Journal of Education and Practice
ISSN 2222-1735 (Paper) ISSN 2222-288X (Online)
Vol.5, No.26, 2014

Construction of Individualized Audio Instruction Material for Enhancing Teaching of Physics and Its Effectiveness

Binuraj A
Assistant Professor in Education, NSS Training College, Ottappalam, Palakkad, Kerala, India

Sankaranarayanan Paleeri (corresponding author)
Assistant Professor in Education, NSS Training College, Ottappalam, Palakkad, Kerala, India
E-mail: paleeri@gmail.com

Dr. Celine Pereira
Associate Professor, School of Pedagogical Sciences, MG University, Kottayam, Kerala, India

Abstract
The students' ability of learning science is largely depending up on the quality of instruction provided in the classrooms. The traditional methods of teaching are not working apt with the needs and capabilities of present day children. The teaching strategy for the modern period must suit to the requirements, capabilities and interests of the pupils. Certain attempts like Individualized instructional Material is to be developed for effective teaching of science.The present paper is a study focused on developing an Individualized Audio Instructional Material on the content areas "Magnetic Effect" and "Current Electricity" from the subject physics. It is intended to validate the constructed material and also to find its effectiveness in teaching and learning of physics among high school students. The study was an experimental research based on Pre-test Post-test method. There were control and experimental groups in the experimenting phase of the research. It is found that the developed Audio Instructional Material was very effective in teaching and learning of physics for high school students.
Keywords: Individualized Audio Instructional Material, conventional method, Achievement.

1. Introduction

Teaching science in school is an attempt to link the concepts of science with the growing minds of the children through active pedagogy. It is the function of the pedagogic methods to contribute solutions to the difficulties of the teaching- learning process by developing desirable understandings, skills, abilities and attributes. If science is properly taught, with the support of an effective pedagogy, it can help to liberate the human mind from unwanted snoozing.

According to Bruner (1966) science should be taught as a way of thinking and the process skills are best acquired by the pedagogic methods of discovery. The students' ability of learning science is largely depends up on the quality of instruction provided in the classrooms. The traditional methods of teaching have become out-model in present context of technological development. Possibilities of innovative pedagogical ideas and applications are increasing day by day. Student approach towards learning is changing according to the vast possibilities of technological devices. Learners can make use devices from television to computer with internet. The teaching strategy for the modern period must suit to the requirements, capabilities and interests of the pupils. Here comes the importance of an individualized instructional material for science teaching.

Individualized instruction provides a learning environment that encourages the children and motivates them intrinsically. The goal of individualized instruction is that each child's learning should become self-motivated and self-directed. Sharma, (1993) notes that the individualized self-instruction gives the learner certain necessary skills, understandings, and ways to approach a problem that may lead her/him to exercise the creativity and individual ability in learning.

In the conventional ways of teaching, a heterogeneous group is taught using the same method of instruction for a long time on all types of context or a predetermined practice of group work may held without creative individualized learning task. By these ways students are getting very less chance to participate actively in teaching-learning process. Very many experts and teachers pointed out this draw back. To overcome this limitation the individualized instruction devices are a better solution (Das, 1992).

The rate of imparting information by the teacher may not be according to the capabilities of the learner. This is applicable even to activity-centered approaches. The teacher there becomes a supporter at first and in due course learning may not take place without the support of teacher and within short-while the pupil self-interpretation on

activities reaches bottom level (Paleeri, 2009). Here also the individualized instruction becomes more worthy. By individualized instruction, students can make use their own abilities and capabilities of learning. Considering the priority of individualized instruction, educational experts are trying to introduce new approaches for teaching of science. The investigators assumed that an audio instruction method will lead to individualized instruction and will help to break the monotony in the usual ways of classroom teaching. Thus, it developed an Audio Instructional Material in physical science for high school students. The material is supportive for individualized instruction from teacher side and a self-learning device from pupil side.

