Volume 2, Issue 3, March 2015, PP 45-53
ISSN 2349-0373 (Print) & ISSN 2349-0381 (Online)
www.arcjournals.org

International Journal of Humanities Social Sciences and Education (IJHSSE)

Advance Organizers Help to Enhance Learning and Retention

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Abstract
Advance organizers are used for the meaningful learning. The present study investigated the effect of Advance Organizers Strategy on the performance of the 9th grade science students. The main objective of this study was to find out the effectiveness of Advance organizers and to compare the performance of experimental group with control group. The research design was true experimental pre-test, post-test design. The sample consisted of fifty randomly selected students of 9th grade. Data was analyzed using t-test at 0.05 significant level. The results of the study showed that the use of Advance Organizers Strategy had a positive effect on the performance of experimental group. The use of Advance Organizers Strategy found to be helpful for enhancing retention ability of the students. The results of the study lead to the conclusion that Advance Organizers Strategy is useful to improve retention ability of the students.

Keywords: Advance Organizers, Retention, Meaningful Learning, Science Education.

1. INTRODUCTION

Teaching and learning process is mandatory part of education. In Pakistan, efforts are being made to enhance the quality of teaching and learning Science. Similarly efforts are being made to improve the learning of students in chemistry through the application of variety of teaching and learning strategies.

Advance organizers theory supports effective teaching and learning process. It is an appropriate instructional strategy for teaching science concepts. Ausubeldescribed that Advance Organizers Learning Theory is a pedagogical strategy for implementing principles of progressive differentiation and integrative reconciliation which involves the use of appropriately relevant and inclusive materials that are stable and discriminated from related conceptual systems in the learner's cognitive structure.

"Advance Organizers are in the form of concept maps or in the form of discussion and short arrangements of materials introduced to the learner before the lesson. It is designed to cue the relevant prior knowledge of the student, and it is normally presented at higher order abstraction level" (Curzon, 1990).

Advance organizers provide support for learning process and are presented prior to providing new concept .In this way advance organizers provide framework to enable student learn new ideas or information by meaningfully link these ideas to the existing knowledge.

1.1. Statement of the Problem

There are number of learning theories advocated different teaching strategies. Considerable efforts had been made to uplift the 'teacher's knowledge' but the positive effect of that knowledge had not been proven yet. In the same way effectiveness of teaching strategies and teaching tools and particularly teaching chemistry with Advance organizers strategy needs a large amount of research to develop consensus among Chemistry teachers. Hence this study explored the effectiveness of use of Advance organizers on learning and retention of 9thgrade students for Chemistry subject.

1.2. Significance of the Study

It is apparent that objectives of New National Curriculum of Pakistan (2006) laid a great stress on the construction of knowledge instead of rote memorization by using Activity based methods and Inquiry based methods. The ultimate end of these methods is deep understanding and meaningful learning. For this purpose, there is need to use tested methodology for effective learning. Students can think critically if they have clear understanding of the taught material concepts. This research would be benefit for all science teachers, curriculum developers and Policy Makers. Moreover this research would also help-ful for other researchers to do further researches. This study would also support the researches which had already been conducted.

1.3. Objectives of the Study

1. To compare the achievements of control group and experimental group students on pretest and post test.
2. To investigate the extent to which traditional teaching will affect the performance of the control group students.
3. To examine the extent to which the use of advance organizers will enhance the retention ability of chemistry students.

1.4. Hypotheses

The following hypotheses were tested.

H_0 There will be no significant difference in the performance of control Group and experimental group in the subject of Chemistry on pre-test.

H_0 There will be no significant difference in the performance of control group and experimental group on Post-test.

H_0 The Advance Organizers strategy has no effect on enhancing retention ability in the students of 9th class in the subject of Chemistry.

2. REVIEW OF RELATED LITERATURE

In this era of technological innovations, speedy progress and advancement, the improvement of science education is becoming the dire need of the nations. Science Education is considered to be a tool for developing scientific attitude among the students and help the learners to think like a scientist. Safdar(2011) stated that "how to learn is equally important with what to learn but how to teach (teaching strategy) is more important than what to teach".

The main function of science education at secondary school level is to make the students able to acquire scientific knowledge in a systematic way which could further enable them to use that knowledge in their lives for making maximum benefits from the science and scientific advancements. It should help the students to acquire skills, enhance thinking ability and use the scientific knowledge for the solution of problems in all areas of life like health, environment, understand the changes in the matter and make them useful for the humanity. Behaving scientifically is becoming more necessary than having more knowledge of science. Students are facing a number of problems in acquiring the knowledge of science in class rooms. This includes understanding the concepts, theories and laws which are governing the changes in the environment. According to Zaman (1996)as quoted by Safdar, "present era is known as the era of science and so science is assumed to be an important subject of school curricula, now people are required to get the knowledge of science for employment in scientific pursuits". This space exploration and technologically driven age requires that every student should be taught science.

