CHAPTER III
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3.0 Introduction

The literature review of this Study encompasses topics related to Dimensions of Learning Model, Creative Thinking and attitude towards of science. The literature review enables to obtain clarity on the definition of the key terms used in this Study and to examine the extent of research already done in the subject areas. It is to be examined whether past studies have indicated any outcomes with respect to impact of the independent variables in the Study and the relationship among the dependent variables.

This chapter discusses review of studies related to Dimensions of Learning Model, studies related to Creative Thinking and studies related to attitude towards of science.

3.1 Studies Related to Dimensions of Learning Model

To gather information on the past studies and trends in research regarding teaching through Dimensions of Learning Model, various texts, websites and journals were reviewed, particularly with reference to science teaching, and those studies related to Dimensions of Learning Model and its impact in promoting Achievement in Science, Creative Thinking and Attitude towards of Science. It was revealed that classrooms based on this Model enhanced Achievement of students, Stimulated Thinking and aided development of their Attitude towards Science.

Many researchers have shown that Dimensions of Learning Model develops achievement, Creative Thinking, and attitude in students. Dujari (1994) Conducted a Study aimed to determine the effect of tow components of the Dimensions of Learning Model on the Achievement of under prepared college science students, namely the Acquiring & Integrating Knowledge and Extending & Refining knowledge, the Study was applied to 61 students at Wilmington College in America, and an Achievement Test was used in this study, the results of this Study indicated that there was no significant difference between the Experimental and Control Groups, but the better improvement in
score was observed within the Experimental Group. This clearly indicates that although there was no difference in instructional methods, students gained content knowledge when taught the strategy. The Study had limitations from small size and limited experimentation time.

**Brown's Study (1995)** based on a design Observation Card of elements of Dimensions of Learning which a students were displayed within each Dimension of Learning, the researcher applied semi structured Observation Card to eleven schools, in Maryland. Findings of this Study suggested increasing student learning of the skills included in the content using the teaching according to the Dimensions of Learning Model.

**Thompson (1999)** in his study aimed to test the effectiveness of the implementation of the Dimensions of Learning Program in an Australian independent boy’s school. Subjects were secondary school students from the school over a period from 1994 until 1998 from standards 8 to 12. It was found that, in its early stages of implementation, the Dimensions of Learning Program has had a measurable positive effect equivalent to approximately 40 percent of one year’s growth, indicating that more able students would appear to profit more from the introduction of the program.

According to Alfino (1999), found that the students of first Experimental Group who were exposed to teaching using Dimensions of Learning Model only and students of second Experimental Group who were taught using traditional method along with Dimensions of Learning Model during teaching some topics performed significantly better than students of Control Group in the Achievement in Mathematics. However, he further reported that the two Experimental Groups showed little difference in Mathematics Achievement in favor of first group which exposed to Dimensions of Learning Model only.

**Al-Baz (2001)** conducted a study of the effectiveness of Dimensions of Learning Model for tenth standard students. 71 male students (36 Experimental Group, 35 Control Group) constituted the sample for the study. Experimental Group was taught two units of chemistry subject “atomic construction & principals of organic chemistry” using
Dimensions of Learning Model and Control Group was taught the same content by conventional method. An Achievement Test in Chemistry, Scale of Attitude towards Chemistry and Complex Thinking test including Creative Thinking Test, Critical Thinking test and Decision Making test were constructed by the researcher. The mean, SD and ‘t’ test were used for data analysis. The researcher concluded that Dimensions of Learning Model fosters Student’s Achievement in Chemistry, Attitude towards Chemistry and Complex Thinking Skills including Creative Thinking, Critical Thinking and Decision Making.

Similarly, Jebreel (2003) conducted a study to assess the effectiveness of Dimensions of Learning Model on Thinking Skills included in third Dimensions of Learning Model such as comparison, classification, induction, deduction, analyzing error, constructing support and analyzing perspectives with students in seven standard. The findings showed that Dimensions of Learning Model appeared generally encourage and develop Thinking Skills included in third Dimensions of Learning Model such as comparison, classification, induction, deduction, analyzing error, constructing support and analyzing perspectives.

Al-Haroon (2003) carried out study by teaching biology through Dimensions of Learning Model. Participants included 70 tenth standard high school female students. A Achievement Test and Scale of Meta Cognition Skills were the tools of the study. Significance difference has been found in the mean scores of Achievement and Meta Cognition Skills of the Experimental Group. It was concluded that Dimensions of Learning Model was more effective than the conventional method.

A study of Abu-Bakr (2003) aimed to examine the effectiveness of Dimensions of Learning Model on Achievement and Attitude towards Rhetoric. The participants in this Study were 84 male students in secondary school. Two classrooms selected were randomly assigned one for Dimensions of Learning Model and the other for traditional method. The findings showed a significant in scores on a measure of Achievement and Attitude towards Rhetoric when Dimensions of Learning Model on Rhetoric was used. The final result of the Study indicates that Dimensions of Learning Model can have a positive effect on Achievement and Attitude towards Rhetoric.
Al-Baali (2003), through teaching of science using Dimensions of Learning Model, investigated Achievement and Science Processes Skills. Data were collected from 159 of eighth standard students. The sample was split into two groups Experimental Group was taught using Dimensions of Learning Model and Control Group was taught by conventional method. An Achievement Test and Science Processes Test were constructed by the Researcher. An Achievement Test and Science Processes Test were constructed for administering as pre-test and post-test. The results revealed students taught by Dimensions of Learning Model improved their Achievement and Science Processes Skills more than students taught by traditional approach; also it found a positive correlation between Achievement and Science Processes Skills.

