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REVIEWING ART AND SCIENCE INTEGRATION STUDIES IN THE MIDDLE EAST REGION

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Abstract- Up to 5 years or slightly more art and science studies were appeared in the Middle East Region trying to Keep up with the West in their exploration and examination of the relationship between art and sciences. In this study, a qualitative research design is used to reviewing art and science studies in the Middle East region. An improvement was noticed, as well as changes in student learning impact among these studies and published researches in both disciplines. Some of these studies regarding art as a medium for teaching and learning as well as motivating students to accomplish an advanced level of achievement; whereas others used it for enjoyment and fun. Which also resulted in better learning due to integrating arts in the school curriculum, showing a causal link between visual art education and academic accomplishments in other disciplines. In general, it is concluded that both disciplines-art and science play a positive and productive role in the teaching and learning of these disciplines. In addition, it plays an essential role in developing individuality and promoting higher order thinking skills and abilities to meet the 21st century's requirements. The findings are recorded, presented, discussed, and the recommendations are provided accordingly.

Keywords- Art And Science, Knowledge Integration, Teaching And Learning, Middle East Region.

I. INTRODUCTION

with no adopt that there were massive and comprehensive previous researches and studies in the western countries carried out to understand the real relationship between art and science. This kind of knowledge integration has resulted to showing major effects in students teaching and learning with typical references to the students' academic achievements in both disciplines. (Hunter, 2018), (Philip & Siân, 2017), (Bullot, Seeley & Davies, 2017), (Schwartz, 2015). On the other side, studies in the visual art and art education also promoting and supporting the effects of integrating art within other school curriculum such as (Horon, 2009; Gelineau, 2011 and Mcdougall, Bever, & Seper, 2011) where these studies and others more support the notion that art is a unique approach towards the knowledge and develop our understanding of the world today. As Horon (2009) points out that the arts have real potentials and factors to make the education better by what learners exploring, imagining and making? which should go beyond intrinsic value as straight types of thoughts.

Dhanapal, Kanapathy and Mastan (2014) also tired in their study to understand the role of visual arts in the teaching and learning of science among Grade 3 teachers and students. Dhanapal et al. (2014) identified how the usage of visual arts to motivate learning in science. The findings of this study indicated that most teachers and students show positive perceptions for integrating visual arts within science teaching and learning. The positive changes were noticed among their academic achievements with enjoyments and freedom to choose their favorite art forms to express their learning of science discipline. Teachers also noticed that integrating

visual arts as a medium to teach science motivated students to attain a higher level of achievement.

Brennan (2018) indicates that Art-science collaborations are proliferating as the benefits of bringing artists and scientists together are increasingly recognised and supported. Moreover, Turkka, Haatainen and Aksela (2017) confirm that many case studies propose that integrating art and science education can keep students with creative projects and encourage them to express science in multitude of ways. However, Turkka et al. (2017) state that little is acknowledged about art and science integration in daily science teaching practices. This study concluded that the implications for science teacher education should offer opportunities for more consistent knowledge integration from discipline of art.

From international perspective, Katz (2017) published a book entitled "Drawing for Science Education" which includes a collection of 21st researches and essays that offer theory, techniques, outcomes, and models for using drawing as a tool for science teaching and learning. This book with other Pedersen and Finson (2013) build upon previous work (Finson & Pedersen, 2009) to bring some definition to the meaning of visual data as it relates to be used in the science education. Katz et al., (2011) and in (2013) also draw our attention to use drawings within science teacher preparation program the University of Maryland in the USA. In their studies they tried to answer two fundamental research questions: "Please draw yourself teaching science," and "Please draw you students learning science," and the noticed a change during and after the experiments and they concluded that the drawings are continues to

be seen as an essential tool for science work and science education (Katz et al., 2011, 2013).

Sleight and Craske (2017) also confirm the historical relationship between art and science which is highlighted in terms of epistemology, notably the qualities of imagination and curiosity. This paper argues that artists have engaged with science for centuries, exploring theories of perspective, color and perception contemporary to their work, and this relation moved to the more engagement between art and science as it seen in today life. Miller and White (2013) tried to answer a research question: "Why arts and science are better together"? They believe that "Combining arts and science in the curriculum could be the answer. From science, students learn about sound methods for testing hypotheses, and about interpreting and drawing valid conclusions from data. From arts, they will also learn about developing arguments, and about understanding, moving, and changing the minds of diverse audiences". Miller and White (2013) acknowledge this relationship is already there but it is not enough and "there is a great potential for them to be better – improving students' employment prospects and fostering new skills in "the space between" speciality areas". One solution for this fragmentation is to offering a double degrees' program in the higher education institutions, which might be a significant in preparing graduates for employment (Miller and White, 2013).