According to McFarlane"Science education has a great concern to help individuals understand the basic things of science for the promotion of scientific literacy". The aspects of nature of science have been emphasized in science education standards and also new national curriculum 2006 in Pakistan. Science Education has also a concern with teacher's understanding about Science.

Teachers need to develop their understanding about nature of science which will enable them to choose effective teaching learning strategy.

2.1. Rote Learning Vs Meaning Learning

According to Ausubel, "the most important single factor influencing learning is what the learner already knows" According to Novak (1998),

"Relationships between concepts are formed when two concepts overlap on some level. As learning progresses, this network of concepts and relationships becomes increasingly complex. Ausubel compared meaningful learning to rote learning, which refers to when a student simply memorizes information without relating that information to previously learned knowledge. As a result, new information is easily forgotten and not readily applied to problem-solving situations because it was not connected with concepts already learned" (p.71).

Rote learning is a memorization technique based on repetition. The idea is that one will be able to quickly recall the meaning of the material by repeated practices. Some of the alternatives to rote learning include meaningful learning, associative learning, and active learning. In Rote learning, students acquire knowledge, recall it but they are not able to use this knowledge for solving problems of the daily life.

In constructivist learning, students engage in active cognitive processing, such as paying attention to relevant incoming information, mentally organizing incoming information into a coherent representation, and mentally integrating incoming information with existing knowledge (Mayer RE, 2003). Meaningful learning is recognized as an important educational goal. It requires that instructiongo beyond simple presentation of Factual Knowledge and that assessment tasks require more of students than simply recalling or recognizing Factual Knowledge (Bransford, Brown, & Cocking, 1999; Lambert & McCombs, 1998).

2.2. Advance Organizers Strategy

Recent advancements and modern teaching strategies have enhanced the learning and retention of new information and advance organizers is one of them. According to (Mayer, 2003), it is an information that is given prior to teaching any concept, and it helps the students to organize and interpret new information. At the start of the lesson, presentation of the advance organizers can be used in the form of probing questions, story or any other way that may help in connecting the new ideas with the previous concepts or ideas which must be learnt by the students. Teachers may use Advance Organizers keeping the following principles;

1. General concepts should be presented first and then moved towards specific concepts.
2. Integration of instructional material with previous information should be done in an organized way.

2.3. Learning by Building on Previous Knowledge

Novakagreed that 'Ausubel's theory is applicable and more powerful for teaching science education than the developmental psychology of Piaget. Both Ausubel and Piaget have offered some key insights for sciences. Failing to recall is caused mainly due to loss of connections between the ideas so the persons can find their way in their long term memory to retrieve the answer they want. According to Arends1, "the major pedagogical strategy proposed by Ausubelwas the use of advance organizers". It is the job of the organizers to "Delineate clearly, precisely, and explicitly the principal similarities and differences between the ideas in a new learning passage, on the one hand, and existing related concepts in cognitive structure on the other."

2.3.1. Scope and Practical Application of Advance Organizers

Ausube(1968) indicates that "Meaningful learning theory applies only to reception (expository) learning in school setting. He distinguishes reception learning from rote learning and discovery learning; the former because it does not involve Subsuming i.e. meaningful material) and the

latter because the learner must discover information through problem solving."

Advance organizers serve three purposes:

1. To direct the attention towards the importance of the coming material.
2. To highlight the ideas and create relationship amongst the ideas.
3. To remind the students about important information they already have.

Advance Organizers can be useful devices at the start of a unit, before a discussion, before a question-answer period, before giving a homework assignment, before student reports, before a video, before students read from their science book, before a hand on activity, and before a discussion of science concept based on student's laboratory experiences.

2.3.2. Benefits of Advance Organizers

Advance organizer enhances the learning of the students, these can also be called as linking agents, as they link the previous knowledge to the newly learnt knowledge. It is designed to indicate the relevant prior knowledge of a learner and it is usually presented at a higher level of abstraction, generality and inclusiveness than that of the planned lesson. There are several additional benefits of advance organizers to student achievement including that they "can easily be connected to content standards across the curriculum" (Dell' Olio), "That the flexibility of advance organizers make it easy to appropriately modify them for students with special needs, and that they explicitly inform students what they will be learning thus reducing the possible stress of the unknown which has been shown to negatively impact student achievement" (Konecki&Schiller 2003). Advance organizers are beneficial to encourage students to directly participate in their learning and to be self-reflective throughout the lesson. At the start of the unit teachers can use the advance organizer/s to facilitate whole class discussion about upcoming information, getting students thinking and talking about what they already know.

