THE EFFECTIVENESS OF ADVANCE ORGANIZER MODEL ON STUDENTS' SCIENCE ACHIEVEMENT AT THE MIDDLE SCHOOL LEVEL

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Abstract

The major purpose of this research was to study effectiveness of Advance Organizer Model on students' science achievement at the middle school level. This study was conducted with both quantitative and qualitative research methods. For quantitative research, an experimental study was used to study effectiveness of Advance Organizer Model. In this experimental study, the subjects were Grade Eight students selected from No (1) BEHS Latha and No (4) BEHS Pazundaung. The experimental designed adopted in this study was a true experimental design, namely, posttest only control group design. For this study, (120) Grade Eight students were selected from both schools by random sampling method. These students were divided into two groups: control and experimental. The experimental group was treated with Advance Organizer Model and the control group was taught with formal instruction. After that, a posttest was administered to two groups. Independent samples *t*-test was used to test whether there was significant difference between these two groups. Examination of the means and *t*-test at No (1) BEHS Latha (t=11.99, df =58, MD=7.94, p=.000) and No (4) BEHS Pazundaung (t=13.90, df=58, MD=8.30, p=.000) indicated that students who were taught by Advance Organizer Model demonstrated significantly better than those who were taught with formal instruction. The qualitative data also supported the findings from the experimentation. For this research study, students from the experimental group from two selected schools were given a questionnaire. The results showed that the students expressed their willingness to learn in Advance Organizer Model and they had positive attitudes towards this Advance Organizer Model. Research findings proved that Advance Organizer Model has positive contribution to the science teaching at the middle school level.

Keywords: Effectiveness, Advance Organizer Model, Science, Achievement

Introduction

Education is a continuous and lifelong process. The aim of education is not to prepare people only for the present, but also to prepare them for the future and to train them in such a manner that they can meet the challenges of the future in an appropriate manner. In addition, education is a foundation for socioeconomic development of a country. In national education strategic plan (NESP), the purpose of Myanmar's national education system is to equip students, youth and adult learners with the knowledge and skills they need to succeed in the 21st century (Ministry of Education [MOE], 2016).

In 21st century, the world has dramatically changed and many challenges have been emerged. In order to keep up with and to confront them, teaching demands a complicated activity that requires creative thinking and a commitment to lifelong learning. Thus, teachers must not give a fish to students and they must teach them how to get a fish. Teachers must decide wisely which teaching methods are the best suitable for their students like painters and sculptors. In making decisions for teaching methods, learners' needs and societal needs will be taken into

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account. Accordingly, teaching methods used in the classroom must be aligned with 21st century skills. Nevertheless, the purpose of teaching is to facilitate learning.

Learning should be meaningful to prepare students for confrontation with the challenges of 21st century. Ausubel (2000) described that meaningful learning occurs when material is related to existing cognitive structure in nonverbatim and nonarbitrary manner. In rote learning, students have to overlearn for retrieval of learned information from the memory. They have to put more effort into their learning without understanding the relationships between concepts, rules and propositions. In this way, learning becomes a burden for students. Rote learning gives boredom to students and locks their thinking skills. Teachers should have a key to unlock this door for students' thinking skills. Only meaningful learning encourages thinking, creativity and innovation. Not to occur rote learning in students, teachers can use Advance Organizer Model which is based on meaningful verbal learning. The purpose of this research is to investigate the effectiveness of Advance Organizer Model (AOM) on students' science achievement at the middle school level.

Purposes of the Study

The major purpose of this study is to study the effectiveness of Advance Organizer Model on students' science achievement at the middle school level.

The specific purposes are as follow:

- To compare science achievement between students who are taught by Advance Organizer Model and those who are not
- To investigate students' attitudes towards Advance Organizer Model
- To make suggestions for improving science teaching based on the data obtained from this study

Research Hypotheses

1. There is a significant difference in the achievement on science learning between Grade Eight students who are taught by Advance Organizer Model and those who are not.
2. There is a significant difference in performing knowledge level questions on science learning between Grade Eight students who are taught by Advance Organizer Model and those who are not.
3. There is a significant difference in performing comprehension level questions on science learning between Grade Eight students who are taught by Advance Organizer Model and those who are not.
4. There is a significant difference in performing application level questions on science learning between Grade Eight students who are taught by Advance Organizer Model and those who are not.
5. The students who learned with Advance Organizer Model have positive attitudes toward learning, interest in inquiry, and habits of precise thinking.

