

PERFORMANCE IN PHYSICAL SCIENCE EDUCATION BY DINT OF ADVANCE ORGANISER MODEL OF TEACHING

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ABSTRACT

Education should be made painless and the teaching must be made effective. Teaching is an activity, which is designed and performed for multiple objectives, in terms of changes in student behaviours. Models of teaching are just a blue print designed in advance for providing necessary structure and direction to the teacher for realizing the stipulated objectives. Ausubel in his theory of meaningful verbal learning, presents the most important ideas, phenomena and other difficult words in the beginning of instruction, so that the learner can easily understand each and every concept and learning becomes meaningful. According to Ausubel's Advance Organizer Model of Teaching (AOMT), the concepts are hierarchically organized from simple to very abstract and all the concepts are linked together. Ausubel believes that structural concepts of each discipline can be identified and taught to the students and the students can become an information processing system to solve problems. The objective of the study is to find out the effect of AOMT on the achievement, gain and retention of the secondary prospective teachers in physical science. The investigator adopted Pre-test - Post-test Equivalent Group Design for the study. Sixty prospective teachers, 30 for experimental group and 30 for control group, were selected as sample. Statistical techniques used were standard deviation and t- test for independent variables. Findings of the study reveal that performance and retaining capacity of the experimental group are significantly higher than that of the control group.

Key words: Models of Teaching, Information Processing System, Advance Organiser Model of Teaching, Metacognitive skills, Meaningful learning, Subsumption.

INTRODUCTION

Education is the fundamental right of all human beings and it is considered to be a national responsibility. The development of a nation is determined by the quality of its human races, which depends on the level of knowledge, and higher education plays a crucial role in the development of knowledge. In recent years, the Indian higher education system has become fully aware of the need for quality but it cannot be attained overnight. Quality based education depends on education process, where teacher is a vital component to achieve quantitative and qualitative enhancement of education.

Teaching and learning are transformations. The environment of the classroom is of course not uniquely determined by the teacher, but a teacher has to adapt his/her teaching to the social and regional environment.

The student-teachers are prospective teachers with the onus of creating environment for learning. Teaching models provide the learning experiences by creating appropriate environment for real behaviour outcome, for which, teaching should be effective. Lecture should be effective based on an outline rather than a complete text. Advanced Organizer Model (AOM) is an effective lecture method (Townsend, 1969, Barrow, 1973, Mahajan, 1983, Bharambe, 1999, Chen & Baiyun, 2007) by which teaching can be made from an outline of content.

Significance of The Study

Ausubel's AOM is an innovative teaching model aimed at developing meaningful verbal learning. Based on this theory, the most important ideas, phenomena and other difficult words are present in the beginning of instruction, so that the learner can easily understand each and every

concept and the learning becomes meaningful. According to AOM, the concepts are hierarchically organized from simple to very abstract and all concepts are linked together. Ausubel believes that structural concepts of each discipline can be identified and taught to the students and the students can become an information processing system to solve problems.

In our modern scientific world, the concept of mastering the subject has changed especially in learning science and generally discovery approach is being followed in the teaching of science. The new curriculum developments in science emphasize the teaching of science in various approaches and models. Ausubel's theory of learning can be effectively followed in the colleges of education. If the student-teachers practice what they learned during the pre-service period in the actual field, the school wards of them will certainly experience variety of teaching which will enhance the quality of teaching and hence the learning. Keeping this in mind, the investigator took an attempt to know the effectiveness of Advance Organiser Model of Teaching over the conventional method of teaching on the performance of student-teachers in physical science education and hence the present study.

Objectives

- To establish the homogeneity of the sample groups.
- To find the effect of Advance Organiser Model of Teaching (AOMT) on the performance of student-teachers in physical science education.
- To find the effect of AOMT on the retaining capacity of the student-teachers in physical science education.