Rote learning is not very much useful in teaching chemistry learning. The students took more interest in chemistry if they will be taught with the help of advance organizers. Students will take much interest and they will begin to see everything as a part of chemistry. The advance organizers enhance the learning and retention ability of the students.

3. MATERIAL AND METHODS

The Research was an equivalent group pre-test, post-test experimental design.

3.1. Population and Sample

All students Studying Science in the Schools and colleges under Federal Directorate of Education were population of the study. Researchers selected IMCB G-6/2 Islamabad for conducting the research study. Fifty students were selected from IMCB G-6/2 Islamabad. The selected students were divided into two groups. One was taken as control group and other as an experimental group. Experimental group was taught by advance organizer's strategy where as Control group was taught by traditional method.

3.2. Procedures

The Pretest consisted of 20 objective type MCQs from the Chemistry of 9th grade. Two equivalent groups were set on the basis of 8th grade achievements and pretest achievement. Twenty advance organizers were prepared along with lessons in experimental group. Both expository and comparative advance organizers were used as a teaching strategy along with suitable methods to the experimental group. Pictorial and written advance organizers were also used. Both groups were taught for 5 weeks. Post test was administered to both groups at the end of the treatment. Mean was calculated for the achievements of both groups, t-test was used to find the comparison of both groups.

3.3. Instrumentation

The research instruments (pre test and post test) were developed using the content of 9th grade

Chemistry curriculum. The content areas were identified by keeping in view the purpose of the study, and then an item pool was generated. The instruments were reviewed, revised and tried out. Alpha study (Piloting and Item Analysis) and Beta Study (Reliability and Validity) were also conducted. The information collected from the responses of the students helped for item analysis (Item difficulty and item discrimination).

3.4. Validity and Reliability of the Instrument

The tests were revised and corrected in the light of responses of Expert opinions, pilot testing, difficulty level and discriminating Index. The final version of tests consisted of 20 MCQs and six essay type short questions. Then item difficulty level and Discrimination index was calculated for each item as a response of 100 students from different areas of Islamabad Capital territory. The reliability of a research instrument concerns the extent to which the instrument yields the same results on repeated trials. Two methods were used by the researcher to check the reliability of the test. First test-retest was used and second alternate method was used. The test was found reliable to a larger degree. Pearson formula was used to find the reliability value, which was 0.85. After five weeks of teaching, post-test was administered. The tests were marked and data was tabulated for analysis.

3.5. Analyses of Data

The data was analyzed on the bases of means, standard deviations and standard errors. Before the start of experimentation, descriptive statistics was used to compare both groups. The t-test was applied for statistical difference between control groups and experimental group.

Experimental and control groups were developed on the basis of pre-test. t-test was used to evaluate whether there was any significant difference between the mean scores of students in the 9th class chemistry test. The results (Table 1) indicated that there was no significance difference between the mean scores of control group (M=17.76, SD=5.811) and experimental group (M=17.68, SD=5.475), t(48) = 0.05 and table value at 0.05 significance level was 2.00. The calculated value was less than table value. Therefore null hypothesis, "There is no significant difference in the performance of control group and experimental group students of 9th class in the subject of Chemistry on pre-test" was accepted. This data shows that experimental and control groups were same before start of the experimentation. Table 1 shows that there was no significant difference between the performance of experimental group and control group in pretest. Both groups scored equally.

Table1. Comparison of Performance of Experimental Group and Control Group on Pre-test

Groups	Control group	Experimental group	df	t-value
N	25	25	48	0.05* 2.00**
Mean	17.68	17.76		
SD SS	5.475 1716	5.811 1537		

*tabulated t-value
**calculated t-value and not significant at 0.05
*tabulated t-value

The table 2 represents the data about post-test regarding experimental group and control group. t-test was used to evaluate whether there was any significance difference between the mean scores of experimental group and control group on post-tests. The result indicated that there was significance difference between the mean scores of post-test of experimental group (M=39.44, SD=4.8397) and Control group (M=29.44, SD=8.456), t(48) = 5.132 and table value at 0.05 significance level was 2.00. Null hypothesis "there is no significant difference in the performance of control group and

experimental group students of 9th class in the subject of Chemistry on Post-test' was rejected as the calculated value of "t" was greater than table value.

