pupils with visual impairment should employ the use of 5E instructional method for teaching and learning to ensure that pupils with visual impairment benefit maximally for instruction.

**Keywords:** 5E Instructional Method, Special Needs Education, Pupils with Visual Impairment.

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## INTRODUCTION

Pupils with visual impairment frequently miss out on lessons because teachers often lack the knowledge and skills to make appropriate accommodations for them. This is particularly evident in teaching Basic Science and Technology concepts to pupils with visual impairment which often pose a serious challenge in science classrooms. Kumar, Ramsamy and Stefanich (2011) observe that pupils with visual impairment are often restrained (due to vision loss) from the highly enriching experiences that should enable them understand concepts easily. However, overcoming these barriers (teaching methods, facilities, environmental, curriculum and activities, limited expectations amongst others) in

teaching/learning activities is critical in stimulating the intellectual growth of pupils with visual impairment.

The Individuals with Disabilities Education Act (IDEA) (2013) defines visual impairment as vision loss which adversely affects a child's educational performance. Visual impairment is classified in degrees: a) total blindness: visual acuity worse or less than 20/200 including light perception and nil light perception in the better eye with the best corrected vision. b) low vision: visual acuity worse or less than 20/70 and 20/100 including light perception and nil light perception) in the better eye with the best corrected vision. The term is also classified based as onset or advent of visual impairment which includes; a) congenital impairment: this refers to vision loss that occurs from birth or immediately following birth and occurs before visual memory has been established while b) adventitious impairment: this refers to vision loss that is acquired after birth to adulthood and occurs after visual memory has been established

Over the years, Science teaching has relied on methods that train pupils to follow directions with little connection to inquiry based teaching methods and pupils have become accustomed to this method of learning, most of which do not form a deep conceptual understanding of Basic Science and Technology (Nadelson, Williams & Turner, 2005). The most prominent among these methods is the text book approach which is more challenging to pupils with visual impairment due to lack of vision to see diagrams and illustrations replete in text books. Pupils are also unable to carry out experiments, measurements and observation which are core activities in explaining and describing concepts in Basic Science and Technology lessons. The Education Development Centre (2007) asserts that 38% of pupils with visual impairment hardly receive any instruction in Science and 90% of teachers who teach Basic Science to pupils with visual impairment often employ the text book approach in teaching.

Consequently, there is a total dissatisfaction on how science is still traditionally being taught to pupils with visual impairment (Yaksat & Hill, 1994). This dissatisfaction and its inherent challenges have led to a major shift towards inquiry based practices in the teaching and learning of Basic Science and Technology. This major shift towards inquiry based approaches in science has led to the development of the 5E instructional model.

## **STATEMENT OF THE PROBLEM**

The perspective of teachers towards teaching Science to pupils with visual impairment has been negative over the years. This implies that they find it more challenging to adapt teaching/learning strategies in teaching Science. Pupils with visual impairment often find it challenging to understand difficult science concepts (Adelakun, 2000). As a result, pupils with visual impairment often miss out on science lessons and find it difficult to understand certain basic Science concepts. This is perhaps due to the fact that teachers are often unaware of the need to adopt inquiry based instructional strategies in teaching basic science to pupils with visual impairment in primary schools. Hence, teachers often rely on the textbook approach which does not suit the special learning needs of these categories of pupils. The use of text book approach is mostly depicted by diagrams, pictures and illustrations that are not accessible to pupils with visual impairment. Therefore, appropriate accommodations in meeting their learning needs in the Science classroom are necessary.

## **REVIEW OF RELATED LITERATURE**

Literature is replete with the 'E' learning circle models such as 3E, 4E, 5E, 6E, and 7E. This study is hinged on the 5E instructional model. The 5E model is an example of a structured inquiry learning circle approach developed in the mid 1980's by principal investigator Roger Bybee and his team members: Joseph Taylor, April Gardner, Pamela Scotter, Janet Powell, Anne Westbrook, and Nancy Landes. It was developed specifically for Science programmes and it is used in the Biological Science Curriculum Study (BSCS). The model is aimed at transforming the teaching and learning of science that is based on most recent research, ensures scientific accuracy, includes field test with diverse pupils (including pupils with visual impairment) in diverse settings and upholds the principle of universal design for learning amongst others (Bybee, Taylor, Gardner, Scotter, Powell, Westbrook & Landes, 2006).