Null Hypotheses

- There is no significant difference between the control and experimental groups in the performance of physical science education before giving treatment.
- There is no significant difference between the control and experimental groups in the performance of physical science education after giving treatment.
- There is no significant difference between the control and experimental groups in the performance of physical science education in the gain scores.
- There is no significant difference between the control and

experimental groups in the retaining capacity of physical science education.

Design of The Study

The investigator adopted Pretest and Posttest Equivalent-Groups Design (Best & Kahn, 2003: 176) for the present study.

Sample

Sample consisted of 60 prospective teachers of physical science education studying in two rurally located colleges, thirty from each constituted the control group and experimental group.

Tool Used

The investigator constructed and validated a performance test in physical science education consisting of 41 objective type questions. Weightage was given to three learning objectives - knowledge, understanding and application. The investigator then showed the performance test to teacher educators of science education to verify the suitability of the items to the target students. After inclusion and deletion of certain items, 61 items were retained. The draft tool was administered to 100 physical science prospective teachers working in the Colleges affiliated to Tamilnadu Teachers Education University. The responses were scored and the item analysis was carried out by finding out the discriminative index and difficulty level of each item. The items having discriminative index above 0.20 and the items having difficulty level between 40 % and 80% were selected. Here the reliability coefficient of the half test was found to be 0.76 and the reliability coefficient of the whole test using the Spearman - Brown prophecy formula was found to be 0.86. Thus the validity and reliability of the tool were established.

Statistical Techniques Used

Standard deviation and t- test for two independent means (Best & Kahn, 2003: 392) were the statistical techniques employed in this study.

Treatment

To analyse the effect of AOMT on the performance in physical science education, sixty prospective teachers of physical science education were divided into two groups - experimental group (N = 30) and control group (N = 30).

The homogeneity of the two groups was established in terms of Attitude towards Teaching Profession and pretest scores. The experimental group was treated with AOMT and the control group was treated with conventional method of teaching. The major topic selected for the experimentation was microteaching which covers skill of introduction, skill of explaining, skill of stimulus variation, skill of reinforcement, skill of questioning, skill of using blackboard, skill of demonstration and skill of achieving closure. Before taking classes for the experimental group, the topics were brought into eight lesson plans and a sample is given in the Appendix. The experiment lasted for eight days, an hour per day. Before and after the treatments, a performance test developed and validated by the investigators was administered to find out the effectiveness of AOMT in terms of elevation in performance of the target groups. In addition to these two tests, a delayed post-test has also been conducted after twenty days to the post-test to know their retaining capacity.

Data Analysis

The collected data were analysed using SPSS package and the results are tabulated below.

In Table 1, since p-value is greater than 0.05, the null hypothesis is accepted at 0.05 level of significance. Hence it is concluded that there is no significant difference between the pre-test scores obtained by the control and experimental groups.

In Table 2, since p-value is less than 0.01, the null hypothesis is rejected at 1% level of significance and it implies that there is significant difference between the posttest scores obtained by the control and experimental groups. The mean scores reveal that experimental group performed better than the control group in the post-test.

Table 3 shows that the p-value is less than 0.01. Hence the null hypothesis is rejected at 1% level of significance and it is concluded that there is significant difference between the gain scores of control and experimental groups. The mean scores reveal that the gain scores of the experimental group was higher than that of the control group.

Table 4 shows that since p-value is less than 0.01, the null hypothesis is rejected at 1% level of significance and it is

Category	Group	N	Mean	S.D	Calculated value of 't'	p-value
Achievement	Control	30	13.23	3.37	1.08	0.28
	Experimental	30	12.30	3.31		

Table 1. 't' test for the performance scores of control and experimental groups in the pre-test

Group	N	Mean	S.D	Calculated value of 't'	p-value
Control	30	16.57	3.12	9.88	0.00**
Experimental	30	24.53	3.11		

** Significant at 1% level

Table 2. 't' test for the performance scores of control and experimental groups in the post-test

Group	N	Mean	S.D	Calculated value of 't'	p-value
Control	30	3.33	3.17	9.83	0.00**
Experimental	30	12.23	3.80		

** Significant at 1% level

Table 3. 't' test for the gain scores of control and experimental groups

Group	N	Mean	S.D	Calculated value of 't'	p-value
Control	30	19.47	3.45	8.25	0.00**
Experimental	30	27.50	4.06		

** Significant at 1% level

Table 4. 't' test for the retaining capacity of control and experimental groups

concluded that there is significant difference between the scores obtained by the control and experimental groups in the delayed post-test. The mean scores show that the experimental group scored more than the control group in the delayed post-test.

