



Impact of Marzano's Dimensions of Learning Model on Students' Science Achievement

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ABSTRACT

The purpose of this study was to determine Marzano's Dimensions of Learning Model on students' science achievement. A total of 190 eighth grade students were chosen randomly from two schools. In each selected schools, two classrooms were randomly chosen, random method in the form of 4 classes and placed into 4 experimental and control groups. At the end of the study, post test was given. Teaching and learning process was carried out for ten weeks. Data were analyzed using the t-test to determine performance by comparing the mean of the post test for treatment and control group. The results of this study showed that Dimensions of Learning Model improve students' achievement in science.

Keywords : Dimensions of Learning Model, achievement, science.

INTRODUCTION

Despite science is around us everywhere and makes our lives easier from the technological aspect, science has not been taught very efficiently. Research done abroad has showed that conventional teaching has negative effects on most of the students. Even in well-developed countries, it has been discovered that goals cannot be reached in the teaching of science (Rivard and Straw, 2000).

It would be necessary to find out the main reasons behind this low achievement level in the science area. Also, this question is one of the main concerns for science educators and researchers in Yemen. Related to this problem, Haladyna, Olsen and Shaughnessy (1982) indicated that students' achievement in science area and their future career preferences strongly correlated with students' attitudes toward science (cited in Turkmen, 2007, 67). The researchers assert that traditional teaching approach is the main reasons of students' low achievement in science which make students feel that there is a gap between the syllabi they learn at school and their actual day-to-day needs.

In order to strengthen the quality of science education at all levels, there seems to be an urgent need to practice learner-centered, approach for teaching science at the high primary level, which will make the learning of science an enjoyable experience for students. An effect model of teaching-learning intends to empower the learners with the ability to master various competencies.

Various instructional models or programs are based on cognition and learning. One of the latest models of instruction is Dimension of Learning (DOL). The DOL Model is derived from the theory and research base of Dimension of Thinking.

The DOL program suggests that for effective learning to take place, the teacher and the students should participate in five different dimensions. These five Dimensions are the following (Marzano, 1992, 4):

Dimension 1: Positive Attitude and Perceptions about Learning should promote an encouraging environment for learning and task clarity.

Dimension 2: Acquiring and Integrating Knowledge

i. Declarative Knowledge: The knowledge and understand

ing of facts and concepts in which meaning is constructed, organized and stored by the learner.

ii. Procedural Knowledge: The knowledge of processes and skills in which models are constructed, shaped and internalized.

Dimension 3: Extending and Refining Knowledge

Learning does not stop with acquiring and integrating knowledge. Learners develop in-depth understanding through the process of extending and refining knowledge. These complex reasoning processes include comparison, classification, induction, deduction, analyzing error, constructing support, abstraction and analyzing perspectives that help in thinking critically (Marzano, 1998, 269).

Dimension 4: Using Knowledge Meaningfully

The most effective learning occurs when we use knowledge to perform meaningful tasks. This dimension uses the complex reasoning processes of decision making, investigation, experimental inquiry, problem solving and invention, which like the dimension three processes, further encourage the students to take apart and re-construct their knowledge (Huot, 1996, 80; Marzano, 1992, 106).

Dimension 5: Productive Habits of Mind

Students are encouraged to develop those mental habits which will enable them to think critically, think creatively, and regulate their behavior, and become life-long learners. These mental habits include those of self-regulation, critical thinking, and creative thinking (Marzano et al, 1988, 17).

The significance and value of the study comes from its introduction of a new method and approach of teaching to the students of science subject. Specifically, the objectives of the study were to determine:

- To study the impact of Marzano's Dimensions of Learning Model on achievement in science of eighth grade students.
- To study the difference between males and females in achievement in the science.

METHOD

The 'Randomized Groups, pre-test, post-test Design' was used for the present study. The instructional material based on DOL Model was subjected to experimentation in which

the participants are randomly assigned to experimental and control groups.