The 5E Instructional Model as the name implies, constitutes five discrete elements that is: Engagement; Exploration; Explanation; Elaboration and Evaluation.

### The Five Stages of the 5E Instructional Model

STAGE	STRATEGY
ENGAGE	Elicit thoughts or actions by the student that relate directly to the lesson's objective.
EXPLORE	Experiences where students' current understandings are challenged by activities, discussions and currently held concepts to explain experiences.
EXPLAIN	Presentations of scientific concepts that change students' explanations to align with scientific explanations.
ELABORATE	Activities that require the applications and use of scientific concepts and vocabulary in new situations.
EVALUATE	Culminating activity that provides the student and the teacher with an opportunity to access scientific understanding and intellectual abilities.

Source: The BSCS 5E Instructional Model: Origins, Effectiveness and Applications.

As depicted in the diagram above, each phase of the model, according to the Biological Science Curriculum Study (BSCS, 2015) indicates its purpose from both teachers and pupils' perspectives to include: engagement (pupils prior knowledge accessed and interest engaged in the phenomenon); exploration (pupils participate in an activity that facilitates conceptual change); explanation (pupils generate an explanation of the phenomenon); elaboration (pupils understanding of the phenomenon is challenged and deepened through new experiences) and evaluation (pupils assess their understanding of the phenomenon). The exploration phase is very important for pupils with visual impairment as it gives them the opportunity to explore (examine) real objects or models of objects tactually while the elaboration phase gives them the opportunity to clear doubts or misconceptions that may arise after the exploration phase. This study is hinged on the cognitive constructivism theory propounded by Piaget in 1972. Piaget depicts an individuals' reaction to teaching and learning experiences that lead to/fail to promote learning and concluded that humans learn through the construction of progressively complex logical structures from infancy through adulthood. The constructivism theory is based on the premise of successive knowledge building that increases in depth and complexity from stage to stage.

### PURPOSE OF THE STUDY

The purpose of this study is to examine teachers' knowledge and utilization of 5E instructional model in Science classrooms in Gindiri School for the Blind, Mangu LGA, Plateau State. The specific objectives of the study are to:

1. Identify the instructional models utilized by teachers of pupils with visual impairment Science classrooms.
2. Ascertain the extent to which teachers of pupils with visual impairment are knowledgeable about 5E instructional model
3. Determine the extent to which teachers of pupils with visual impairment use 5E instructional model in Science classrooms.
4. Determine the extent to which teachers of pupils with visual impairment are willing to use 5E instructional model in Science classrooms.

### RESEARCH QUESTIONS

In order to achieve the above objectives, the study was guided by the following research questions.

1. What are the instructional models utilized by teachers of pupils with visual impairment Science classrooms?
2. To what extent do teachers of pupils with visual impairment knowledgeable about 5E instructional model?
3. To what extent do teachers of pupils with visual impairment use 5E instructional model in Science classrooms?
4. To what extent are teachers of pupils with visual impairment willing to use 5E instructional model in Science classrooms?

## METHODOLOGY

The descriptive survey research was adopted for this study. The study population comprised of teachers of pupils with visual impairment. The sample of the study comprised of all 14 (fourteen) teachers of pupils with visual impairment of Gindiri school for the blind, Mangu LGA, Plateau State. The total number of 14 teachers of pupils with visual impairment made up the sample of the study. The instrument used for this study was *the Teachers Knowledge and Use of 5E Instructional Model Questionnaire*. It is a five point attitude scale questionnaire where respondents will be required to tick the option (Strongly Agree (SA), Agree (A), Undecided (U), Disagree (DA) and Strongly Disagree (SD). The questionnaire comprised of 20 items and two sections. Section A sought the responses of teachers' personal data while section B sought responses on teachers' knowledge and utilization of 5E instructional model in Science classrooms in Gindiri School for the Blind, Mangu LGA, and Plateau State. The questionnaires were given to all teachers of pupils with visual impairment in order to get their response.