Findings

The findings are as follows:-

- There is no significant difference between the control and experimental groups in the performance in physical science education before giving treatment.
- There is significant difference between the control and experimental groups in the performance in physical science education after giving treatment. The experimental group performed better in physical science education than the control group.
- There is significant difference between the control and experimental groups in the gain scores of teaching physical science education. The experimental group

earned more gain scores in physical science education than the control group.

- There is significant difference between the control and experimental groups in the delayed post-test scores in physical science education. The experimental group retained more than the control group.

Discussion

In this study, no significant difference in the pre-test scores indicate that both the control and experimental groups were equal in their subject knowledge prior to experimentation. This shows that the two groups were homogeneous, which is the prerequisite for the proper experimentation.

The experimental group scored higher than the control group in the post-test. Hence it is obvious that AOMT is more effective than the traditional method of teaching. This finding is in harmony with the reviewed studies (Townsend, 1969, Barrow, 1973, Mahajan, 1983, Bharambe, 1999, Chen & Baiyun, 2007) also.

The gain scores of experimental group were significantly higher than that of the control group. It also confirms the effectiveness of AOMT over the traditional method of teaching.

The delayed post-test scores imply that the retention ability of students belonging to experimental group was better than the control group. This shows that the treatment helped for more retaining capacity of the prospective teachers in physical science education.

Educational Implications

The study implies that the AOMT is significantly effective comparing the conventional method of teaching physical science education. This result shows the positive impact of AOMT on performance in physical science education. So teachers at all the levels can be given orientation on various models of teaching in their respective subject and employ them effectively in the classroom teaching. Prospective teachers must be acquainted with good lesson plans prepared by the experts for teaching of science by this new approach. The authorities may give due considerations to teach science as well as other subjects through AOMT. Well-prepared lesson plans based

on AOMT and handbook for teachers consisting guidelines of models of teaching should be provided to the in-service teachers. Teachers must have experience in preparing lesson plans based on the various models of teaching like AOMT.

When presenting the Advance organizer, inner speech of the learner is reinforced to think and link with previous knowledge. Executive process of organization is possible by AOMT. The enhancement of the metacognitive skills of the learners is made possible in general, and specifically organisation of information into an integrated system helps the low performing students. So seminars and symposia on models of teaching may be conducted for teacher educators to have interaction and innovative exposure with the experts who make use of those in their own teaching. AOMT bridges the gap between what is already known and what is to be learned; higher level of abstraction is also possible by AOMT. So demo sessions on AOMT may be arranged for the pre-service and in-service teachers. As it strengthens the cognitive structure and facilitates meaningful learning and retention, prospective teachers may be trained to integrate AOMT in regular classroom teaching. Higher order tasks can also be performed well by AOMT. So empirical studies on effectiveness of different models of teaching carried out by the in-service teacher educators in colleges need to be published in educational journals and popularized to their colleagues and wards. AOMT provides clear and well-organized cognitive structure, which is better anchorage for new learning and retention. The teacher educators who have been practicing AOMT-like models in their classrooms may be encouraged so that the prospective teachers can make use of them in their routine teaching so that the slow learners are benefited and the exceptional ability students' mental world is easily organized by AOMT.

Conclusion

An advance organizer, a cognitive strategy, allows the learner to recall and transfer prior knowledge to the new information being presented. Learning is facilitated, if the learner can find meaning in the new information. If a connection can be made between the new information and previous knowledge, the learning experience will

become more meaningful to the learner and hence the new information will be learned. So all the universities must add models of teaching in the teacher education curriculum and it must be made mandatory for practicing teaching also.