Saleh and Basheer (2005) conducted a study to assess using of Dimensions of Learning Model on Skills and Concepts associated with some educational experiences required for kindergarten child. The participants in this Study two classrooms of second KG. The results revealed that children taught by Dimensions of Learning Model acquire Skills more than students taught by traditional approach.

Wallace (2006) examined the effect of the Dimensions of Learning Model on the Epistemological Beliefs of students enrolled in general chemistry laboratory for post-baccalaureate pre-medical students. The Experimental Group received twenty to thirty minute interactive instruction for each laboratory activity. This instruction for the Experimental Group was designed to include the five Dimensions of Learning. The Control Group received normal laboratory instruction which consisted of background information to complete the activities. Results indicated that there was not a significant difference between the two groups in the Epistemological Beliefs.

Hassaneen (2006) assessed the influence of Dimensions of Learning Model on Physical Concepts Acquisition, Complex Thinking and Attitude towards Physics. Compared to students in the Control Group who received conventional method, students in the Experimental Group taught using Dimensions of Learning Model. The result revealed that Dimensions of Learning Model was more effective than the conventional method in developing Physical Concepts Acquisition, Complex Thinking and Attitude towards Physics.
The study of Aita (2007) aimed to determine to what extent Mental Skills as mentioned in Marzano's Dimensions of Learning Model are included in the general science syllabuses in the lower basic stage in Palestine as it was issued by the ministry of education. The Researcher used the analytical descriptive approach in analyzing the included questions in the eight books; he also prepared a list with the Mental Skills needed to be available in the general science syllabus in the lower basic stage. The result revealed that there was no percentage balance between the instructional and the evaluative questions, the instructional questions were about (60.52%) while the evaluative questions were (39.48%) from the over whole total questions of the eight books, memorization questions were (28.02%), deduction questions were (17.92%) and observation questions (17.29%), of the over whole total of the eight books. There were fewer questions which focused on expansion, comparison and classification. The questions neglected the skills of ordering, prediction, mistakes identification, features identification and demonstration in close levels.

Al-Rehali (2007) conducted an experimental study comparing the effects of the Dimensions of Learning Model and the traditional method for teaching science in two higher primary schools for girls. The main purpose of the Study was to compare the effectiveness of Dimensions of Learning Model and traditional method of teaching science on the Science Achievement and developing Multiple Intelligences. The results indicated that the students in the Experimental Group performed significantly better than the students in Control Group in the Achievement Test. But the Experimental Group was not more effective than Control Group in developing Multiple Intelligences. However, the results also show positive correlation between Achievement and Multiple Intelligences among the Experimental Group, but there was no positive correlation between Science Achievement and Multiple Intelligences among the Control Group.

Al-Hassan (2007) conducted a study to investigate the effectiveness of Dimensions of Learning Model on some Thinking Skills included in Dimension 3 of Marzano’s Dimensions of Learning (Comparison, classification, induction, deduction and Analysis perspective), some Conceptual Understanding (explanation, interpretation and application) according to classification of (Wiggins & Mctighe, 1998), and Perceptions
towards Classroom Environment in all its Dimensions (acceptance, participation and cooperation, system and rule, teacher support, orientation towards classroom tasks and creativity and innovation). The sample of the Study was chosen by purposive method from two government schools in Riyadh, 30 female students from one school to represent Experimental Group and 30 female students from other school to represent Control Group. Pre-test post-test none equivalent Control Group Design was used for the study. Thinking Test, Conceptual Understanding Test and Scale of Perceptions towards Classroom Environment were constructed by Investigator. The ANCOVA was used for data analysis. She reported that the female students who were exposed to Dimensions of Learning Model showed significantly greater productivity in Thinking Skills, Conceptual Understanding and Classroom Environment Perceptions.

The study of Al-Maghrabi & Al-Jabri (2007) aimed to determine to what extent Thinking Skills as mentioned in Marzano’s Dimensions of Learning Model are included in the Palestinian mathematics syllabuses in the higher basic stage in algebra. The Researcher used the analytical descriptive approach in analyzing the included exercises and questions in the higher basic stage (6th - 10th) standard; he also prepared a list with the Thinking Skills needed to be available in the mathematics syllabus. The result indicated that the most skills used in science are a skill of the production where its percentage reached 42% of the overall Thinking Skills. The reason behind that is that this main skill comprises a number of the minor skills such as application, deduction and induction. It was clear that percentages of the low thinking skills were very low such as collecting of information, storage and recovery where their percentage reached together 7.5%, while the middle Thinking Skills such as organization and analysis, their percentage together reached 19.5%, and the higher skills such as production, integration and evaluation has amounted to 73%.