## RESULTS AND DISCUSSION

The data gathered were analyzed and presented in the tables below:

### Research Question One: What are the instructional models utilized by teachers of pupils with visual impairment Science classrooms?

**Table 1.** Responses on instructional models utilized by teachers of pupils with visual impairment Science classrooms

S/N	QUESTION	SA	A	U	D	SD
1	Pupils with visual impairments require specialized instructional models in science classrooms in order to benefit from instruction	12 (85%)	2 (15%)	-	-	
2	As a classroom teacher, I adopt instructional models in teaching Science as well as other subjects to pupils with visual impairment	-	4 (29%)	-	6 (42%)	4 (29%)
3	Instructional models are inevitable in teaching science to pupils with visual impairment.	14 (100%)	-	-	-	-
4	I am aware of instructional models in teaching science pupils with visual impairment	10 (71%)	-	-	4 (29%)	-
5	I am not aware of scientific models used in teaching especially in science classrooms	4 (29%)	-	-	10 (71%)	

In table 1 above, 85% and 15% of teachers strongly agree and agree that pupils with visual impairments require specialized instructional models in science classrooms in order to benefit from instruction. Consequently, 29% of teachers agreed that they adopt instructional models in teaching Science as well as other subjects to pupils with visual impairment while 42% and 29% disagreed to this assertion. In addition, all teachers agreed to the statement that instructional models are inevitable in teaching science to pupils with visual impairment. A total of 71% of teachers are aware of instructional models in teaching science pupils with visual impairment while 4% of teachers are not aware. In the same vein, 29% of teachers are not aware of scientific models used in teaching especially in science classrooms while 71% are aware of scientific models used in teaching especially in science classrooms.

**Research Question Two: To what extent do teachers of pupils with visual impairment knowledgeable about 5E instructional model?**

**Table 2.** Responses on extent do teachers of pupils with visual impairment knowledgeable about 5E instructional model

S/N	QUESTION	SA	A	U	D	DA
6	I am conversant with 5E the instructional model in teaching science	-	-	-	14 (100%)	-
7	The 5E instructional model is well known amongst Science teachers in primary schools	-	-	-	7 (50%)	7 (50%)
8	I am aware that 5E instructional model is commonly used amongst teachers in science classrooms	-	-	7 (50%)	7 (50%)	-
9	Most teachers are not conversant with 5E instructional model and do not use it in science classrooms	14 (100%)	-	-	-	-
10	Teachers are aware of instructional models in teaching science but do not adopt them in science classrooms	8 (57%)	6 (43%)	-	-	-

As indicated in table 2, all (100%) respondents are not conversant with 5E the instructional model in teaching science. In addition, all teachers disagreed with the assertion that the 5E instructional model is well known amongst Science teachers in primary schools. 50% of teachers are undecided while 50% disagreed that they are aware that 5E instructional model is commonly used amongst teachers in science classrooms. Similarly, all 100% of teachers believe that most teachers are not conversant with 5E instructional model and do not use it in science classrooms. Moreover, 57% and 43% of teachers strongly agree and agree respectively that with the assertion that teachers are aware of instructional models in teaching science but do not adopt them in science classrooms.

**Research Question Three: To what extent do teachers of pupils with visual impairment use 5E instructional model in Science classrooms?**

**Table 3.** Responses on the extent to which teachers of pupils with visual impairment use 5E instructional model in Science classrooms

S/N	QUESTION	SA	A	U	D	SD
11	I often utilize the 5E instructional model in Science classrooms.	-	-	-	7 (50%)	7 (50%)
12	I sometimes utilize the 5E instructional model in Science classrooms.	-	-	4 (29%)	10 (71%)	-
13	I rarely utilize the 5E instructional model in Science classrooms.	8 (57%)	6 (43%)	-	-	-
14	I have never utilized the 5E instructional model in Science classrooms.	14 (100%)	-	-	-	-

Table 3 shows that 100 % of teachers are of the view that teachers often utilize the 5E instructional model in Science classrooms. Moreover, 71% teachers disagreed and also 29% of the teachers are undecided with the assertion that teachers sometimes utilize the 5E instructional model in Science classrooms. However, All 100% of teachers have never utilized the 5E instructional model in Science classrooms.

