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Empirical Assessment on Mathematics and Sciences' Understanding Among Physically Challenged Pupils Using Information and Communication Technology

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Abstract
This work is an empirical assessment of the physically challenged students (deaf) in mathematics with a view of recognition and reintegration the brains among them back to the technological world view. The research design for the study is a quasi- experimental research design with experimental and control group. The sample for the study and Science consisted of 40 primary IV deaf pupils selected by strategically purposive sampling techniques from special school (of deaf) for the study. The instrument used for the study is Mathematics Achievement Test. The instructional package used was a comprehensive lesson plan on two major topics in Mathematics (Algebra and construction) with Visualized Instructional Package (VIP) anchored by a trained special Mathematics teacher. Finding revealed that the introduction of ICT and imagery in the teaching of the special pupils enhanced academic performance of physically challenged in mathematics Suggestions were made to stakeholders on the need to embrace ICT in the teaching of the special pupils in Mathematics.

Key words: Visualized instructional package; ICT; Mathematics understanding; Deaf student; Imagery; Recognition; Reintegration

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INTRODUCTION
Sophistication in Information and Commutation Technology (ICT) had gone beyond ignoring a particular group of individual from proving their worth in mathematical world view. The needed knowledge for scientific breakthrough is not in the expression of words only but also in the mental resourcefulness that an individual exhibit in transforming its society to a better place. Societal transformation revolves round innovative and result oriented teaching of physically challenged pupils in ICT, It is therefore necessary to devise a new method of teaching that would help to reintegrate the affected ones back to the society, noting that the world is dynamics and technology is fast growing. Owolabi et.al (2013) ICT has been a veritable tool that could be used to enhance learning.

Ability to form mental image through analytical reasoning could be accomplished through visual representation of mathematical tools in a classroom setting. This may be complemented with signs and gestures development, using ICT to form a synergy with imagery for better academic performance. There are a lot of graphics and pictures that are programmed in the ICT (configured mathematical website) that would enable teachers to explore the fundamental principle of mathematics skillfully to the pupils under 10 years old.. Mastering the application of configured mathematics website (CMW) has become imperative for human advancement from childhood to adulthood According to Radford et al. (2003) mathematics comprehension could be achieved through pointing gestures and kinesthetic action of moving a pen along a graph, which ICT has made easy.. Harries (2002) asserted that the deaf can be taught to speak, studying how tongue and finger is rolling (deaf mutes) use leap reading or manual alphabet. One of the ICT is Visualized Instructional Package (VIP) which

is made up of mathematics programs with associated documentation in signs, symbols and gestures, designed to teach mathematics for the deaf pupils between the ages of 3-10. National Institute of Education (2007) affirmed that VIP is a program that has been written to teach deaf pupil, which contain multiple repetitiveness, leap movement with body movement among others.

Owolabi et.al (2013) revealed that teachers are indispensable within the teaching—learning process. Hence, they constitute a major input in the accomplishment of educational goals and objectives in all nations. In the developed world, premium is placed on how best a learner can display his skill and accuracy regardless of his physical deficiency. Nevertheless, shifting from certification to ICT driven mechanism that could broaden learner's skills and intelligence is a panacea that may cease poverty and crime rate in the developing nation like Nigeria. This in turn would change the mentality of any physically challenged individual from street begging to a worthwhile adventure in ICT and related field. Indeed, attitudinal change as a result of ICT teaching would determine the altitude of any physically deficient individuals.

Cawley and Miller (1989) confirmed that ICT needs to be introduced in teaching students with disability, since activities in concrete form allows deaf pupils to discover mathematics Some researchers Chard and kameenul, (1995), David, (2007) investigated students with special needs (disabled) and found that disable students consistently perform at lower levels than their peers without special needs. This is as a result of the inadequacies in professional activities and plans to make mathematics lesson more accessible for students with special needs. Promoting ICT gadget would expedites observation and appeal to their functioned sense organs, thereby moving disabled teaching from abstract to concrete. Since scientific observation has affirmed that education is not what the teacher gives alone, but natural spontaneous activities by individual, acquired not by learning words but by experiences upon the environment Osisioma (2010).

