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## Using of Inclusive Education to Enhance the Teaching of Chemistry to the Visually Impaired Students in Secondary Schools

Authors

**Omiko, A.<sup>1</sup>, Igwe, I. O.<sup>2</sup>, Ukpa, J. I.<sup>3</sup>**<sup>1</sup>Department of Science Education, Faculty of Education, Ebonyi State University, Abakaliki,  
Email: [akaniomiko@gmail.com](mailto:akaniomiko@gmail.com).<sup>2</sup>Department of Educational Foundation, Faculty of Education, Ebonyi State University, Abakaliki  
E-mail: [igweiheanyi27@gmail.com](mailto:igweiheanyi27@gmail.com)<sup>3</sup>Department of Science Education, Faculty of Education, Ebonyi State University, Abakaliki

### Abstract

*This study focused on the use of inclusive education to enhance the teaching of chemistry to the visually impaired students in Ebonyi State of Nigeria. Three research questions and two hypotheses guided the study. Questionnaire was the instrument used for data collection while mean and standard deviation were the statistical tools used in the data analysis. The results of the data analysis revealed that visually impaired students are excluded from the study of chemistry, because it deals with physical and dangerous chemicals and it is also practical oriented. Based on the findings, the researcher made the following recommendations; chemistry teacher and the government should provide good and enabling environment for inclusive education, the science (chemistry) teachers should ensure the use of better classroom strategy which would give every learner equal opportunity to learn and practice what he/she has learnt in chemistry.*

### Introduction

“Inclusion” has become a catch phrase not only among the educationist, but among administrators, policy makers/implementers, human right advocates, (particularly those who advocate for the right of people with disabilities and those who advocate for educational justice and empowerment of vulnerable members of the society).

Inclusion in Education is an approach of educating learners with special education needs. Under the inclusion model, students with special needs spend most or all their time with non-disabled students. UNESCO (2003) defined inclusive education as a developmental approach that seeks to address the learning needs of all children, youth and adults with a specific focus on those who are vulnerable to marginalization and exclusion. Many international declarations have legitimated the idea of inclusion in education system.

Education is derived from Latin word educare which means to bring up, to lead out, to rise up and finally to educate. Hence education simply refers to the totality of efforts geared towards raising the social, political, economic and intellectual life of the people in the society (Taiwo, 1986).

Education can also be seen as the sum-total of all the experiences, both formal and informal which an individual comes across in the journey of life. Education also means helping people to learn how to do things and encouraging them to think about what they learn. It is also important for educators to teach learners ways to find and use information. Through education, the knowledge of the society, country, and the entire world is passed on from generation to generation.

Inclusive education is a relatively controversial topic for many parents and educators. Inclusive

education is an idea in the field of education in which students with special needs will be placed in the same classroom environment with other students who do not have special needs. This idea comes from the idea of social justice, which demands that all people have common right without any discrimination. In the educational sector, the desire to attain education for all (EFA) by 2015, has propelled the advocates of EFA to start looking for ways in which they can overcome the barriers to inclusion and participation of the vulnerable members of the society face.

Some stakeholders in the EFA have been critical of the omission of people with disabilities in the millennium development goals (MDGS). (Omiko, 2010) observed that inclusive education is a pairing of philosophy and pedagogical practices that allow each student to feel respected, confident and save so that he or she can learn and develop to his or her full potential. It is based on a system of values and beliefs centred on the best interest of the students, which promotes social cohesion, belonging and active participation in learning a complete school experience and positive interactions with peers and others in the school community.

Within inclusive education, there are two main braches of thinking: mainstreaming and full inclusion. Mainstreaming is a process that allows children with special needs to enter certain standard classroom after they had shown the ability to keep up with the rest of their peers. Full inclusion puts students with special needs in standard classroom environment without testing or demonstration of skills. Despite the complexity of inclusive education, many countries have seen the importance of educating children together, regardless of their abilities. The inclusive education philosophy recognizes and appreciates that all humans have a right to social services regardless of their abilities/capabilities (Cameron and Valentine, 2011). It focuses on the need to foster people's participation and eliminating all forms of discrimination in the society. The philosophy of inclusion is thus important in

ensuring that people develop social skills needed for their daily living (Noyoo, 2000).