Taha (2007) studied the effect of Dimensions of Learning Model on Achievement in Biology, Creative Thinking, Critical Thinking and Decision Making for secondary school students. Participants included tenth standard students who attended biology classes about “human & environment”. The Investigator found that Dimensions
of Learning Model was better than the traditional methods on developing Achievement in Biology, Creative Thinking, Critical Thinking and Decision Making.

On the same lines, **Fath-Allah (2008)** carried out a study to examine the effect of Dimensions of Learning Model on Conceptual Understanding and Habits of Mind in Science. The participants in this Study were 71 male students. A Conceptual Understanding Test and Scale of Mind Habits were constructed for administering as pre-test and post-test. The data were analyzed through mean, SD, ‘t’ test and ANCOVA. The result confirmed that Dimensions of Learning Model group achieved Conceptual Understanding and Habits of Mind in Science better than students taught by traditional method, also positive correlation between Conceptual Understanding and Habits of Mind was found.

**Al Saud (2009)** conducted an experimental study comparing the effects of the Dimensions of Learning Model and the traditional method for teaching history in two secondary schools for girls. The main purpose of the Study was to compare the effectiveness of Dimensions of Learning Model and traditional method of teaching instructional unit on the Critical Thinking, Mental Features and Achievement in History. The participants in this study were 50 female students. The results indicated that the students in the Experimental Group performed significantly better than the students in Control Group in Critical Thinking, Mental Features and Achievement in History.

**Saleh (2009)** compared the Achievement levels in Science, Reasoning Thinking and Attitude towards Science of 42 male students (Experimental Group) who taught by Dimensions of Learning Model and 41 male students (Control Group) who taught through conventional method. The result revealed that there were significantly differences among students of the Experimental Group and the Control Group on Achievement in Science, Reasoning Thinking and Attitude towards Science in favor of students of the Experimental Group, besides; there were positive relationship between dependent variables of the study.

A study of **Kamil & Issa (2010)** aimed to examine the effectiveness of Dimensions of Learning Model on Skill of Reading Map and Critical Thinking. The
participants in this Study were 54 fifth standard students of Learning Difficulties. The result revealed that Dimensions of Learning Model was more effective than the conventional method in Skill of Reading Map and Critical Thinking.

Assaid (2011) carried out study by teaching philosophy through Dimensions of Learning Model. The Study aimed to determine the effect of using Marzano’s Dimensions of Learning Model among secondary school students on their Critical Thinking and Decision Making. The findings showed that students of the Experimental Group more effective than students of the Control Group on Critical Thinking Skills and Decision Making.

The study of Attakaineh (2011) aimed to investigate the effect of using strategy based on Dimensions of Learning on Attitudes towards Mathematics and Mathematical Communication Skills of private schools. The participants were 79 students of 7th standards. The sample was split into two groups Experimental Group was taught using Dimensions of Learning Model and Control Group was taught by conventional method. The result showed that there is significant difference between the two groups in both the Attitudes towards Mathematics and Mathematical Communication Skills in favor of Experimental Group, there is significant interaction between the strategy and the levels of Attitude towards Mathematics and there isn’t significant interaction between the strategy and the levels of Attitude towards Mathematics and Communication Skills in Mathematics.

Al-Zoqbi and Al-Salamat (2011) conducted a study which aimed to determine the effect of using a strategy based on Marzano’s Dimensions of Learning Model among high primary school students on their Achievement of Physics Concepts, development of Critical Thinking Skills and their Attitudes towards Physics. The Study randomly sampled 60 male students. The ANCOVA was used for data analysis. The findings showed that students of the Experimental Group more effective than students of Control Group on Physics Achievement, Critical Thinking skills and Attitude towards Physics.

Studies reviewed above show that Marzano’s Dimensions of Learning Model has a positive impact on many variables, though in one study it has been proved contrary to
the above findings. Also it appears that few studies are conducted to find out the impact of Marzano’s Dimensions of Learning Model on Achievement, Creative Thinking and Attitude towards Science.

3.2 Studies Related to Creative Thinking

Torrance conducted extensive research and identified several candidate Scales that seem to measure important aspects of creativity. He chose those with lowest inter-correlations (Torrance, 2003) so that each component of the test has a unique contribution to overall assessment. Significantly, Torrance argued that TTCT differs from the tests developed by Guilford (1967, 1970) and Wallach and Kogan (1965). The first of these was an attempt to measure factorially pure mental functioning. The latter was designed to allow ideational associations using an untimed and game-like testing environment. Activities on the TTCT aim to measure Creative Thinking tasks that are necessary for daily life activities and creative breakthroughs under traditional test conditions (Runco, Millar, Acar and Cramond, 2010, 362).

Al-Mehasen (2000) examined the effect of a suggested method that was derived from Creative Thinking researches on Creative Thinking of higher primary school students in science. Participants included 150 male students. To measure the Creative Thinking skills (fluency, flexibility and originality) of students, the Creative Thinking test was prepared by the Researcher. The results indicated that there was a significant difference between the Experimental and Control Groups in the fluency, flexibility and originality skills in favor of the Experimental Group.