PARTICIPATES

The participants was chosen by random method from two government schools in Ibb, Yemen, the experimental group consisted of 93 eighth grade students, which were 45 males and 48 females and the control group consisted of 92 eighth grade students, which included 46 males and 46 females.

INSTRUMENTS

Achievement test in science: In this study, the achievement test was prepared by the researcher. The pre and post test contained fifty one items, including 34 multiple choice items, 5 fill in the blanks, 11 short answers and 1 long answer question with the allocation of seventy marks on the whole test. The time allocated is 90 minutes. All the items were reviewed by the Faculties of Department of Education and Science and experienced science teachers for validation. Besides, discriminative validity was done using 't' test. The calculated reliability of the achievement test was found to be 0.78 by using Cronbach alpha.

RESULTS

To determine the effects of Marzano's Dimensions of Learning Model on students' achievement, an analysis of students' post test mean scores was carried out. Table 1 shows the post-test achievement mean scores of the experimental and the control groups. The results indicate that the mean score for experimental group was 51.66 and that of control group was 42.93. The results also indicate that the difference between the achievement mean scores for experimental and control groups $t(183) = 0.000$ is significant at the alpha level of 0.01.

As shown in Table 2, the results indicate that the mean score for males was 52.40 and that of females was 50.93. The results also indicate that the difference between the achievement mean scores for males and females $t(91) = 0.361$ is not significant at the alpha level of 0.05. This, therefore, means that the males and females were at the same level of achievement at the start of the study.

Table 1: Post-test achievement mean scores of experimental and control groups

S.N	Group	N	Mean	S.D	df	t' Value	Significance p
1	Experimental	93	51.66	7.65	183	8.67	.000
2	Control	92	42.93	5.91			

$P < 0.01$

Table 2: Post-test achievement mean scores of males and females at experimental group

S.N	Gender	N	Mean	S.D	df	t' Value	Significance p
1	Males	45	52.40	7.20	91	0.91	0.361
2	Females	48	50.93	8.10			

$P > 0.05$

DISCUSSION

The results of this study indicate that the DOL resulted in higher achievement than the traditional teaching approach. The reason for the increase in students' achievement could be caused by there are various strategies were used while teaching DOL such as cooperative learning, K.W.L, brain storming, advance organizations, think aloud, etc which emphasis on active learning. The other reasons for improved achievement in science may be due to showing an interest in what they have learned rather than in their grades, avoiding the threatening situation associated with answering the classroom questions and creating a climate of mutual respect and acceptance between students and between students and teachers; therefore, they effect positively on students' high interest and positive attitudes toward science which leads to enhance students' achievement in science. Also, acquiring knowledge involves interaction between what the students already know and what they want to learn. And then students can link new knowledge to their prior knowledge, organize this knowledge and store this knowledge in long-term memory which leads to make the learning much more easy. In addition, DOL gives more opportunities for students sharing knowledge, solving problems, providing ideas, discussing with teammates and teacher, realizing weak points during team work and supporting each other during engagement intensity in classroom tasks which lead to develop their understanding in-depth. Also this model provides the students with explicit opportunities to apply their knowledge in meaningful ways though extra-curricular activities and assignment were given students. The result of this study also corresponds to the findings of Al-Baz (2001), Al-Bali (2003), Al-Rehali (2007), Alfino (1999) and Saleh (2009) who found that achievement is improved through the use of Dimensions of Learning Model. However, a study by Dujari (1994) found no significant difference was observed between the control and experimental groups. But traditional teaching method is teacher based; therefore, lack opportunity is given to students to participate in classroom tasks, setting up competitive situations, lack of opportunity to use ideas or what has been learned and hesitating to ask about unknown question or topics.

The results of this study also indicate that the DOL was fits males and females because they are learning in an equal learning environment and there is no difference between males and females in terms of behaviors performed by them during their learning through active participation in the discussion with each other.

CONCLUSION

Student-centered approaches such as DOL enhance science achievement. Thus, the DOL focuses on shifting from 'what and how much' the students have learnt to 'how the students learn'. Therefore, teachers in schools, especially teachers who teach science need to be aware of the benefits and importance of DOL.

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