An audio-instructional material is a self-supporting device. It helps self- work on learning. It assures auditory learning and self-activity simultaneously. There is no qualm that learning function with auditory support, visual support and interactivity are more effective than the Audio material. But, such multisensory devices are expensive and difficult to prepare and maintain. As it is comparatively less expensive, but effective too lead learning, it is decided to construct an audio instructional material.

2. Objectives

The major objectives of the study are:

1. Construct an Individualized Audio-Instructional Material to enhance teaching- learning tasks in the selected content areas in physics for High school classes.
2. To estimate the extent of effectiveness of the constructed Individualized Audio-Instructional Material in teaching of Physics.
3. To compare the performances of pupils in the achievement test in physics at pre-test level and post-test level in order to state the effectiveness of the Individualized Audio Instructional Material based teaching.

2.1 Hypotheses

For the present study, the following the hypothesis was framed:

- Individualized audio-instruction material based teaching is more effective than that of the conventional methods of teaching on achievement in physics of secondary school students.

2.3 Method

For the present study, the investigators made use Experimental Design. It is the Pre-test cum Post-test experimentation method is used. Brog and Gall (1989) suggest the pre-test cum post-test experimentation as relevant method to find out the effectiveness of a teaching or learning device. Analysis was the test based analysis, designed to find the extent and effectiveness of the individualized audio instructional material.

2.4 Variables

The study zeroed in on two types of variables – dependent variable and independent variable.

The variable that is measured to determine the effect of the experimental treatment is usually referred as the dependent variable (Brog & Gall, 1989). In this study student performance in learning physics was the dependent variable.

In experimental studies, the condition that varied is referred to as the independent variable (Travers, 1964). Hence the teaching strategy – the individualized audio-instructional material based teaching – considered for the experiment in study is referred to as the independent variable.

2.5 Participants

As it is difficult to get two equivalent groups for any experimental study, the investigators decided to conduct experiment with two non-equivalent intact classroom groups. Two divisions of standard 8^{th} (Malayalam Medium) were selected from St. George Mount High School, Kaipattur, Pathanamthitta District, Kerala State, India for the experiment. Initially, sample included 40 students from each class. Of the two divisions, one was considered control group and the other was considered experimental group.

Though the initial sample included 40 students from each class, due to the absence of some students in course of experiment and because of irregular response to the tests the final sample size was limited to 35 pupils from each class.

2.6 Instruments

Individualized Audio Instruction Material: The investigators constructed an Individualized Audio Instruction Material (a package type) on the areas ‘magnetic effect’ and ‘current electricity’. The material is supportive for 16 lessons on different topics from these two areas. The investigators prepared the supporting material in CD form and made it ready to use. The material is useful as a devise for self-learning too by pupils.

3. Principles and Steps Used for the Preparation of individualized Audio Instructional Material

a. Selected the areas 'Magnetic Effect' and 'Current Electricity' those come in 8th standard Kerala State syllabus for physics.
b. Audio Instructional Modules for 16 lesson topics from these selected areas were prepared and they were audio taped.
c. The individualized Audio Instructional Material was modified on the basis of observations made by investigators themselves, comments and suggestions from the students and schoolteachers and according to the suggestions by experts in Physics and Pedagogy of Science. The material is modified accordingly.
d. The modified version of Individualized Audio Instruction Material was recorded. This version is administered for the experiment.
e. An achievement test was prepared in the content areas 'magnetic effect' and 'current electricity', keeping due weightage to the 'objectives', 'process' and 'difficulty level.' Test carries 10 multi-level questions having 3 marks each. The total marks were 30 and time was 50 minutes. The same test was administered at the pre-experiment and post-experiment sessions.

4. The Experiment, Result and Discussion

The achievement test was administered to both the control group and experimental group before and after the experiment. The details of the scores in achievement test of both groups are given in table 1 and table 2.