Ismail (2000), through teaching of mathematics using Constructivist Learning Model, investigated Achievement, Retention and Creative Thinking. Data were collected from 166 of seventh standard students. The sample was split into two groups Experimental Group was taught using constructivist learning model and Control Group was taught by conventional method. An Achievement Test and Creative Thinking Test were constructed by the Researcher. The results revealed students taught by Constructivist Learning Model improved their Achievement and Creative Thinking more
than students taught by traditional approach; also it found a positive correlation between Achievement and Creative Thinking.

Gates (2001) conducted a study to compare the effect of group interactive Brainstorming to individual brainstorming on Individual Creativity assessed in a final product. Subjects were randomly assigned to either a treatment group that participated in group verbally interactive Brainstorming prior to developing a Product Individually, or a Control Group that participated in an Individual Brainstorming session. Analysis of variance revealed no significant differences when creativity scores were compared between two Brainstorming groups. That is, projects developed by interior design students did not differ significantly in creativity systematically between the two Brainstorming Techniques. When scores on the two dependent variables of secondary interest (novelty and appropriateness) were compared between groups they also did not differ significantly.

Hwa (2005) states that there has not been enough educational support to educate children who have high creativity and special talents in regular schools, and they have been neglected and the need to develop Creative Thinking in schools. Thus, he conducted a study to determine the relationship among Creative Thinking ability and Creative Personality of preschoolers and found that there was significant relationship between Creative Thinking ability and Creative Personality; also there were significant differences in language, drawing and total score of Creative Thinking ability according to gender, but no significant differences in Creative Personality. Girls displayed higher creative ability in both language and drawing than boys, the differences were statistically significant. And there were significant differences in both Creative Ability and Creative Personality according to age. That is, 5 year-old preschoolers scored higher in the language and drawing domains of Creative Thinking Ability and Creative Personality than 4 year-old preschoolers.

Ali (2006) conducted an experimental study comparing the effect of teaching science according to the science, technology and society approach on Creative Thinking and the traditional method. The main purpose of the Study was to compare the effectiveness of teaching science according to the science, technology and society
approach and traditional method of teaching science on Creative Thinking. The results indicated that the students in Experimental Group performed significantly better than the students in Control Group. Also males and females in the Experimental Group achieved significantly higher scores than the control males and females on Creative Thinking. However, the results also show that there was no difference among males and females in Creative Thinking.

Friedel & Rudd (2006) indicate that Creativity is multidimensional and still not completely understood by psychologists. Much research has given evidence that cognitive style of Creative Thinking is independent of cognitive level of Creative Thinking. However, they carried out Study to examine the presence or absence of relationships between student learning styles and student Creative Thinking. To determine this relationship the Torrance Test of Creative Thinking and the Gregorc Style Delineator were given to students enrolled in an oral communication course. The researchers found no significant relationships between Creative Thinking ability and Learning Style, except for Abstract Random learners who scored lower in the Creativity constructs of fluency and elaboration. Also, students scored high in the creative construct of elaboration with mean scores in the 99th percentile and originality was the only Creativity construct with mean scores below the 75th percentile.

Khatab (2007) conducted a study aimed to determine the effect of Meta-Cognition strategy among eighth standard students on their Achievement and Creative Thinking skills through teaching mathematics. The participants in this Study were 137 students. The Achievement Test and Creative Thinking Test were constructed by Investigator. The findings showed that students of Experimental Group more effective than students of Control Group on Achievement and critical thinking skills, also it found a positive correlation between Achievement and Critical Thinking Skills.

Similarly, Zrnoqi (2007) carried out study of effectiveness teaching physics using computer on Achievement and Creative Thinking with students in secondary school. The Study randomly sampled 114 female students. The Achievement Test in Physics and Creative Thinking Test were constructed by the Investigator. The results showed that there were improvement in the Achievement of the students and Creative Thinking Skills.
(fluency, flexibility, originality) and concluded that teaching physics using computer was more effective than the conventional method.

**Al-Ahmadi (2008)** in her study aimed to examine the effect of Brainstorming on Creative Thinking and Written Expression in Arabic Language. The participants in this Study were 40 female students in ninth standard. The Creative Thinking Test and Written Expression Test were constructed by the Researcher. The results revealed that Brainstorming was more effective than the conventional method in developing Creative Thinking and Written Expression Skills.

**Al-Itabi (2009)** conducted an experimental study to determine the Ability of six elementary standard females on Deductive Thinking and Creative Thinking and Problem Solving and their relation to Achievement in Science. Data were collected from 853 of sixth standard female students. The Deductive Thinking and Creative Thinking and Problem Solving Tests were constructed by the Investigator. The result revealed that the general Ability on Deductive and Creative Thinking and Problem Solving exceed the minimum limit of the accepted performance (75%) of the total mark measure on the level of the three branched measures, also there is not a statistically significant correlation between the students’ abilities orders in Deductive and Creative Thinking and Problem Solving in Science and their Achievement orders in Science and there is not a statistically significant effect for the students’ abilities orders in Deductive and Creative Thinking and Problem Solving in science on their Achievement orders level in Science.