With this recognition of knowledge integration between art and science in the Western context, Al-Amri & Al-Yahiya (2014) confirm that this kind of integration has been missed or ignored in Arabic countries and these authors argue if the arts are to be considered as integral parts of the curriculum as explained in the literature, the art integration within science must be examined in pre- and in-service teacher education. Other study in the Middle East Region, also recommend to adopt this approach in order to improve understanding of both disciplines and arising the academic achievements. Examples of such studies can be found in researches such (Al-Ahmad & Alsughayer 2005); Al-Ahmad 2006; Al-Ahmad & Othman 2007; Al-Amri, Ambusaidi & Al-Yahya 2011; Al-Sadi 2012;). These study and others confirm the important of integration approach between art and science and they continue to formulate new pedagogical of teaching and delivering knowledge.

Furthermore, there is a growing interest in examining the correlation between visual thinking, creative thinking, scientific concepts, science misconceptions and academic achievement in science discipline as a result of integrating art and science such as cartoon and caricatures drawings. Example of doctoral and master studies can be seen in studies such as (Almmani, & Dolat, 2011; Al-Rikabi, Abdul Razaq

& Bdul Ridah, 2016; Al-Ghamedy, 2013; Al-Qurashi, 2017; Al-Araimi 2017 and Al-Jabri 2017). These studies have a crucial role to play in providing deeper insights about art and science integration studies in the Middle East.

II. RESEARCH STATEMENT AND AIMS

If the knowledge integration between art and science is to be considered as an important factor for developing teaching, learning and understanding, as explained in the literature, then the reviewing art and science Studies in the Middle East region is must be importuned and these studies must be examined to see the conditions and standards of such researches. As it mentioned early, the relationship between art and science is a novel one and it's still in growing in some aspect as the idea itself might for from Scientifics minds; as traditionally, the art and science are often seen as separate entries especially in the Middle East region. As a consequence, the whole relationship between art and science is depends on such believes as a principle for success. On the other hand, education for creativity requests new combinations of knowledge. Therefore, in order to provide high-quality instructional studies in the art education, visual arts educators should collaborate with other educators (NAEA, 2009) and students in the visual arts should "be able to relate art knowledge within and across the arts disciplines" (NAEA, 2004, p. 14). He/she should be able to make connections between visual arts and other disciplines. As a result of absent of art-integration studies in the Arabic countries this research tried to bridging the gap. Therefore, the purpose of this research study was to review some art and science Studies in the Middle East and exam their studies aims, main topics examined, research design and methodology used, the results and findings, and final the most important recommendations and suggestion their purpose for.

III. RESEARCH DESIGN AND METHODOLOGY

The researchers would like first to note that while there is a wide-range of literature available on the both art and science as separate discipline, as well as on teacher education in general, there is a limited amount of literature available specifically concerning integrating art within other disciplines in general, as well as on integrating art and science in particular. This research only covered the three major sciences: physics, chemistry and biology in relation with visual art only. This research also not includes studies integrating art within mathematics, computer sciences or other disciplines of sciences in general.

For the purpose of this paper, we used some databases in both languages (Arabic and English) to rich as much as we could such as ALMANHAL,

AraBase, Humanindex, Islamic info, Shamaa, and Horizon Information Portal, Researchgate and Google network. We used different keywords such as art and science, knowledge integration, drawing in science, cartoon drawing, scientists' images, art and science teachers' perspectives, visual arts and science, teaching and drawing concepts, animations drawings, caricature drawings in science, and teachers' beliefs. all these keywords were associated with in art and science in order to be more focused on the target of the current study. The researchers also refer to some reviewed journals through the research engines within the Library of Sultan Qaboos University to get more researches and studies integrating art and science. The researchers would like to draw the readers' attentions that there is limitation in this study as it tried to just review some cases for art and design integration studies in the Middle East region and this study only representing these study and future deep reviewing and analyzing well take place on following study.