Chemistry is a branch of science which deals with the study of matter, its compositions, reactions and its physical and chemical structures. Okeke (2000) and Omiko (2016) observed that students who do well in biology and chemistry could have prospects of becoming-medical doctors, Engineers, Nurses, pharmacists, Biology teachers, chemistry teachers, medical technologist, food technologist among others. For effective learning in chemistry to take place, the chemistry teacher has to consider the disabled learners in the class, such disabled learners include; the hearing impaired learners, visually impaired learners and learners with communication disorders, emotional and behavioural disorders, physical disabilities, and developmental disabilities (mentally retarded learners). But this study focused on the visually impaired learners.

The visually impaired learners, according to Chapman and Stone (1988), are those learners who have difficulty in seeing which necessitate the use of special educational methods or materials and who need to use special aid and equipment for learning. Visually impaired can be classified under the following:

- Visually handicapped (which includes the blind, the low vision and the partially sighted).
- Long sighted or hypermetropia
- Short sighted or myopia
- Astigmatism (blurred sighted).
- Presbyopia

Visually impaired children are always excluded from the study of chemistry because chemistry deals with physical objects or substances that are harmful if not properly handled. But the students need the knowledge of chemistry for their understanding of the composition of materials in their environment and also for their academic ambition in science.

### Statement of the Problem

The visually impaired learners are excluded from the study of chemistry because the subject is visually and practical oriented, but they need the knowledge of chemistry for their understanding of the world around them and also for their academic development, which will equally enable them to be contributing members of their community.

Chemistry as a science subject does not just depend on theory but practical which would help in the practice of the theory. This has resulted to the academic failure of students with special education problems and however, dropping out of school. These young stars end up in doing minor jobs such as begging at school age.

Therefore, the problem of this study is to find out the influence of inclusive education on the teaching of chemistry to visually impaired learners in secondary schools in Ebonyi State of Nigeria.

### Purpose of the Study

The focus of this study was to determine how the learning of chemistry could be enhanced by inclusive education strategy for the visually impaired learners.

1. How inclusive education could improve the teaching of chemistry to visually impaired learners.
2. How inclusive education during the teaching and learning of chemistry could improve the learning outcome of visually impaired learners.
3. How inclusive education could enhance effective participation of visually impaired learners in the teacher of chemistry.

### Significance of the Study

The findings of this study will be of great help to the following stakeholders in education, the teachers, Ministry of Education, the government and the learners (visually impaired learners).

- **The Teachers:** The findings of this study will help teachers to acquaint themselves with the knowledge, ideas, skills etc on the use of learning mediation in making teaching and learning of chemistry subject

more meaningful and less difficult for the visually impaired learners.

- **Ministry of Education:** The findings and results of this study will help the ministry of education in curriculum planning for the disabled learners and equally for the policy of inclusive Education for the visually impaired learners.
- **The Government:** The findings of this study will help the government to give concrete meaning to the idea of equal educational opportunities for all children irrespective of their physical, mental, visual, emotional and behavioural disabilities. Also to provide adequate education for all disabled children and adult in other that they may fully play their roles in the development of the nation.
- **The Learners:** The results of the findings would help to increase the knowledge of the learners and other future researchers on their studies that may have similar or related topics.
- **The Parents:** The findings of this study will be useful to parents by making them to appreciate and believed that their children with disabilities are not useless in their family and the society, and that with the aim of inclusive education, their disabled children can be useful in future.

### Research Questions

The following research questions guided the study

1. How does inclusive education enhance the teaching of chemistry to the visually impaired learners?
2. How does inclusive education improve the visually impaired learners' learning outcomes specified for chemistry students?
3. How does inclusive education foster effective participation of learners with visual impairment in learning of chemistry with normal learners?

### Hypotheses

The following null hypotheses tested at 0.05 level of significance guided this study:

**Ho<sub>1</sub>:** There is no significant difference on the mean ratings of the visually impaired students and the normal students on how inclusive education could improve learning outcome in chemistry.

**Ho<sub>2</sub>:** There is no significant difference between the mean score of visually impaired students and normal students on effective participation in the teaching of chemistry.

### Research Method

**Design of the Study:** The design of this study is descriptive survey. It aimed at discussing a study of inclusive education and its effects on the teaching of chemistry to the visually impaired learners in secondary schools in Ebonyi State of Nigeria.

Nworgu (2006) viewed survey research as one in which a group of people or items considered to be the representative sample of the entire group are studied. He observed that descriptive survey studies aim at collecting data and describing in a systematic manner, the characteristics features or facts about a given population. This descriptive design was used by the researcher because it is only interested in describing certain variables in relation to the population.