Definition of the Key Terms

- **Effectiveness is** a measure of the match between stated goals and their achievement (Fraser, 1994, as cited in Harvey, 2018).

- **Advance organizer** can be defined as introductory material presented ahead of the learning task and at a higher level of abstraction and inclusiveness than the learning task itself (Ausubel, 1968, as cited in Joyce & Weil, 2003).
- **Science** can be defined as an interconnected series of concepts and conceptual; schemes that have developed as a result of experimentation and observation (Conant, 1951).
- **Achievement** can be defined as the students' grasp of some body of knowledge or proficiency in certain skills (Tinambunan, 1988).

Scope of the Study

The following points are the scope of the study.

- This study is geographically restricted to Yangon Region.
- No (1) BEHS Latha and No (4) BEHS Pazundaung are selected for this study.
- Participants of this study are (120) Grade Eight students from selected schools in the academic year (2018-2019).
- The content area is limited to chapter five: The Earth and Space from Grade Eight General Science Textbook.

Review of Related Literature

The philosophy of education is the most important aspect of teacher training because it explains how educational theories arise. By examining the philosophy of education, teachers are able to see why and how theories complement or oppose each other. Educational theories are backbones of successful teaching and learning processes. If teachers understand and avail them effectively, they can bring meaningful learning to students.

Information Processing Theory

Information processing theory focuses on how people attend to environmental events, encode information to be learned and relate it to knowledge in memory, store new knowledge in memory, and retrieve it as needed (Shuell, 1986 as cited in Schunk, 2012). According to Mayer (1996), humans are processors of information. The mind is an information-processing system. Cognition is a series of mental processes. Learning is the acquisition of mental representations. Learners are active seekers and processors of information. If teachers understand how learners process information, they can design learning experiences that optimize this activity.

Meaningful Reception Learning Theory

The acquisition of new meanings from presented learning material makes meaningful reception learning. To be meaningful, there are two requirements: a meaningful learning set and the presentation of potentially meaningful materials to the learner. Meaningful learning and the learning of meaningful material are not same. First, the learning material is only potentially meaningful. Second, a meaningful learning set must be present. Learning material may consist of already meaningful components, but each component of the learning task and the learning task as a whole is not logically meaningful. If the learner's learning set is not meaningful, even logically meaningful material may be learned by rote (Ausubel, 2000). Three kinds of meaningful reception learning may be distinguished: representational learning, concept learning and propositional learning.

Like all learning, reception learning is meaningful when the learning task is related in nonarbitrary and nonverbatim fashion to relevant aspects of what the learner already knows. Meaningful reception learning is inherently an active process because it requires at the very least (i) the kind of cognitive analysis necessary for ascertaining which aspects of existing cognitive structure are most relevant to the new potentially meaningful material; (ii) some degree of reconciliation with existing ideas in cognitive structure; and (iii) reformulation of the learning material in terms of the idiosyncratic intellectual background and vocabulary of the particular learner.

Advance Organizer Model

Advance Organizer Model was based on meaningful verbal learning theory developed by David Ausubel. This theory deals with some concerns: how knowledge is organized, how the mind works to process new information, and how teachers can apply these ideas about curriculum and learning when they present new material to students. In other words, they are curriculum, learning and instruction. Primary goal is to help teachers organize and convey large amounts of information as meaningfully and efficiently as possible.

Advance organizers were "an introductory material presented ahead of the learning task and at a higher level of abstraction and inclusiveness than the learning task itself" (Ausubel, 1978). The heart of Ausubel's definition of an advance organizer is its ability to provide ideational scaffolding. The aim of the advance organizer is not only to provide ideational scaffolding for the specifics in the learning passage, but also to increase discriminability between the new ideas and the previously learned ideas by pointing out explicitly the principal similarities and differences between them (Ausubel, 1978).