IV. ARABIC STUDIES IN KNOWLEDGE INTEGRATION BETWEEN ART AND SCIENCE

In this part, we will try to present some Arabic studies based on knowledge integration between disciplines of art and science. We are not claiming that we did covered all studies, however, this will draw overall a picture about the kind of studies caring out in the Middle East region. The following presentation will be from the oldest to the newest studies as chronological order.

At the beginning, we would like to draw attention that there was initiative in the Middle East countries to integrate arts and science in the discipline of education. As AlAhmad's study (2007) indicates that Selim study in 1956 is regarded as one of the first initial studies in the region to promote cognitive integration between science and the arts. This study emphasizes the importance of integration between aesthetic education and studies of environmental science. Selim (1956) represents in the science curriculum models for animals and plants functions with references to Scientific stories and straggling of human being straggling with knowledge to control the environment. He also presents the important of individual capacity to realizes and appreciation of universe. Although the first beginnings in the Middle East, but we find a lack of modern Arab studies in the field of cognitive integration between the arts and science specifically (AlAhmad, 2007).

In 2002, AlAhmad aimed to use drawing as a means to learn what is going on in the minds of middle school students about the concept of science and what scientists normally do. The study sample consisted total of 67 students (experimental group N=35, and

control group N=32) from grade 8 of middle school in the Saudi Arabia. Students were asked tow question: the first to describe the form and image of the scientists and the second to draw the environment in which the scientists were located. The results of the study indicated that the perceptions of the educated about science and scientists were controlled by a vision based on rigid molds which influenced by the media. This vision was changed after the group's experience as a result of using teaching methods used within control group. Therefore, the methods of teaching science should be changed for give real perceptions about the science and scientists and encourage students to studying science as a specialization with hope that they will be scientists in the future.

Al-Ahmad and Alsughayer (2005) also carry out a study in Saudi Arabia entitled "How Children see Scientists". The purpose of this study was to explore student-held images of science and scientists according to gender and grade level. A drawing activity and interviews about instance on the theme of science and scientists were administered to a total of 115 children from one private school in Riyadh city. The result of study indicates that the prevailing preconceptions of scientists, held by children in the group, are negative stereotyped such as the scientists are men with the large white beard, wearing glasses with white coats, and face wear, and they use mathematical equations, and symbols of knowledge and research. The analysis of these images show that these image were created as a result of a large impact of the visual and print media from books, magazines, television, video and computer games. The results also show that female student being more specific in drawing accurate details of the male scientists' image and their characteristics (stereotype), however there was no significant difference between male and female in their images due to their classrooms.

In her study, AlAhmad (2006) aims to investigate perspective of female teachers of middle school students toward the future environment. The sample of this study consisted of (N=188) drawings produced by (N=188) teachers in middle school. The results of the study showed that the analysis of the drawings helped to identify the quality the thinking. The study also concealed that what producing such drawings not come just from their desire to draw only, but rather as a result of combination between knowledge and mental visualization and these elements are vital to the development of higher thinking processes and mental representation.

AlAhmad and Othman (2007) designed a unit study entitled; "A Return from the Future" to measure the effectiveness of integrating science and visual arts in a science course designed for third-year preparatory schoolgirls in Riyadh. The results of the study show:

(1) An improvement in the learners' achievement in the science course; (2) An increase in the number of average and above average learners and a decrease in the number of below average learners; (3) A stronger motivation on the part of the learners in the science course and art education course and; (4) A correlation between the achievement of the learners in the science post-test as well as in measuring the learners' attitudes toward integration of science and art courses. The paper concludes by giving a number of recommendations and suggestions for future studies in this field.

Terabyte (2007) carry out a study aims to measure the effectiveness of the caricature stories in modifying some misconduct health behaviors and raising awareness among the hearing impaired students in the elementary school in Zagazig city in Egypt. This study rich that the students show different level of awareness regarding the misconduct of the health behaviors and the level of practicing these behaviors and the rate varies from one to another, also the awareness of students were very low, and there was a weak positive correlation between the frequency of misconduct health behaviors and level of awareness among the students regarding this matter. The result also shows that there was a statistically significant difference at ($\alpha = 0.05$), between the average scores of the research sample members regarding misconduct health behaviors in the pre and post checklist in favour of the post checklist. In general, the study shows effectiveness of the caricature stories in modifying some misconduct health behaviors and raising awareness among the hearing impaired students in the school.