**Al-Taher (2009)** in his study aimed to identify the impact of the application of the mechanism of quality educational program adopted by Edexecl (assignment, educational small project and quizzes) in the development of Creative Thinking Abilities (fluency, flexibility, originality and elaboration) and increasing Achievement. The sample consisted of 60 male students. TTCT- figural form was administrated as pre-test and post-test. The Data were analyzed through ANCOVA, Man-Whitney and Wilcoxon. The result revealed that quality educational program is superior to conventional approach in developing Creative Thinking. Also it was found that there was not effective than conventional approach in Achievement.
**Al-Zaidy (2009)** conducted a study to assess the effect of Active Learning on Achievement in Science and Creative Thinking (fluency, flexibility, originality and elaboration) for ninth standard students. The sample consisted of 56 female students. The Achievement Test and TTCT-figural form were administrated as pre-test and post-test. The results showed that fluency, flexibility, originality and elaboration skills and Achievement in Science was developed; also it was found that there was significant relationship among Creative Thinking and Achievement in Science.

**Erdogan, Akkaya and Akkaya (2009)** observed that although there is a significant difference between the Creative Thinking Test, fluency, originality, the titles’ being Abstract, Creative Forces lists, and Creativity pre-test and post-test scores of the students in the Experimental Group, a significant difference between the pre-test and post-scores of students in the Control Group related to the sub-dimensions of Creativity Thinking and total scores was not observed. When the Creative Thinking levels of the students after the instruction was examined, a significant difference was found in total post test scores related to fluency, originality, the titles’ being Abstract, Creative Forces lists and Creativity in advantage of the Experimental Group.

**Karpova, Marcketti and Barker (2009)** conducted a study to assess effectiveness of creativity training by measuring student Creative Thinking before and after implementation of Creativity Exercises. The Exercises were a systematic approach designed to help students experience and practice non-traditional ways of thinking to identify opportunities, to create, to evaluate and to promote their ideas. The Exercises utilized both interactive and experiential learning approaches. To assess Creativity, figural format of the Torrance Test of Creative Thinking (TTCT) was used (Torrance, 1966 & 1998). The results indicate that for the total group of students participated in the Study the Creativity index after the Exercises was significantly higher than before the training.

**Sawafta (2009)** conducted a study to investigate the effectiveness of Solving Problem method on Achievement in Physics and Creative Thinking (fluency, flexibility and originality). Data were collected from 78 of eleventh standard male students. The tools used in this Study were Achievement Test and Torrance Test of Creative Thinking -
variable form. The findings indicated that Solving Problem was more effective than the conventional method in fostering Achievement and Fluency and Flexibility skills in Experimental Group, but the Experimental and Control Groups showed no difference in Originality skill.

The study of **Abu Adhra (2010)** aimed to know the effect of using Express- Plan-Evaluation Strategy in teaching mathematics for students of seventh standard on developing the Creative Thinking Skills in Gaza area. The sample of the study consisted of (140 students), they were divided into two groups: the Experimental and the Control Group from seventh standard (female and male). The Express-Plan-Evaluation Strategy was used in teaching the Experimental Group, while the tradition method was used with the Control Group. The findings showed that students of Experimental Group more effective than students of Control Group.

**Ali (2010)** conducted an experimental study comparing the effects of the Constructivist Approach and the traditional method for teaching geography in two basic stage schools for boys and girls. The main purpose of the study was to compare the effect of Constructivist Approach and traditional method of teaching geography on the Achievement and Creative Thinking. The results indicated that the students in the Experimental Group performed significantly better than the students in the Control Group in the Achievement in Geography and Creative Thinking. However, the results also show that there was no difference among boys and girls in Achievement in Geography and Creative Thinking, also there was no positive correlation between Achievement and Critical Thinking among the Control Group.

**Al-Omary (2012)** carried out study of effectiveness of Instructional Program based on Computer on Creative Thinking among seventh standard students. The study randomly sampled 116 students. They were assigned to Experimental Group-I, Experimental Group-II and Control Group. The experimental treatments through cooperative learning based on computer and individual learning based on computer were applied on Experimental Group-I and Experimental Group-II. The findings revealed that students taught by Cooperative Learning based on Computer and Individual Learning based on Computer improved their Creative Thinking more than students taught by
traditional approach. The Study also revealed that there is significant difference between Experimental Group-I and Experimental Group-II.

It can be seen from the reviewed literature that Creative Thinking is an important component of science education that is to be developed in the classroom.

### 3.3 Studies Related to Attitude towards Science

Sokadar and kulce (2008) noted that research studies have identified a number of factors influencing students' Attitudes towards Science in general. Most frequently, Researchers have compared gender (males versus females) and/or age (primary, lower secondary, secondary level) and/or school (private versus government) or peer influences toward school science.