Guidelines for Constructing an Advance Organizer

Constructing an advance organizer is the task of the teacher. The teacher determines the structure of the discipline, content, or subject to be mastered and then develops the organizer. Some guidelines for this process may be helpful.

1. Short set of verbal or visual information.
2. Presented prior to learning a larger body of to-be-learned information.
3. Containing no specific content from the to-be-learned information.
4. Providing a means of generating the logical relationships among the elements to be learned information.
5. Influencing the learner's encoding process (Mayer, 1979).

The specific construction of advance organizer will depend on subject matter, learners, and the desired learning outcome.

Characteristics of Advance Organizer Model

Advance Organizer Model has the following characteristics.

(i) Syntax of Advance Organizer Model

Advance Organizer Model consists of three phases: the presentation of the advance organizer, the presentation of the learning task or learning material and the strengthening of cognitive organization. Phase one includes of three activities: clarifying the aims of the lesson, presenting the advance organizer, and prompting awareness of relevant knowledge. In phase two,

the learning material is presented in the form of lectures, discussions, films, experiments, or reading. Phase three tests the relationship of the learning material to existing ideas to bring about an active learning process. The purpose of phase three is to anchor the new learning material in the students' existing cognitive structure. It will strengthen the student's cognitive organization (Joyce & Weil, 2003).

Table 1 Syntax of Advance Organizer Model

Phase One: Presentation of Advance Organizer
Clarify the aims of the lesson. Present organizer: • Identify defining attributes. • Give examples or illustrations where appropriate. • Provide context. • Repeat. Prompt awareness of learner's relevant knowledge and experience.
Phase Two: Presentation of Learning Task or Material
Present material. Maintain attention. Make organization explicit. Make logical order of learning material explicit.
Phase Three: Strengthening Cognitive Organization
Use principles of integrative reconciliation. Promote active reception learning. Elicit critical approach to subject matter. Clarify ideas (such as by testing them).

Source: From Joyce & Weil (2003)

(ii) Social System

In this model, the teacher retains control of the intellectual structure, since it is continually necessary to relate the learning material to the organizers and to help students differentiate new material from previously learned material.

(iii) Principles of Reaction

The teacher's solicited or unsolicited responses to the learners' reactions will be guided by the purpose of clarifying the meaning of the new learning material, differentiating it from and reconciling it with existing knowledge, making it personally relevant to the students, and helping to promote a critical approach to knowledge. Ideally, students will initiate their own questions in response to their own drives for meaning.

(iv) Support System

Well-organized material is the critical support requirement of this model. The effectiveness of an advance organizer depends on an integral and appropriate relationship between the conceptual organizer and the content. This model provides guidelines for building (or reorganizing) instructional materials.

(v) Application

Advance Organizer Model is especially useful to structure extended curriculum sequences or courses and to instruct students systematically in the key ideas of a field.

The model can also be shaped to teach the skills of effective reception learning. Critical thinking and cognitive reorganization can be explained to the learners, who receive direct instruction in orderly thinking and in the notion of knowledge hierarchies. This model can increase effectiveness in reading and watching films, and in other "reception" activities.

(vi) Instructional and Nurturant Effects

The probable instructional values of this model seem clear because the ideas themselves that are used as the organizer are learned, as well as information presented to the students. The ability to learn from reading, lectures, and other media used for presentations is another effect, as are an interest in inquiry and precise habits of thinking.

Method

Population and Sample size

Two Basic Education High Schools in Yangon Region were selected as the sample schools for experimental design by using simple random sampling method. These sample schools were No (1) BEHS Latha and No (4) BEHS Pazundaung. All the participants in the sample were Grade Eight students. In both schools, only 60 students were selected by random sampling method from Grade Eight in the academic year 2018-2019.