Mathematics understanding is crucial and its needful for human day to day activities It is indeed a known fact that the child's mind is hypothetical primarily blank like a clean slate "tabula rasa" which later equipped with knowledge. No one is born with silver spoon in his mouth". According to Kolawole and Oginni (2009) practicalising of mathematics instruction would help the learners to appreciate the subject. Although; it is unethical to teach mathematics in abstract for those with hearing impairment, if those pupils without hearing problems are complaining on mathematics difficult. Many of the disable scholars today that have been able to prove their mettle in various fields of endeavour are much better than some physically fitted individuals.

Concretizing mathematics instruction could enable child's memory become sharpen and broaden their scope on a particular subject matter. Mayberry (2002) reported that concreteness through imagery seeks to expand the knowledge base of the pupils suffer from partial deafness, as symbols, signs or spoken enhance the degree of recalling and remembering by deaf learners. Harries (2002) found out that imagery and familiarity are the best predictors of geometry. Generally speaking, there is ability in disability. Human potential is made known when an enabling environment is created for resourceful thinkers. Borich & Tombari (1997) asserted that deafness is not a learning disability and as many thinks since the partial loss of hearing is by choice. Therefore, the study investigated the empirical assessment of ICT and imagery on mathematics understanding by students with special needs; the study examined the relative effectiveness of ICT on the achievement of students with special need.

1. RESEARCH HYPOTHESES

The following null hypotheses were postulated and tested at 0.05 level of significance.

a. There would be no significant difference in the scores of the control and experimental deaf students' prior treatment.

b. There would be no significant difference in the scores of the deaf students taught mathematics with customized computer method and visual pedagogical package for the deaf (VPPD).

c. There would be no significant difference in the scores of students exposed to mathematics with imagery and their counterpart taught with ICT teaching method.

d. There would be no significant difference in the scores of female and male students taught mathematics with customized computer and visual pedagogical package for the deaf (VPPD).

2. METHODOLOGY

2x2 pre test, post test control groups quash experimental design was used. Treatment was given to the first group while the second group was exposed to conventional method. The subjects for the study consisted of 40 primary deaf pupils selected by stratified and purposive random sampling technique. Stratified sampling technique was used because certain group of interest was considered (equal numbers of male and female). Purposive sampling technique was adopted to select deaf pupils within limited number of deaf schools in the state

The instrument (Mathematics Achievement Test) used was constructed by the researchers on the concept of geometry and constructions. The instrument was given to the expert lecturers in mathematics for face and content validity. The coefficient of the reliability of the instrument yielded 0.87, which determined the reliability of this study.

The instructional packages used for the study include research assistants with developed visual pedagogical package for the deaf used for the experimental group as well as customized computer for the deaf. The control group was exposed to a mock treatment. Achievement test was initially administered on the two groups during pre test, and after two weeks of rigorous teaching with ICT gadget, the same test was given to the two groups. Hence, the pupils were later subdivided into subgroups depending on ICT, imagery and conventional teaching in the study.

3. RESULTS AND FINDINGS

a. There would be no significant difference in the scores of the control and experimental deaf pupils prior treatment.

Table 1
t-test Summary on Pre-Test Scores of Control and Experimental Pupils

Variables	N	df	Mean	SD	t- cal	t-tab	Result
Control	20	38	37.4	14.7	0.924	2.021	Not Sig
Experimental	20	38	37.0	12.6			

P < 0F.05

Table 1 shows that t-calculated value = 0.924 which is lesser than t-table at 0.05 alpha level, It implies that the null hypothesis one was not rejected. Hence there would be no significant difference in the score of the control and experimental deaf pupils in their pre-test, By implication, all the groups are of uniform status before treatment.

b. There would be no significant difference in the scores of the deaf pupils taught mathematics with conventional method and their counterparts that were taught with visual pedagogical package for the deaf (VPPD).