The importance of Attitudes toward Science has been recognized by researchers since decades. Arisoy (2007) stated that student Attitudes toward Science have been discussed for several decades within different research contexts. Developing Positive Attitude toward Science regardless of individual difference is one of the purposes of science education. **Abbas and others (2011)** carried out their study to assess the Attitude of students of secondary classes towards Science. The data was collected from seven secondary schools situated. The sample consisted of 600 students, both male and female drawn from science as well as humanities streams. The study revealed that all students of secondary classes had Positive Attitude towards Science. Attitudes of females are even more positive. Similarly students of science group have more positive Attitude than those of Humanities Group. The Study further revealed that Parental Attitude and school type also contribute towards development of Positive Attitude of students towards Science.

**Similarly, Hacíeminoglu, Tuzun and Ertepınar (2001)** conducted study to investigate middle school students’ Attitude toward Science and the effect of gender, standard level and Parent Education level on students’ Attitude toward Science. The sample of this survey study included 2961 sixth, seventh and eighth standard middle school students. Students completed 40 items test of science related Attitude (TOSRA) developed by Fraser (1978). Four dimensions (adaptation of scientific attitudes, enjoyment of science lessons, leisure interest in science, and career interest in science)
were selected for this study. Descriptive analyses revealed that, regarding the mean scores of each TOSRA dimension, students were undecided about all sub-dimensions of Attitude. MANOVA results showed that standard level significantly affected middle school students’ Attitude toward Science regarding adaptation of Scientific Attitudes, enjoyment of science lessons, leisure interest in science, and career interest in science. Gender and Parents Education level have influence on only adaptation of scientific Attitudes Dimension.

Olatunde (2009) conducted a descriptive survey design using simple frequency and percentages in analyzing the data. 1542 senior secondary two students randomly selected from 2 schools in each of the senatorial districts from the six states in the Southwestern part of Nigeria were used. One instrument (SAT) was used while three research questions were answered in the study. The results showed that the students’ Attitudes towards Mathematics were positive and that many of them believed that Mathematics is a worthwhile and necessary subject which can help them in their future career. It is recommended that the teacher should develop positive relationship with students and stress classroom activities that involve active teaching-learning process and students’ participation in the class.

Chen and Howard (2010) examined the effect of live simulation on students’ Science Learning and Attitude. A students of middle school participated in the simulation, which allowed them to access and interpret satellite data and images and to design investigations. A pre/post design was employed to compare students’ Science Learning and Attitude before and after the simulation. The findings revealed positive changes in students’ Attitudes and Perceptions toward Scientists, while male students had more positive Adoption toward Scientific Attitudes than females. The Study also found that the change in student’s Science Learning was significantly influenced by the teacher.

Sokadar and kulce (2008) conducted study to understand pupils’ Attitudes towards School Science. Subjects were given a Scale to measure their Attitudes towards School Subject, Instruction and Science in three Sub-Dimensions. According to the result of the study, pupils’ Attitudes towards Science were found at medium level. Pupils’ favorite Subject, Attended School, Standard, families’ monthly income and perception of
Self-Achievement relate to the pupils’ Attitudes towards Science. The pupils’ Attitudes towards science differ depending on Pupils’ favorite subject, attended school, standard, families’ monthly income and perception of self-achievement. On the contrary, there were no significant differences at the pupils’ Attitudes towards Science relating to gender, parents’ educational background and job and social self-perception of the pupils.

On the contrary, Sadi and Cakiroglu (2011) investigated the effectiveness of Hands-on Activity enriched instruction on sixth standard students’ Achievement and Attitudes toward Science. One class of each teacher was assigned as Experimental Group and treated with Hands-on Activity enriched instruction and other class was assigned as Control Group and treated with traditional instruction. The results revealed that Hands-on Activity enriched instruction were more effective than traditional instruction. However, the statistical results failed to show a significant difference between the Experimental and Control Groups’ Attitudes toward Science.

Kirikkaya (2011) conducted a study; the aim of this Study is to investigate the standards 4 to 8 students’ attitudes towards science under the ‘liking school’, ‘independent Investigator’ and ‘what I really think of science’ titles. The affect of gender, standard level and Science Achievement on students’ attitudes was analysed in ‘liking school’, ‘independent Investigator’, ‘science enthusiasm’, ‘social context’ and ‘science is a difficult subject’ subscales that took place in this study. All schools were clustered into three groups which are upper, middle and lower levels according to their achievement. From each group four schools, totally 12 primary schools selected by drawing lots, a total of 540 students were selected from every group with randomly selection method. According to the results, level of willing ‘independent Investigator’ falls significantly at unsuccessful students and ‘science enthusiasm’ falls significantly at high standard levels. Wang and Berlin (2010) observed that there were no gender or standard-level significant differences in students’ overall attitudes toward science class.

Teachers in particular, have the largest influence on student attitudes toward science. One Study showed that teachers’ teaching style and instructional decisions are the most noticeable factors in students’ attitude toward science (Jarvis & Pell, 2005 as cited in Chen & Howard, 2010). Singer (2010) in his study aimed to investigate
undergraduate student attitudes toward science as a result of teacher feedback. Classroom observations were conducted to answer how students react to teacher feedback, attitudinal surveys were administered to collect current attitudes toward science, and individual interviews were completed to gather information about how teacher feedback affects student attitudes toward science. The results revealed that positive oral feedback increased student participation in the classroom, attitudes of students toward science is developed as a result of their previous science experiences and the attitude of their science teachers and student attitudes were increased as a result of teacher feedback.