Table2. Comparison of Performance of Control group and Experimental Group on Post-test

Groups	Control group	Experimental group	df	t-value
N	25	25	48	5.132* 2.00**
Mean	29.44	39.44		
SD SS	8.456 688	4.8397 770		

*tabulated t-value
**calculated t-value and significant at 0.05

The table 3 represents the data about retention test regarding experimental group. t-test was used to evaluate whether there was any significance difference between the mean scores of post-test and retention test on experimental group.

Table3. Retention Ability in Chemistry Students of 9th Grade (Experimental Group).

Test Number	Post-test	Retention Test	Df	t-value
N	25	25	48	0.028* 2.00**
Mean	39.44	39.40		
SD SS	4.8797 770	4.8 768		

*tabulated t-value
**calculated t-value and not significant at 0.05

The result indicated that there was no significance difference between the mean scores of post-test experimental group (M=39.44, SS=769) and retention test (M=39.40, SS=410), t(48)=0.028 and table value at 0.05 significance level. The calculated value was less than table value. Hence it was concluded that there was no significant difference between performance of experimental group on post-test and retention- test. It can be said that advance organizers help to retain the knowledge/information.

Table4. Comparison of Enhancement in Mean Scores of Experimental Group and Control group.

Group	Control group	Experimental group
Mean Scores of Pre-test	17.68	17.76
Mean Scores of Post-test	29.44	39.44
Difference in Mean Scores	11.76	29.68
Relative Enhancement in means	29.68- 11.76 = 10.92	
Of Control and Experimental groups.		

The relative increase in mean scores achievements were studied and difference was found (10.92) between experimental group and control group as depicted in table 4. The mean score of the experiment group was greater than control group. This difference was due to the use of Advance Organizers strategy in teaching of chemistry to 9th grade students.

4. FINDINGS

The mean scores of Control group and experimental group on pre-test were 17.68 and 17.76 respectively. It showed that there was no significance difference in the performance of control group and experimental group on pretest. The Hypothesis "There is no significant difference between the mean scores of control group and experimental group in posttest" is accepted.

The mean score of control group and experimental group in post-test were 29.44 and 39.44 respectively. The difference was significant at 0.05 level. Hence, Ho, "There is no significant difference between the mean scores of control group and experimental group in posttest" was rejected. The alternate hypothesis "There is significant difference between the mean scores of control group in pre test and post test" was accepted.

The mean scores of experimental group on post-test and retention test were 39.44 and 39.40 respectively. The use of Advance Organizers Strategy is helpful in enhancing retention ability of the students. The hypothesis "The Advance Organizers strategy has no effect on enhancing retention ability in the students of 9th class in the subject of Chemistry" was rejected. The alternate hypothesis "The Advance organizers Strategy have a positive effect on the retention ability of the students" was accepted.

5. DISCUSSIONS

After data analysis, it was examined whether the objectives of the study were achieved or not. First objective was to compare the performance of control group and experimental group on pretest. It was found that there was no difference in the performance of the both groups at the start of the study.

The second objective was to investigate the extent to which traditional teaching on control group and use of advance organizers in the experimental group will affect the performance of students of both group. This means all the strategies had some effect on the learning of the students. Only the difference was that of the extent of improvement or quality of learning. In the light of second objective it is evident that traditional strategy has an effect on the performance of the students, but the performance of experimental group was much better than that. Here it is evident that the effect of Advance Organizers strategy is very prominent. Since Advance organizers strategy is considered as student-centered Strategy and its effect on the learning of different subject has been seen by many researches. Many researchers have focused on the effectiveness of Advance Organizers on the students learning and many have done researches on how to use Advance Organizers in the teaching process. Very little progress has been made on the solution of problems in Chemistry. Shihusa and Kerazoinvestigated the effect of using advance organizers on students' motivation to learn biology in their study. Oloyede (1996) studied the effects of pictorial and written advance organizers on the achievement and retention of senior secondary school in chemistry. Vandanaand Jadhav(2011) studied the effect of advanced organizer model on the achievement of students in physics in her study.

The third objective was to see the retention ability of the students of experimental group. It was clear from retention-test that Advance Organizers strategy had a positive effect on the retention ability of the students.

6. CONCLUSION

1. Advance Organizers strategy is more effective in teaching learning at secondary level. Learners performed better when taught by Advance Organizers as compared to learners taught by traditional method.
2. The performance of the learners in control group also improved in academic achievement in chemistry but average performance was lower as compared to the performance of experimental group.
3. Advance Organizers Strategy is useful to improve retention ability of the students.

4. This strategy is also student centered and students have to remain active while studying through this strategy.

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Citation: TanveerUzZaman, Farkhunda Rasheed Choudhary and Arshad Mahmood Qamar (2015) Advance Organizers Help to Enhance Learning and Retention. IJHSSE 2(3), PP: 45-53.