Table 2
t-test Summary on Post-Test Scores of Conventional Method and Visual Pedagogical Package for the Deaf

Variables	N	Df	Mean	SD	t- cal	t-tab	Result
Conventional	20	38	66.85	12.15	7.372	2.021	Sig
VPPD	20	38	47.65	30.64			

P < 0.05

Table 2 shows that t-calculated, t-value = 7.372 is greater than t-table at 0.05 alpha level, It implies that the null hypothesis two was rejected. Hence there would be significant difference in the score of the students taught using conventional method and visual pedagogical package for the deaf (VPPD) in their post-test scores in favour of the VPPD. By implication, the effect of treatment contributed to the rejection of hypothesis.

c. There would be no significant difference in the scores of students exposed to mathematics with imagery and their counterpart taught with ICT teaching method.

Table 3
t-test Summary on the Scores of Students That Were Exposed to Imagery and ICT Teaching

Variables	N	Df	Mean	SD	t- cal	t-tab	Result
Imagery	10	18	37.4	14.7	6.91	2.021	2.021
ICT	10		66.85	12.15			

P < 0.05

Table 3 shows that t-calculated, t-value = 6.21 is greater than t-table at 0.05 alpha level; It implies that the null hypothesis three was rejected. Hence there would be significant difference in the score of the pupils taught by using imagery compared with ICT method. By implication, the effect of ICT teaching is much felt than that of imagery. This is because ICT is more encompassing than imagery.

d. There would be no significant difference in the scores of female and male pupils taught mathematics with customized computer and visual pedagogical package for the deaf (VPPD).

Table 4
t-tests Summary on Pre-Test and Post Test Scores of Female Pupils

Variables	N	df	Mean	SD	t- cal	t-tab	Result
Female	20	38	37.0	12.6	1.371	2.021	Not Sig
Male	20	38	47.65	30.64			

P < 0.05

Table 4 shows that t-calculated, t-value = 1.371 is lesser than t-table at 0.05 alpha level; It implies that the null hypothesis four was not rejected. Hence there would be no significant difference in the score of the female and male taught by using customized computer and visual pedagogical package for the deaf (VPPD) By implication, there is homogeneity in female and male deaf pupils performance in mathematics

4. DISCUSSION

The findings in this study revealed that teaching deaf students with VPPD and customized computer had significantly positive influence on the performance of the deaf students. The findings supported that advancement in technology could bridge the gap between the physically challenged and those that are physically alright. The study maintained a positive shift towards mathematics appreciation when ICT and imagery were applied to teach deaf students. The findings is in line with Owolabi et.al(2013),Harris (2002) that imagery and ICT promote mathematics learning This implies that the use of ICT facilities enhances knowledge deepen of the learners in this category. Berge (1998); Barron, (1998) corroborated.

This study established that there is no gender discrepancy in the scores of male and female pupils while exposing them to ICT teaching. The result is contrary to the findings of Kolawole and Oginni (2009) that male students performed better than their female counterparts in mathematics laboratory lessons. Again, the findings showed that pupils with special skills teachers in ICT performed highly impressive compared with those without skilled personnel. However, the findings revealed that imagery can also influence academic performance in mathematics particularly in teaching deaf pupils.

CONCLUSION

Conclusively, ICT and imagery should always be seen as a tool for teaching mathematics for the deaf pupils, Again, deaf pupils should be equipped with ICT and relevant imagery materials for effective teaching and learning system especially in mathematics.

RECOMMENDATIONS

Based on this finding, It is therefore recommended that a framework for ICT learning should be prioritized in the teaching of the physically challenged pupils. Also, ICT experts should be recruited into the schools for the deaf so as to improve their mathematics knowledge. Internet facilities and other relevant ICT gadgets should be procure for the teaching of the deaf pupils in mathematics.

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