In 2009, Al-Amri (2009) published a study aims to investigate the educational role of plastic arts in the process of learning and to identify the most important features of the integrative relationship between plastic arts curriculum in one hand and some school curricula on the other hand. His investigation includes disciplines such as Language (Arabic or English), History, Graphical, Mathematic, and Sciences in relation to Plastic Arts. This study used the descriptive analysis method and ended up with some useful findings, suggestions and implementations which could applied in the discipline of Education. In generally, this study shows that the discipline of plastic arts is a rich resource which can be used for integrating human knowledge. Finally, it ended up with suggesting different implementation models for the integration of knowledge project.

Almomani and Dolat (2011) try to measuring the effectiveness of using carton drawings program in acquiring scientific concepts in the city of Irbid in Jordan. The researches use experiment research design to measure the effectiveness. The results of this study concluded that there were statically

significant differences at ($\alpha = 0.05$) between the two groups in acquiring scientific concepts in favour of the experimental group. The result also revealed that there were statically significant differences in acquiring scientific concepts at ($\alpha = 0.05$) between male and female students in favour of female students. According to the above results, the recommendations were raised to adopt the use of carton drawings in teaching science.

In Oman, Al-Amri, Ambusaidi & Al-Yahyai (2011) investigated art and science student teachers' perceptions of the knowledge integration between art and science curricula and their attitudes towards the integrated approach for teaching and learning in both discipline. The sample of this study consisted of (90) art and science student teachers from the College of Education at Sultan Qaboos University. The results showed that the "the importance of integration between art and science" domain has the highest average mean score among the other domains, whereas the "the future picture as a result of integration between art and science" domain has the lowest average mean score. Furthermore, the results showed no statistically significant differences between art and science student teachers' perceptions of the integration between art and science due to their gender, or due to interaction between gender and specialization. However, there was a statistically significant difference that can be attributed to specialization in favor of art teachers. Moreover, the art and science student teachers showed positive attitudes towards the integrated approach to teaching, but there was no significant difference between art and science student teachers in their attitudes due to their gender, specialization and the interaction between gender and specialization. Al-Amri et al. (2011) ended up with serious recommendations such as insuring the place of knowledge integration between art and science. Also, providing instructional models from both subjects in how to integrate knowledge in the student teaching practices as well as conducting empirical studies to measuring the effectiveness of this approach.

Falbman (2011) in her study aims to identify the impact of caricatures on academic achievement and creative thinking of science subjects for intermediate first grade female students in Makkah City. The sample has 59 students studying at intermediate first grade, 31 students in the experimental group, and 28 students in the controlling group in public intermediate schools. The result shows that there are statistically significant differences at $a < 0.05$ between the post mean scores of controlling group and the mean scores of the experimental group in terms of the measurement of creative thinking (Fluency-Flexibility- Originality- Elaboration- creative thinking altogether) for the experimental group. Also, there are statistically significant relations at $a < 0.05$

between the scores of students' academic achievement and that of creative thinking. The researcher recommends that more attention should be given to caricature drawings when designing science curricula for all educational grades.

In Oman, Ambusaidi and Al-Balushi (2011) published a longitudinal study aimed at revealing the beliefs of prospective science teachers at Sultan Qaboos University about science teaching. To achieve this, aim a Draw-A-Science-Teacher-Test Checklist (DASTT-C) tool was used with sample consisted of (N=45) science teachers. The instrument was applied to the sample three times: before and after finishing the Science Method I and II courses and the Practicum. There was no significant change after the Science Methods II course and the Practicum. Furthermore, the results also showed that among the three different teaching styles: exploratory, conceptual and explicit indicated in the second part of the DASTT-C instrument, prospective science teachers in the current study were found to be at the conceptual teaching style, closer to the boundary with the exploratory teaching style. This teaching style remained consistent across the three administrations of the DASTT-C instrument.

Al-Sadi's study (2012) aimed to investigate the impact of using the integration approach between science and plastic arts on science achievement and the development of science process skills among 5th Grade Basic Education Female Students in Oman (N=28). The result of this study revealed that there were no statically significant differences in science achievement at ($\alpha = 0.05$) between the experimental group and the control group. However, there were statically significant differences at ($\alpha = 0.05$) between the two groups in acquiring science process skills in classifying and communicating skills and the whole process skills test in favour of the experimental group. The study also showed that there were statically considerable differences at ($\alpha = 0.05$) between pre and post process skills test in observation, classifying, communication and in the whole test in favour of the experimental group. Accordingly, the study recommended the need for conducting workshops and training courses for science teachers on how to use the integration approach between plastic arts and science in teaching science.