4.1 The Experiment

The experiment included transaction of 16 lessons with the help of the constructed individualized Audio Instructional Material. The lessons were for forty minutes each. The lap-top with speaker output was used in the class room to play the audio. Students have given opportunity to listen the audio lesson, module by module. The modules in each lesson extent from two to five minutes. Each lesson has three to six modules as per the said time span. After listening an audio module and students have to perform individually on the prescribed content in the given work book. Replay of audio was given if there had request from student side. After the first module and the followed learning task, the second module was played. After the play of module the learning task of the same was followed. The time to learning task after the listening of the module of the audio lesson was extended from 5 to 10 minutes.

The control group was also taught by the same teacher in conventional methods. Conventional method is used because to go on at par with the usual teaching strategy followed in schools. All the sixteen lesson plans were prepared on constructivist approach. The normal aids and support systems were made use for the instruction. The topics were covered by sixteen lessons in the same content area.

After the stipulated schedule of teaching for sixteen lessons, two days were given to both groups as study days. After that, the test was administered again as post test to measure the achievement.

4.2 Analysis and Results – Before Experiment

As per the table 1, it is clear that the pupils in both groups did not achieve high scores in the test. The Mean of control group is a little greater than that of experimental group, but the difference is only 0.14. The value of quartile deviation is also very low. These show that the two groups did not differ very much in their achievement in the test in physics at pre-test level.

Other indices are:

The value of skewness obtained for the scores of the experimental group is 0.37 and it is positively skewed. It indicates that the students who scored low marks are comparatively more than those who scored high marks in this group.

The negative value of the skewness of the control group (-0.18) indicates that the students who scored high marks in the achievement test are comparatively more in number than those who scored low marks.

4.3 Analysis and Results – After Experiment

The post-test was administered to both the control group and experimental group, after conducting the experiment of transacting stipulated lessons based on the Individualized Audio Instructional Material and in the conventional method. The details of statistical analysis of the post-test are given in table 2.

As per table 2, these mean scores of control group and experimental group have a notable difference of 4.11. This indicates that students in the experimental group achieved high scores in the post-test than that of the control group.

Other indices are:

The difference in the median values shows that the experimental group achieved greater scores in the post-test than that of the control group.

The low value of quartile deviation and standard deviation for both groups indicates that the scores do not differ very much from the average.

The positive value of skewness of the control group (0.25) indicates that the students who scored low marks are comparatively more than those who scored high marks in the test.

The negative value of skewness of the experimental group (-0.95) indicates that the students who scored high marks are comparatively more than those who scored low marks in the test.

As per table 1 and table 2, difference between the arithmetic mean of the scores of control group in pre-test and post-test is 2.91. Such a low increase of the score may not be because of the incompetence of conventional method. The self-learning tasks are more effective to score better (Paleeri, 2009). The students are getting less chance to work themselves in the classroom in the conventional method while it is compared with that of Audio instructional material based teaching. The audio instructional material provided more opportunity to do self- learning tasks (individualized tasks) after listening the audio modules.

As per the table 1 and table 2, the difference between the mean scores of experimental group at pre-test and post-test level is 9.27.

This differences in the mean scores of both groups at pre and post-test levels prove that the experimental group has considerable difference in the mean scores of the pre-test and post- test level than that of the control group.

It can be stated that the Individualized Audio Instructional Material based teaching has greater effect on the students' academic achievement in science than that of the conventional method of teaching.

The low values of quartile deviation and standard deviation for both groups show that the scores do not have much variation from the average.

4.4 Comparison of Performance of Pupils in the control and experimental groups in Pre and Post Achievement Tests

The performance of pupils in control and experimental group were compared before and after the experiment. The statistical analysis of the performances of both groups in pre-test level is given in table 3.

As per table 3, the obtained critical ratio is 0.31. Since the table value for *df 68* is 2.00 at 0.05 level, the obtained critical ratio 0.31 is not significant. It indicates that the difference between the means of pre-test scores of pupils in control group and experimental group is not significant even at 0.05 level. Hence, it is clear that the pupils of two groups do not differ significantly in their initial achievement in physics.

After experiment, the performances of the pupils of both groups were compared. The statistical analysis of the post-test measurement has given in table 4.