Ong and Ruthven (2009) reported the relative effect of smart and mainstream schooling on students’ attitude towards science. The participants comprised 775 Form 3 students from two smart schools and two mainstream schools. The results indicated that the level of Attitude towards Science of form 3 students who had participated in the smart schools is statistically significantly higher than the level of schools.

Abu Qamar (1996) examined the effect of using the guided inquiry on Achievement and attitudes in science among eighth standard students. The participants in this Study were 189 students. The result revealed that there were significantly differences among students of Experimental Group and Control Group on Achievement in Science and Attitude towards Science in favor of students of Experimental Group. However, the results also show that there was no difference among males and females in Achievement in Science, but; attitudes of males are more positive than females.

Annaser (2001) conducted a study to assess the effect of cooperative learning on Achievement in Physics and attitude towards physics for eleventh standard female students. The sample consisted of 83 female students. The Achievement Test in Physics and Attitude Scale towards Physics were prepared by Investigator. The findings showed that female students of Experimental Group more effective than female students of Control Group on Achievement and Attitude towards Physics; also it was found that there was significant relationship among Achievement and Attitude towards Physics.
Hamam and Soliman (2001) conducted a study to investigate the effectiveness of suggested strategy in cooperative learning on Achievement in Science, communication skills and Attitude towards Science for deaf students. The Achievement Test in Science, communication test and Attitude Scale towards Science were prepared by the Investigators. The results indicated that the students in the Experimental Group performed significantly better than the students in the Control Group in the Achievement in Science, communication skills and attitude towards science.

AmbuSaidi and Al-Hashmi (2003) conducted study to investigate the effectiveness of science technology society approach on Achievement in Science and Attitude of ninth standard female students towards science. The sample consisted of 143 female students. The findings revealed that science technology society approach had more significant effect on Achievement in Science and attitude of ninth standard girls towards science than conventional approach.

Al-Matrafi (2008) carried out a study to examine the effect of using the Constructive Learning Model on Achievement in Science and Attitude towards Science. Data were collected from 132 of ninth standard male students. The ‘t’ test was used for data analysis. The study’s results found improvement in the Achievement in Science and Attitude towards Science of the Experimental Group.

Al-Ghamdi (2009) conducted study to assess the effect of Programmed Instruction on Achievement in Science and Attitude towards Science. The sample consisted of 50 male students. The results revealed that the Programmed Instruction is superior to conventional approach in developing Achievement in Science and Attitude towards Science. He also reported that there was significant correlation among Achievement in Science and Attitude towards Science.

Asslwi (2010) conducted study to investigate the impact of Science Technology Society Approach on Decision Making and Attitude of eleventh standard female students towards Physics. The participants in this Study were 64 female students. The Decision Making test and Attitude Scale towards Physics were constructed by the Investigator. The
findings showed that students of the Experimental Group more effective than students of the Control Group on Decision Making and Attitude towards Physics.

Hong (2010) investigated the effects of a Collaborative Science Intervention on high Achieving Students’ Learning Anxiety and Attitudes toward Science. Thirty-seven eighth- standard high achieving students were selected as an Experimental Group who joined a 20-week Collaborative Science Intervention, which integrated and utilized an innovative teaching strategy. Fifty eight eighth- standard high Achieving students were selected as the comparison group. Both quantitative and qualitative findings revealed that Experimental Group students experienced significant impact as seen through increased Attitudes and Decreased Anxiety of Learning Science.

The purpose of study of Zakaria, Chin and Daud (2010) was to determine the effect of Cooperative Learning on Mathematics Achievement and Attitude towards Mathematics. This Quasi Experimental study was carried out on two form one classes. One class 44 was assigned as an Experimental Group and the other 38 was assigned as a Control Group. The two groups were Pre-tested prior the implementation. At the end of the study, post test was given, while daily quiz was used as a tool for formative testing. Teaching and learning process was carried out for two 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 Cooperative Learning Methods improve students’ Achievement in Mathematics and Attitude towards Mathematics.

On the contrary, Unal and Ergin (2006) conducted an Experimental study comparing the effects of the Science Learning through Discovery and the traditional method on Students’ Academic Achievements, Learning Approaches and Attitudes towards Science. The study was conducted with 30 Experimental and 29 Control Groups students at 7th standard in a state primary school in Buca, Izmir, Turkey. Multiple choice academic Science Achievement Test, Learning Approaches Questionnaire and Scale of Attitude towards Science were given to both groups as pre-tests and p-ost-tests. During the instruction, the Experimental Group received Discovery Learning Science Activities while the Control Group utilized traditionally designed science instruction by the same teacher over a period of 5 weeks. The results indicated that the there is a meaningful
difference between the Experimental and Control Groups regarding their Academic Achievement in favor of the Experimental Group and there is no meaningful difference between Experimental and Control Groups regarding their Learning Approaches and Attitudes towards Science. Also it was found that there was a significant relationship among study variables.