Table 2 Population and Sample Size

Name of School	No. of Population	No. of Student
BEHS (Latha)	235	60
BEHS (Pazundaung)	172	60

Research Design

The design adopted in this study was one of the true experimental designs, namely, the posttest only control group design (Gay & Airasian, 2003).

Table 3 Experimental Design

Assignment	Group	No. of Students			Treatment (X)	Posttest (O)
		BEHS (Latha)	BEHS (Pazundaung)	Total		
Random (R)	Experimental	30	30	60	Advance Organizer Model	SA
	Control	30	30	60	Formal Instruction	
Total		60	60	120		

Note: SA = Science Achievement

Instrument

The instrument used for this study was a posttest (Achievement test). To establish the reliability of the instrument, a pilot study was conducted with Grade Eight students at No (2)

BEHS Dagon Seikkan. Before the test, validation related to the achievement test was asked from (5) experienced teachers. And then, the teacher gave instruction which was based on Advance Organizer Model to students. And these students were given enough time to answer the questions of the test. The reliability coefficient, Cronbach's alpha was computed to show the internal consistency of the test. Its value was 0.72. The instrument was constructed in line with the first three levels of Bloom's taxonomy. The allocate time for the posttest was (45) minutes and the given marks were (25). To examine students' attitudes, feelings, experiences and opinions, a questionnaire was constructed with the advices and guidance of the supervisor. It consists of (15) items four point Likert-scale.

Procedure

This study was to investigate the effectiveness of Advance Organizer Model on science achievement of Grade Eight students. Students were divided into two groups in each school: the control group and the experimental group. There were 30 students in each group. For the control group, the teacher taught as usual in the classroom. The experimental group was provided a treatment by using Advance Organizer Model. For the experimental group, the teacher used the phases in Advance Organizer Model. At the end of the treatment period, all the selected students had to sit for the posttest in both schools. And then, a follow up program was found out by a questionnaire to interpret students' attitudes, feelings, experiences and opinions about Advance Organizer Model.

Data Analysis

The independent samples "*t"* test was used to compare the achievement of students who learned by Advance Organizer Model and that of students who learned by formal instruction.

Findings

This section is concerned with findings of the selected students' achievement on the posttest questions, the summary of the findings and interpretations of the study.

Table 4 *t* Values for Posttest Science Achievement Scores

School	Group	N	M	SD	MD	*t*	*df*	Sig.(2-tailed)
BEHS (Latha)	Experimental	30	22.37	1.43	7.94	11.99	58	.000***
	Control	30	14.43	3.33				
BEHS (Pazundaung)	Experimental	30	22.40	1.40	8.30	13.90	58	.000***
	Control	30	14.10	2.29				

Note: ***$p < .001$

The mean scores of the experimental groups were significantly higher than that of the control groups in each school (see Table 4). It showed that there was a significant difference between students who were taught by Advance Organizer Model and those who were taught with formal instruction on the overall scores of science achievement in each school.

Table 5 *t* Values for Scores on Knowledge Level Questions

School	Group	N	M	SD	MD	*t*	*df*	Sig. (2-tailed)
BEHS (Latha)	Experimental	30	6.27	0.94	1.54	5.85	58	.000***
	Control	30	4.73	1.08				
BEHS (Pazundaung)	Experimental	30	6.30	0.92	1.67	7.00	58	.000***
	Control	30	4.63	0.93				

Note: ***$p < .001$

Results of knowledge level questions showed that the mean scores of the experimental groups were significantly higher than that of the control groups in each school (see Table 5). It showed that there was a significant difference between students who were taught by Advance Organizer Model and those who were taught with formal instruction on the scores of knowledge level questions in each selected school.

Table 6 *t* Values for Scores on Comprehension Level Questions

School	Group	N	M	SD	MD	*t*	*df*	Sig. (2-tailed)
BEHS (Latha)	Experimental	30	6.63	0.94	2.36	6.81	58	.000***
	Control	30	4.27	1.61				
BEHS (Pazundaung)	Experimental	30	6.63	0.99	2.56	8.63	58	.000***
	Control	30	4.07	1.29				

Note: ***$p < .001$

According to the scores on comprehension level questions, the mean scores of the experimental groups were significantly higher than that of the control groups in each selected school (see Table 6). It showed that there was a significance difference between students who were taught by Advance Organizer Model and those who were taught with formal instruction on the scores of the comprehension level questions in the selected schools.