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Appendix

AOMT - LESSON PLAN (A sample)

Name of the investigator : XXX
Name of the College : XXX
Subject : Physical Science
Class : B.Ed.
Duration : 1 hour
Strength : 30
Topic : Skill of stimulus variation

Curriculum Objectives

- To understand the skill of stimulus variation.
- To understand the components of skill of stimulus variation.
- To appreciate the use of the components of skill of stimulus variation.
- To know the components of the skill of stimulus variation.
- To know about the demonstration of skill of stimulus variation.

Process Objectives

- Prospective teachers construct the knowledge of skill of stimulus variation.
- Prospective teachers collaborate the various components of skill of stimulus variation in their classroom teaching.

Syntax

Investigator clarifies the aim of the lesson.

Phase I: Presentation of Advance Organizer

Overview

Today I will teach you the skill of stimulus variation, one of the microteaching skills and its components. At the end of this

lesson, you will be able to define and demonstrate the skill and its components.

Important Words

Teacher Movement

Teacher movement is very important in the classroom. To secure student's attention movement should be meaningful. Habitual movements fail to attract their attention. The movement of the teacher helps pupil to change their posture, which provides physical relaxation to them and also contributes to the alertness, enthusiasm and variety of teacher behaviour.

Teacher gesture

Actions are important and meaningful. Movement of head, hands and body to direct attention to emphasis, importance to explain and express emotion or to indicate shapes, sizes etc. come under this category.

The other important words included in the advance organiser are Changes in voice, Focusing, Changes in interaction pattern, Pause, Physical pupil participation and Switching.

Phase II: Presentation of learning material

Skill of stimulus variation involves deliberate changing of various attentions producing behaviour by the teacher in order to keep pupils attentive at high level. When the teacher explains, he makes use of certain patterns of movement, patterns of speech, gestures, focusing etc. These variations make the students to stimulate. Then only the teaching is effective. This skill is very important for teachers. The components of the skill of stimulus variations are : Teacher movement, Teacher gesture, Changes in voice, Focusing, Changes in interaction pattern, Pause, Physical pupil participation, Switching.

Teacher movement secures students attention. Movement should be meaningful. Teacher gesture (actions) is also important and meaningful. A change in voice is to maintain pupil's attention. Focusing can be verbal, gesture, verbal cum gesture. Teacher should introduce variations in the interaction pattern. Pausing a temporary stop, is very important in teaching. Students writing on the blackboard can make physical pupil participation. By switching, a teacher can vary his medium from one to other; can enhance pupil's attention.

Phase III: Strengthening cognitive structure

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|----------------------|---|--|
| Teacher Educator | : | What I have taught you? |
| Prospective teachers | : | You have taught us the skill of stimulus variation and its components. |
| Teacher Educator | : | What is skill of stimulus variation ? What are its components? |
| Prospective teachers | : | It is a skill which involves deliberate changing of various attentions producing behaviour by the teacher in order to keep pupils attentive at high level. The components are teacher movement, teacher gesture and changes in voice, focusing, changes in interaction pattern, pause, physical pupil participation and switching. |
| Teacher Educator | : | In what way this skill will be useful for your teaching in real situation? |
| Prospective teachers | : | We will make use of all the components of skill of stimulus variation in our classrooms to make the students attentive and learning effective. |

Let a prospective teacher write the components of skill of stimulus variation on the blackboard. Let others ask doubts, point out mistakes, if any, and engage in active discuss. Finally they demonstrate the skill to the peer prospective teachers.

ABOUT THE AUTHORS

Mrs. PB. Beulahbel Bency is a Research Scholar in the Department of Education of Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India. Her area of research is teacher education fused with educational technology. She has presented fifteen papers in National and International seminars. She has published two articles in Educational Journals.



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