### Scope of the Study

This study was conducted in the three education zones of Ebonyi State. Three (3) secondary schools were selected from two of the education zones (Abakaliki and Onueke Zones) and four (4) secondary schools in Afikpo Education Zone, special schools for the blind from each of the three zones were included in the schools selected for the study.

### Population of the Study

The population of the study comprised all the chemistry teachers in the ten (10) secondary schools in the three educational zones of Ebonyi State. The population of the chemistry teachers in the ten (10) secondary schools was 24. The researcher did not include the students in the population of the study because they are visually

impaired and cannot fill or respond to the questionnaire.

### Sample and Sampling Technique

Simple random sampling technique was used in selecting the respondents of this study. The 24 chemistry teachers from the ten (10) selected secondary schools which formed the population of the study were also used as the sample of this study because of its small size.

### Instrument for Data Collection

The instrument for data collection was structured questionnaire. The questionnaire was constructed by the researchers and it contained sixteen statement items. A four point scale of strongly Agree, Agree, Disagree and Strongly disagree were used in answering or responding to the questionnaire items. The four point rating scale's were assigned numerical values as follows:

Strongly Agree (SA)	=	4
Agree (A)	=	3
Disagree (D)	=	2
Strongly Disagree (SD)	=	1

### Validation of the Instrument

Three (3) experts validated the instrument, one from chemistry education, one from measurement and evaluation and one from the school of the blind. They validated the instrument based on its language adequacy, wordings and clarity of the items of the instrument.

### Reliability of the Instrument

After the face and construct validation of the instrument, it contained 20 items. The questionnaire was administered to 24 chemistry students in secondary schools outside the study area. The data obtained were used to calculate the reliability coefficient of the instrument using Cronbach Alpha approach. The data analysis gave a reliability coefficient of 0.73

### Method of Data Collection

Hundred (100) copies of questionnaire were distributed to the respondents (chemistry teachers) in the selected secondary schools. The teachers responded to the items of the questionnaires. The researchers collected the completed (filled) copies of questionnaire from the respondents on the spot

to ensure maximum return of the instrument and also to obtain first hand information from them.

### Method of Data Analysis

The data collected were analyzed using mean and standard deviation. The nominal values were calculated using the formula.

$$\bar{x} = \frac{\sum fx}{N}$$

Where  $\bar{x}$  = mean

$\sum$  = summation

$\bar{x}$  = scores

N = number of items

**Decision Rule:** using the points assigned to the responses, we have.

$$\frac{4 \times 1 + 3 \times 1 + 2 \times 1 + 1 \times 1}{4} = \frac{10}{4} = 2.5$$

**Table 1:** Mean Results on how Inclusive Education enhances the Teaching of Chemistry to the Visually Impaired Learners.

S/N	ITEM	SA	A	D	SD	$\bar{x}$	S.D	Interpreted
1.	Inclusive education creates a platform for chemistry teacher to inculcate knowledge to his or her students devoid the visual impairment	9	11	49	31	1.98	0.88	Not accepted
2.	The mentality of the visually impaired students towards the difficult aspect of the subject change through inclusive education	18	38	13	31	2.61	0.93	Accepted
3.	Inclusive education improves chemistry teachers knowledge on a better class room management that accommodate all caliber of students	51	36	4	9	3.28	1.09	Accepted
4.	Inclusive education does not discriminate students involvement in the subject	43	20	22	15	2.91	1.12	Accepted
5.	The visually impaired learners find it difficult to comprehend in a general classroom setting	18	38	13	31	2.61	0.93	Accepted
	Grand mean					2.68	0.99	

Based on the result in Table 1, all the items from 2, 3, 4 and 5 were accepted because they had mean value above 2.5, while 1 was not accepted because the mean value was below 2.5. However, the grand mean is 2.68 which is above 2.50 therefore, the respondents agree that inclusive

Therefore, the decision rule for this study holds that any response with the mean value of 2.50 and above was accepted as agreed, while a mean score below 2.50 was rejected as disagree.

The null hypotheses were tested using t-test statistics. Decision for interpreting the results were thus: Reject Ho if the t-cal is greater than t-crit. Accept the Ho if t-cal is less than t-crit

### Results

The results were presented in Tables according to the research questions and hypotheses.

#### Research Question 1

How does inclusive education enhance the teaching of chemistry to the visually impaired learners?

education enhances the teaching of chemistry to the visually impaired learners.

#### Research Question 2

How inclusive education improves the visually impaired learners on their learning outcomes in chemistry?