Table 4 shows that the obtained critical ratio at post- test level is 3.62, and which is significant at 0.01 level. It means that there is significant difference between the means of the post-test scores of pupils in control group and experimental group. From this it is clear that after experiment the pupils of the two groups differ significantly in their academic achievement in physics. Since the mean of the post-test scores of the experimental group is greater than that of the control group, the pupils in the experimental group are superior to the pupils in the control group in their achievement in physics. It can be concluded that the Individualized Audio Instruction Material based teaching has greater effect on students' academic achievement in physics than the conventional method of teaching.

5. Suggestions and Conclusion

The study was conducted in physics, which is the core subject of science for high school classes, and it is found that the developed Individualized Audio Instructional Material was effective in teaching. Hence, it is possible to generalize that properly developed Audio Instructional Material might be useful in teaching and learning of Science.

The devices or material like this can be developed in other school subjects.

Since the material is useful for self-learning also, the CD copy of the same can be distributed to the students for self-learning. At present the CD copy the material has supplied only to the science teachers of the experimental school. Copy of the same has to be submitted to other schools and also to Kerala State Institute of Educational Technology for expert evaluation and adaptation for the schools.

The Individualized Audio Instructional Material is useful for Malayalam Medium students. The same type of material can be developed for English Medium classes also.

Any method of teaching has its own effect in learning of the students. The importance of the innovative technology based methods is that they are live and more motivational. More than that student can work more effectively by the self- effort with such devices and materials. Hence the schools should focus on developing such audio or video based teaching methods apart from the conventional methods of teaching.

References

Brog, R, W., & Gall, M, D. (1989). *Educational Research.* New York: Longman.
Bruner, J, S. (1966). *The Process of Education*. Cambridge: Harward University Press.

Das, R, C. (1992). *Science Teaching in School*. New Delhi: Sterling Publishers.
Paleeri, Sankaranarayanan (2009). Cooperative Learning Strategies in Classrooms, The Effective Accomplishment of MITA, *Edutracks Journal.* 9 - 1.
Sharma, A. (1993). *Technology of Teaching.* Meerut: International Book Publishers.
Traverse, R, M. (1964). *An Introduction to Educational Research*. New York: The Mac Millian Company.

Table: 1, Scores of Achievement Test in Physics at Pre-test Level of Control Group and Experimental Group

Group	N	Mean	Median	Quartile Deviation	Standard Deviation	Skewness
Control Group	35	5.53	5.5	1.54	1.95	-0.18
Experimental Group	35	5.39	5.29	1.07	1.93	0.37

Table: 2, Scores of Achievement Test in Physics at Post-Test Level of Control and Experimental Group

Group	N	Mean	Median	Quartile Deviation	Standard Deviation	Skewness
Control Group	35	8.74	8.44	3.24	3.61	0.25
Experimental Group	35	14.66	15.54	2.58	3.12	-0.95

Table: 3, Statistical Analysis of Control and Experimental Groups at Pre-test Level

Group	N	Mean	Standard Deviation	Critical ratio	Level of Significance
Control Group	35	5.53	1.93	0.31	$p \geq 0.05$
Experimental Group	35	5.39	1.85		

Table: 4, Details of Statistical Analysis of the Post-test Scores of Control and Experimental Groups

Group	N	Mean	Standard Deviation	Critical ratio	Level of Significance
Control Group	35	8.74	3.61	3.62	$p \leq 0.01$
Experimental Group	35	14.66	3.12		

The IISTE is a pioneer in the Open-Access hosting service and academic event management. The aim of the firm is Accelerating Global Knowledge Sharing.

More information about the firm can be found on the homepage:
http://www.iiste.org

CALL FOR JOURNAL PAPERS

There are more than 30 peer-reviewed academic journals hosted under the hosting platform.

Prospective authors of journals can find the submission instruction on the following page: http://www.iiste.org/journals/ All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Paper version of the journals is also available upon request of readers and authors.

MORE RESOURCES

Book publication information: http://www.iiste.org/book/

IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digtial Library , NewJour, Google Scholar