The study of **Cook and Mulvihill (2008)** examined college students’ Attitudes towards Science in a course designed with Science Education for New Civic Engagement and Responsibilities (SENCER) ideals. SENCER uses socially engaging issues to teach basic science to non-science majors. A combination of methods was used to measure changes in Attitudes (confidence and interest) and Scientific Literacy after completing this SENCER course. While a pre/posttest showed a significant increase in knowledge about biological concepts, the study revealed no significant change in confidence or interest in science in general as measured by the SENCER Student Assessment of Learning Gains (SALG) survey. However, a second instrument, the Biology Attitude Scale, demonstrated a significant increase in positive Attitudes towards Biology in particular. The case study data (including a content analysis of online reflective questions and semi-structured interviews) revealed that students’ confidence in science remained the same during the semester even though their interest may have increased.

**Oluwatelure and Oloruntegbe (2010)** examined the Attitude of Students towards Biology and Chemistry. There was also a focus on the Parental Involvement. This research was set out find out how Parental Involvement influences students’ Attitude towards Biology and Performance in the two Science Subjects. An Attitude Questionnaire developed and standardized by the Researcher was used. A sample of four hundred and eighty students participated in the study. The result revealed that the level of the home influence has implication on school learning and that performances of students in science are a function of their Attitudes to the Subject. The phenomena observed were discussed in the light of prevailing conditions in most of the developing West African countries. Conclusively, home influence can be a tool to enhance school learning.

**Adesoji (2008)** conducted the study was designed to further clarify the claim by several authors that methods of instruction could change students’ Attitude Positively
towards Science. It was the belief of the author that if students were allowed to develop higher cognitive processes through Problem Solving Strategies, either as Teacher-directed or self-directed, their Attitudes toward Chemistry might change positively. Therefore, the effect of Teacher-directed and Self-directed Problem Solving Strategies on students’ Attitude toward Chemistry was investigated. The findings in this study showed that students in the Experimental Group developed more positive Attitude towards Chemistry after the treatment.

It can be seen also from the reviewed literature that Attitude towards Science is an important component of science education that is to be developed in the classroom.

3.4 Insight from the Review

The Investigator in this Chapter has tried to present some important and related review in studies briefly. After reviewing the available studies, the investigator found that research on Marzano’s Dimensions of Learning Model was limited. And there is no any Study in Yemen seems to have investigated the impact of Marzano’s Dimensions of Learning Model according to the results of the research conducted at the National Information Centre in Yemen until July 2012.

The review of the studies related to Dimensions of Learning Model clearly points out at the dearth of researches conducted on various variables, i.e., on Meta-Cognition Skills, Science Processes Skills, Epistemological Beliefs, Physical Concepts Acquisition, Multiple Intelligences, Critical Thinking, Decision Making, Conceptual Understanding, Habits of Mind, Mental Features, Reasoning Thinking and Mathematical Communication. Studies review also revealed that only very limited studies conducted on the same variables of present study, i.e., on Achievement, Creative Thinking and Attitudes towards Science. It was observed that there is no any study tried to investigate the impact of Marzano’s Dimensions of Learning Model among males and females.

Many studies are found on application of Marzano’s Dimensions of Learning Model in science education and also on its comparison with conventional teaching. Some of the reported studies revealed that Marzano’s Dimensions of Learning Model enhances Meta-Cognition Skills, Science Processes Skills, Epistemological Beliefs, Physical
Concepts Acquisition, Multiple Intelligences, Critical Thinking, Decision Making, Conceptual Understanding, Habits of Mind, Reasoning Thinking and Mathematical Communication of students. Marzano’s Dimensions of Learning Model is useful in teaching thinking in which the students become active learners.

According to the studies related to Creative Thinking, it was found there are studies which have tried to study the effectiveness of the different methods and strategies on Creative Thinking, i.e., Brainstorming, Meta-Cognition Strategy, Teaching Using Computer, Deductive and Creative Thinking and Problem Solving, Mechanism of Quality Educational Program and Active Learning Approach. Further, few studies tried to study the effectiveness of the different methods and strategies on Attitude towards Science, i.e., Live Simulation, Hands-on Activity, Cooperative Learning, Science Technology Society Approach, Constructive Learning Model, Programmed Instruction, Collaborative Science Intervention, Discovery Method and Cooperative Learning.

The present study has, therefore, undertaken the problem of assessing impact of Marzano’s Dimensions of Learning Model on Achievement in Science, Creative Thinking and Attitude towards Science through teaching science among eighth standard students (males and females) in Yemen.

An in depth review of studies and literature presented in this Chapter and the insights obtained from it has helped in the formulation of the problem and defining the key term involved in it. The related studies also provide very good insight into the variety of studies done in the science. Further, it is true that the studies in teaching science are not sufficient and there is a need to take up more studies in this subject.

The methodological details involved in carrying out this study are detailed in the following Chapter.