**Table 2:** Mean results on how inclusive education improve the visually impaired learners on the learning outcomes chemistry

S/N	ITEM	SA	A	D	SD	$\bar{x}$	S.D	Interpreted
6.	Students are involved in some of the learning methods for instance, the practical use of laboratory apparatus	36	4	51	9	3.21	1.07	Accepted
7.	Inclusive education helps every student to cope in chemistry class	17	14	36	33	3.91	1.08	Accepted
8.	Include education gives every student the opportunity to understand the precaution to be adopted before any practical work in chemistry	9	11	49	31	1.89	0.88	Not Accepted
9.	The visually impaired learners are not left out when it has to do with a view of particles/atoms through the use of microscope	37	26	22	15	3.85	1.10	Accepted
10.	The visually impaired learners cope faster with the non-exceptional students.	22	43	20	15	2.13	1.12	Not Accepted
11.	The visually impaired learners are subject to mistakes in learning with the normal students	18	13	31	38	2.11	0.99	Not Accepted
	Grand mean					2.85	1.04	

Results in Table 2, show that items 6, 7, and 9 were accepted because they had the mean values of above 2.50 while item 8, 10 and 11 were not accepted. However, the grand mean is 2.85 which is above 2.50 mean values. Therefore, the respondents agree that inclusive education improves the visually impaired learners on their learning outcomes in chemistry.

### Research Question 3

How does inclusive education foster effective participation and inclusion of learners with visual impairment in learning of chemistry with non-exceptional learners?

**Table 3:** Mean Results on how Inclusive Education Foster Effective Participation and Inclusion of Learners with Visual Impairment in Learning of Chemistry with (Normal) Learners

S/N	ITEM	SA	A	D	SD	$\bar{x}$	S.D	Interpreted
12.	Inclusive education gives equal opportunity to all students in the participation of general class assessment without discrimination.	9	49	31	11	2.98	0.69	Accepted
13.	The visually impaired learners are not comfortable in learning of chemistry in a general classroom setting.	43	15	20	22	2.32	0.92	Not accepted
14.	Inclusive education helps students who are visually impaired to cope with the practical aspect of chemistry	41	20	24	15	3.71	1.82	Accepted
15.	Inclusive education enhances the visually impaired to understand the theoretical aspect of chemistry	43	20	22	15	2.17	1.12	Not Accepted
16.	The classroom management system of inclusive education does not conform to students who are visually impaired.	18	38	13	31	2.61	0.39	Accepted
	Grand mean					2.76	1.00	

Results in Table 3, shows that item 1, 3 and 5 agree because they had the mean values above 2.5 while 2 and 4 disagreed. However, the grand mean is 2.76 which is above 2.50 limit. Therefore, the respondents agree that inclusive education fosters effective participation for visually impaired students in the learning of chemistry.

### Hypotheses

**H<sub>01</sub>:** There is no significant difference on the rating of the visually impaired students and the normal students on how inclusive education could improve learning outcomes in chemistry.

**Table 4:** t-test on the Mean Ratings of the Visually Impaired Students and the Normal Students on Learning Outcomes in Chemistry

S/N	Variables	NO	$\bar{x}$	SD	DF	t-cal	t-crit	Decision
1.	Visually impaired	41	3.02	3.42	94	0.45	1.990	Accepted
	Normal students	52	3.42	3.06				
2.	Visually impaired	41	2.52	3.02	94	0.32	1.990	Accepted
	Normal students	52	2.54	2.52				
3.	Visually impaired	41	3.62	3.02	94	0.83	1.990	Accepted
	Normal students	52	2.09	2.09				
4.	Visually impaired	41	3.87	3.02	94	0.55	1.990	Accepted
	Normal students	52	3.22	3.22				
5.	Visually impaired	41	1.92	3.02	94	0.21	1.990	Accepted
	Normal students	52	2.72	1.15				
6.	Visually impaired	41	2.44	3.02	94	0.38	1.990	Accepted
	Normal students	52	2.02	2.77				
	t-test value					0.47	1.990	Accepted

Based on the above result in Table 4, t-cal value is less than t-crit value, (i.e  $0.47 < 1.990$ ). Hence  $H_{01}$  is not rejected. This implies that there is no significant difference on the rating of the visually impaired students and the normal students on the

influence of inclusive education in the learning of chemistry.