Table 7 *t* Values for Scores on Application Level Questions

School	Group	N	M	SD	MD	*t*	*df*	Sig.(2-tailed)
BEHS (Latha)	Experimental	30	9.47	0.81	3.90	11.57	58	.000***
	Control	30	5.57	1.65				
BEHS (Pazundaung)	Experimental	30	9.77	1.92	4.34	8.60	58	.000***
	Control	30	5.43	1.97				

Note: ***$p < .001$

As regards with the scores on the application level questions, the mean scores of the experimental groups were significantly higher than that of the control groups in each school (see Table 7). It showed that there was a significant difference between students who were taught by Advance Organizer Model and those who were taught with formal instruction on the scores of the application level questions in each selected school.

Students' Attitudes towards Advance Organizer Model

The attitudes, feelings, experiences and opinions of students were examined by a questionnaire which consists of 15 items four point Likert-scale. For (15) items, strongly agreed, agreed, disagreed and strongly disagreed percentage were shown in two selected schools such as No (1) BEHS Latha and No (4) BEHS Pazundaung.

(1) The first item deals with learning by Advance Organizer Model increase students' interest in the lesson. In both schools, (48%) of the students strongly agreed and (52%) agreed to this item.

(2) The second item deals with learning by the use of advance organizer at the start of the lesson enhance students' interest. In both schools, (34%) of the students strongly agreed and (66%) agreed to this item.

(3) The third items deals with activities in the science classrooms bring happy mode to students. In both schools, (35%) of the students strongly agreed, (58%) agreed and (7%) disagreed to this item.

(4) The fourth items deals with learning science make students use time efficiently. In both schools, (48%) of the students strongly agreed and (52%) agreed to this item.

(5) The fifth item deals with seeing pictures and photographs clearly increase students' better understanding in the lessons. In both schools, (53%) of the students strongly agreed, (43%) agreed and (4%) disagreed to this item.

(6) The sixth item deals with guidance of learning by the use of asking questions during teaching learning periods promote students' attention. In both schools, (42%) of the students strongly agreed and (58%) agreed to this item.

(7) The seventh item deals with listening to other students' discussion and explanation create an atmosphere to get new ideas. In both schools, (38%) of the students strongly agreed, (52%) agreed and (10%) disagreed to this item.

(8) The eighth item deals with students who can apply their experience during discussion and explanation. In both schools, (43%) of the students strongly agreed, (55%) agreed and (2%) disagreed to this item.

(9) The ninth item deals with students who can enhance logical thinking. In both schools, (40%) of the students strongly agreed, (57%) agreed and (3%) disagreed to this item.

(10) The tenth item deals with students who want to investigate other events that are related to the lesson. In both of schools, (55%) of the students agreed, (42%) disagreed and (3%) disagreed to this item.

(11) The eleventh item deals with learning by making a connection with environment make students' better understanding. In both schools, (40%) of the students strongly agreed, (58%) agreed and (2%) disagreed to this item.

(12) The twelfth item deals with students who like to read scientific newspapers and articles. In both schools, (37%) of the students strongly agreed, (47%) agreed, (5%) strongly disagreed and (11%) disagreed to this item.

(13) The thirteenth item deals with allowing students express their ideas and thinking develop self-confidence. In both schools, (48%) of the students strongly agreed, (47%) agreed, (2%) strongly disagreed and (3%) disagreed to this item.

(14) The fourteenth item deals with lessons taught in science classroom are useful in outside of the school. In both schools, (50%) of the students strongly agreed, (45%) agreed and (5%) disagreed to this item.

(15) The fifteenth item deals with students who become more interest in science subject and improve their respect on science learning. In both schools, (60%) of the students strongly agreed, (38%) agreed and (2%) strongly disagreed to this item.