### Research Question Four: To what extent are teachers of pupils with visual impairment willing to use 5E instructional model in Science classrooms?

**Table 4.** Responses on extent are teachers of pupils with visual impairment willing to use 5E instructional model in Science classrooms

S/N	QUESTION	SA	A	U	D	SD
17	I will utilize the 5E instructional model in teaching Science in my Science class	14 (100%)	-	-	-	-
18	I am not willing to utilize the 5E instructional model in my Science class.	-	-	-	7 (50%)	7 (50%)
19	The 5E instructional model is inevitable in science classrooms especially for pupils with visual impairment	12 (85%)	2 (15%)	-	-	-
20	Science can be effectively taught to pupils with visual impairment if 5E model is adopted and utilized by Science teachers.	14 (100%)	-	-	-	-

In table 4, all 100% of the teachers strongly agreed that they will utilize the 5E instructional model in teaching Science in their Science classes. Similarly, all teachers strongly agreed that 5E instructional model is inevitable in science classrooms especially for pupils with visual impairment. All 100% of the teachers strongly agreed that Science can be effectively taught to pupils with visual impairment if 5E model is adopted and utilized by Science teachers.

## DISCUSSION OF FINDINGS

The findings of this study revealed that teachers are not aware of instructional models in teaching science pupils with visual impairment and do not adopt these instructional models in teaching Science as well as other subjects to pupils with visual impairment. The findings also indicated that teachers are not conversant with 5E the instructional model in teaching science and the model is not well known amongst Science teachers in primary schools. This finding is in line with the assertion by Lewis, Dema and Harshbarger (2014) which states that elementary science teaching and learning has many challenges which are basically hinged on effective education of teachers. Consequently the study revealed that teachers are aware of some instructional models in teaching science but do not adopt these models in science classrooms teachers never utilize the 5E instructional model in Science classrooms. Moreover, teachers are of the view that they do not utilize the 5E instructional model in Science classrooms for pupils with visual impairment.

The findings of the study revealed that all teachers strongly agreed that they will utilize the 5E instructional model in teaching Science in their Science classes and 5E instructional model is inevitable in science classrooms especially for pupils with visual impairment. According to Franklin (2005), it is possible for pupils with visual impairment to function maximally in Basic Science classrooms when appropriate methods of instruction are used to suit their unique learning needs. The teachers are also of the view that Science can be effectively taught to pupils with visual impairment if 5E model is adopted and utilized by Science teachers. In addition the findings of this study agree with findings of Ansberry and Morgan (2007) which states that the 5E learning circle model provides a planned sequence of instruction that places students at the center of their learning experiences, encouraging them to explore, construct their own understanding of scientific concepts and relate those understandings to other concepts.

## CONCLUSION AND A WAY FORWARD

The teachers of pupils with visual impairment should be able to adopt inquiry based instructional strategies that are appropriate for their pupils/students with visual impairment. Training and re-training should be provided to motivate teachers' interest in the use and application of inquiry based Science teaching methods such as the 5E Instructional model and also explore the effectiveness of modern teaching methods in Science teaching and learning. This will help to draw the attention of teachers to use modern knowledge or instructional methods that are inquiry based in teaching science as well as providing the suitable educational and environmental conditions necessary to apply them. Hopefully, the teachers will learn to act as facilitators in Science classrooms because the pupils will also embark on the creation of knowledge and ideas themselves.

More so, 5E instructional model will be of great benefit to pupils with visual impairment when teachers successfully adopt the use of 5E Instructional model in teaching. Pupils will be able to assimilate and understand Science concepts better. It will stimulate their curiosity to learn which would result in their active processing of information by themselves, develop their thinking skills and creativity in problem solving, promote the active participation of pupils with visual impairment in the learning process and also enable them hopefully take Science based courses at the secondary and tertiary levels of education.

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