**H<sub>02</sub>:** There is no significant difference between the mean score of visually impaired students and normal students on effective participation in the teaching of chemistry

**Table 5:** t-test on the Mean Score of Visually Impaired Students and Normal Students on Effective Participation in the Teaching of Chemistry

S/N	Variables	NO	X	S.D	DF	T-CAL	T-CRIT	Decision
1.	Conventional method	43	3.02	2.83	96	0.41	1.880	Accepted
	Inclusive method	58	2.70	2.52				
2.	Conventional method	43	1.87	3.09	96	0.75	1.880	Accepted
	Inclusive method	58	3.02	3.07				
3.	Conventional method	43	1.72	3.34	96	0.45	1.880	Accepted
	Inclusive method	58	2.82	2.08				
4.	Conventional method	43	3.44	3.06	96	0.63	1.880	Accepted
	Inclusive method	58	1.02	3.02				
5.	Conventional method	43	2.70	1.87	96	0.95	1.880	Accepted
	Inclusive method	58	1.08	2.95				
	t-test value					0.64	1.880	Accepted

Based on the above result in Table 5, t-cal value is less than t-crit value, (i.e  $0.645 < 1.880$ ). Hence  $H_{01}$  is not rejected. This implies that there is no significant difference between the mean score of visually impaired students and normal students on effective participation in the teaching of chemistry.

### Summary of Findings

1. Inclusive education enhances the teaching of chemistry to the visually impaired learners
2. Inclusive education improves the visually impaired learners on their learning outcomes in chemistry

3. Inclusive education fosters effective participation of learners with visual impairment in learning of chemistry with normal learners.
4. There is no significant difference on the rating of the visually impaired students and the normal students on the role of inclusive education in the learning of chemistry.
5. There is no significant difference between the mean scores of visually impaired students taught and normal students on effective participation in teaching of chemistry.

**Research Question 1**

This research question 1 attempted to find out how inclusive education enhances the teaching of chemistry to the visually impaired learners in Ebonyi State. The result in Table 1 revealed that the grand mean for the research question is 2.68 which implies that inclusive education enhances the teaching of chemistry to the visually impaired learners.

**Research Question 2**

The research question 2 attempted to find out how inclusive education improves the visually impaired learners on their learning outcomes in chemistry. The result in the Table 2 revealed that the grand mean for the research question 2 is 2.85, which implies that inclusive education improves the visually impaired learners on their learning outcomes in chemistry.

**Research Question 3**

The research question 3 tried to find out how inclusive education generally fosters effective participation of visually impaired students in learning of chemistry with normal learners. The result in Table 3 revealed that the grand mean is 2.76, therefore, it implies that inclusive education fosters effective participation of visually impaired students in learning of chemistry with normal learners.

**Hypothesis 1**

The hypothesis 1 sought to determine if a case of significant difference existed on the rating of the visually impaired students and the normal students on the role of inclusive education in the teaching of chemistry to the visually impaired learners in Ebonyi State.

The result on Table 4 showed that t-cal value is less than the t-crit value; that is ( $0.87 < 1.990$ ) which implied that there is no significant difference on the rating of the visually impaired students and the normal students on the role of inclusive education in the learning of chemistry by the visually impaired learners in Ebonyi State.

**Hypothesis 2**

The hypothesis 2 sought to determine if a case of significant difference existed between the mean

scores of visually impaired students and normal; students on the effective participation of visually impaired students in the teaching of chemistry.

The result on Table 5 showed that t-cal value is less than the t-crit value that is ( $1.05 < 1.880$ ) which implied that there was no significant difference between the mean score of visually impaired students and normal students on the effective participation in the teaching of chemistry.

**Recommendations**

- 1) The Ministry of Education/government should provide instructional materials which will make learning a reality for the visually impaired.
- 2) The government should organize workshops/seminars to improve teachers knowledge on how to accommodate the visually impaired students with students who do not need special care in the same classroom.
- 3) The school authority should give all students equal right to participate in all academic activities, including competitions not minding if the student is handicapped.
- 4) Government should provide and equip guidance and counseling unit in secondary schools so as to give the students the opportunity to make complains and be counseled.
- 5) The government should establish more inclusive educational schools for the visually impaired learners.

**Conclusion**

This study examined the influence of the use of inclusive education in the teaching of chemistry to visually impaired students in Ebonyi State. This study became necessary in view of the fact that science is fundamental to human existence and its knowledge is important to all. The study found out that teaching, learning outcomes and effective participation were improved for them. Based on



the implications, recommendations were made, which if implemented through inclusive education, visually impaired students would become great scientists both intuitively and deductively.

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