According to the results of (15) items four-point Likert-scale, (97%) of the students have positive attitudes and (3%) do not have positive attitudes towards Advance Organizer Model (see Figure 4.7). Some students do not have positive attitudes because certain attitudes are not easy to change within a shorter time frame. Furthermore, they have had no experience in that kind of asking questions and discussion in the classroom. The following figure shows percentage of students' attitudes towards Advance Organizer Model.

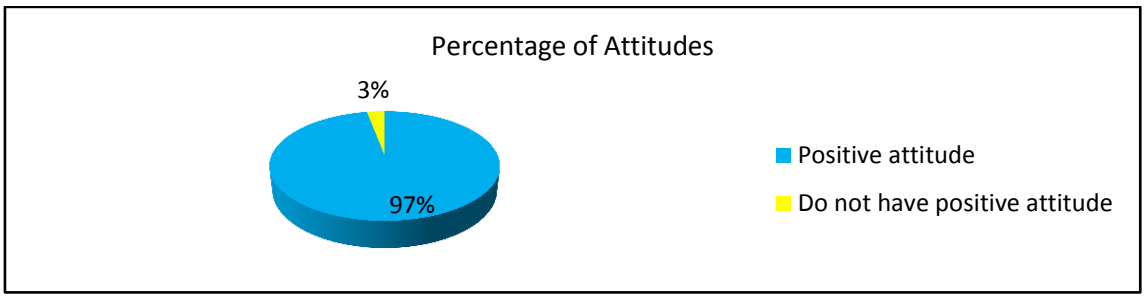

Figure 1 Percentage of Students' Attitudes towards Advance Organizer Model

Summary of Findings

From the experimental findings, the following results were found.

- There was a significant difference between students' science achievement of experimental groups and control groups.
- There was a significant difference between students' science achievement of experimental groups and control groups on the scores of knowledge level questions. It can be interpreted that Advance Organizer Model can improve students' knowledge retention rate and recall the information more easily.
- There was a significant difference between students' science achievement of experimental groups and control groups on the scores of comprehension level questions. It can be interpreted that Advance Organizer Model could bring about the improvement of students' ability to understand logically the structure behind the subject or content area.
- There was a significant difference between students' science achievement of experimental groups and control groups on the scores of application level questions. It can be interpreted that Advance Organizer Model can bring about the development of students' ability to apply their learning in new situation. Therefore, Advance Organizer Model has positive contribution to science teaching at the middle school level.

According to the questionnaires, the following results were found.

- Learning by the use of Advance Organizer Model increases students' retention and conceptual understanding.
- Students developed habits of precise thinking and interest in inquiry.

- Most of students expressed that they were very interested in advance organizers presented by the teacher.
- Learning science is a joyful activity.
- Students expressed that their knowledge was increased and they have willingness to learn more from experience than as usual.

Discussion

In this study, it was found that AOM has significant effect on the science achievement of the students. The findings point out that the mean scores of students who were taught by AOM were significantly higher than those who were taught with formal instruction. Thus, this findings support the research of David Ausubel (197): the mean scores of the experimental were higher than control groups in the use of advance organizers in the learning and retention of meaningful verbal material.

According to the results, there were significant differences between the experimental and control groups according to the comparison of the mean scores on knowledge, comprehension and application level questions for two selected schools. The mean scores of science students who were taught by AOM were significantly higher than that of students who were taught with formal instruction in each achievement level. It can be concluded that students who were taught by AOM improve knowledge retention, interest in inquiry and conceptual understanding. Moreover, it can be interpreted that knowledge retention rate of the students is increased with the help of advance organizers presented by the teacher. Additionally, they develop the habits of precise thinking.

At the first phase of AOM, students were exposed to an advance organizer, which has higher level of abstraction and inclusiveness of the lesson. Owing to the fact that the advance organizer links the previously learned material with new learning material, students could learn meaningfully. Although advance organizers include concepts and abstractions, they do not include in details of the lessons. In this study, three types of organizers were used alternately not to be boredom of lessons for students. All the students described that they were interested in advance organizers presented by the teacher. Thus, providing advance organizers in ahead of the lessons enhances students' attention and interest to the lessons. This step is a distinct feature between AOM and other methods of teaching. In fact, the first step makes students desire to learn the lessons. In other word, it prepares the learners to have readiness to learn.

At the second phase of AOM, the learning material was presented in the form of lectures, discussions, experiments, or reading. In this study, content area was chapter five: The Earth and Space, so lectures and discussions were mainly used in this phase. The teacher also used questions to guide the direction of the learning and to provoke students' thoughts. Learning materials were organized explicitly in order to be meaningful and easy to learn. In this phase, meaningful learning occurs by linking the previous advance organizer and the critical points of the lesson.

The final phase of AOM strengthens students' cognitive organization deeply and learning is an interactive process in which students are come alive with many questions and comments. They had to relate the advance organizers and the lessons. They had to summarize the lessons all they had learned and pick up the critical points. Finally, they had to generate their own ideas and

opinions for real situations in which they faced. This step is called "clarify ideas" and ideas and opinions were tested by orally or writing either individual or group. And it was a climax of AOM. During the first few days of the study, students in the experimental groups were unfamiliar to it, but after three periods of teaching, they had the ability to clarify their ideas. Thus, thinking could be nurtured like a habit. In this way, active reception learning was promoted and the teacher could give feedback to the lessons if necessary. After studying lessons, the teacher assigned students to read newspapers dealing with lessons as a supplementary activity for this teaching model.

To know students' attitudes, feelings, experiences and opinions about AOM, a questionnaire was used. Students expressed openly their opinions about this teaching model. It was amazing that all the students agreed that AOM increase students' interest in the lesson. The reason was that the use of advance organizer at the start of the lesson enhances students' interest. With the help of advance organizers they could easily learn and their knowledge retention rate was increased without rote learning. Therefore, all students assumed that learning in science class was interesting and this kind of learning made their time efficiently. In addition, they all responded to positive attitude toward teacher's questions during teaching periods. The teacher's questions promoted their attention, interest and led them to the aim of the lesson.

According to the findings of research, this study indicated that AOM had positive effect in learning general science. However, no study is perfect in an effort. Thus, a need for further research is quite necessary. After treatment, only knowledge, comprehension and application level questions were used as the posttest. Hence, analysis, synthesis and evaluation questions can also be expanded for further researches. This research was done at the middle school level. It provides useful results and many suggestions to improve science education at the middle school level. As a result, a large number of researches should be carried out at all levels such as primary and high school levels.

Moreover, this AOM is applicable to the other subject areas. So, further researches should also be carried out in other subjects. In this study, simple texts, pictures, and concept maps were used as advance organizers, so other types of advance organizers should be investigated in further studies. In addition, this study was done in the Yangon Region. Therefore, further researches in this line should be carried out in other States and Regions and are needed for the improvement of science teaching.

Conclusion

Today's education system is characterized by a gap between how students live and what they learn and how they learn. Thus, improvement of science education is concerned with development of education. Science is recognized as being a subject of great importance both in school and in wider society. Its concepts and processes are essential in a wide range of disciplines, professions and areas of life. Moreover, science can be used as a tool for solving the problems of hunger, poverty, insanitation, illiteracy, superstition, deadening custom and tradition. Improvements of science teaching are fruitful to development of a nation. Thus, AOM was investigated to study its effectiveness on students' science achievement at the middle school level.

In addition, Advance Organizer Model is compatible with every lesson and every subject. With technology or without technology it is also compatible again in the classrooms. Thus, this

model can also be used not only in urban schools but also in rural schools. This flexibility of AOM can attract many teachers to apply this model in their real classroom setting. According to the results of the study, students' learning with AOM was more effective than formal instruction. This study has also contributions to curriculum planners. The effective use of AOM has significant effect on the overall science achievement of students. Therefore, AOM certainly has positive contribution to the science teaching at the middle school.

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