In Sudan, Abudallah, (2013) research aims to investigate the effect of images and graphics, on academic achievement for students of the basic educational stage, in human and the universe. This research shows that there was a statistically significant difference, at the level ($\alpha = 0.05$), between the experimental group and the control group, in their achievement, favors to the experiment group, which has been taught by the use of images and human

graphics. In the light of the study results, It shows that there is a need to use images and graphics in teaching educational rights and universe and that the teacher considers an essential tool in the educational process. Also, there is a need to provide a special budget from the school administration to support the design and production of educational means of their importance to the stage of basic education in general and teacher rule of man and the universe in particular.

Al-Ghamedy study (2013) aims to identify the effect of using a suggested cartoons drawing software on developing the achievement in science subject for sixth grade students. it depended on using the experimental design of two groups (experimental group and control group). The results show that there is a statistically significant difference between the means of the experimental group and the control group scores in the post implementation of the achievement exam for the benefit of the experimental group. The results also referred to the big size effect of the cartoons has a great impact on sixth grade achievement levels in the subject of science. It is recommended to use the software in teaching science topics in all educational stages. It is also important that software similar to the suggested on in this study.

Al-Zahrani (2013) purpose a study to revel the effectiveness of electronic educational program by using the animations drawing in acquiring academic achievement in the physic curriculum of the 11 grade in the secondary school in Al-Baha region in the Saudi Arabia (N=30). This study used the experimental research design of the quasi-experimental for two groups. This study concluded that there is a statistically significant difference at the level of ($\alpha = 0.05$) between the mean scores of the control group (traditional teaching) in the two measurements pre and post-test grades in physics at the high school students, for the benefit of dimensional measurement. The study is ended with some recommendation such as utilizing the media based electronic educational program that use cartoon drawing in teaching Physics for secondary school students.

Al-Amri and Al-Yahya (2014) curry out a study trying to examine pre- and in-service art teachers' perceptions about art and science curriculum integration. A structured questionnaire was used to identify their perceptions towards this approach. The initial sample of this research consisted of 52 student teachers of art education enrolled in the third and fourth year of their studies at the College of Education, Sultana Qaboos University, as well as 55 in-service art teachers who worked in Omani public schools in Muscat, Oman. The findings of this study show that the both pre- and in-service Omani art teachers have high positive perceptions about the knowledge integration between art and science.

However, the result also shows some perceptions' themes scored highly compare to others. At the same time, the results also show there are statically significant differences between pre- and in-service Omani art teachers' perceptions regarding the knowledge integration between art and science in favor of pre-service art teachers in three themes of the study and in the total mean. As a conclusion this study, there is a need for more empirical studies in testing this approach in generally and between art and science in particularly.

Al-Rikabi, Abdul RAzaq, bdul Ridah (2016) in their study aim to evaluate students' attitudes to toward the use of the caricature in teaching sciences for the female students of the fifth year of intermediate school in Iraq (N=80). The experimental and control groups were used in this study. The results of this study show that there were statically significant differences at ($\alpha = 0.05$) between the means of two study groups in academic achievement test in favor to the experimental groups were taught by using the caricature drawings. The study also shows high demand toward using the caricature within science lessons. The researchers recommend to use training workshops for teachers to increase teachers' knowledge background in using new teaching methods and approaches which have high impact the process of education. Also to include caricature drawings in the science curriculum to facilitate understanding the science content in comic, fan and enjoyable way.

Al-Busaidi (2017) carryout a study to see the effect of using infographic in the development of visual thinking and academic achievement among female grade eleven student in biology (N=60) in Oman, where they divided into groups: an experimental consists of (30) students, and control group (30) students. To achieve the aims of this study, the researcher prepared a teacher guide for the selected unit, as well as two tools: visual thinking test and academic achievement test which were prepared by the researcher. The validity and reliability were assessed and insured for the purpose of this study. The results show there were statistically significant differences in the academic achievement test at ($\alpha = 0.05$) between the experimental and control group in favor of the experimental group. Consequently, the researcher proposed several recommendations such conducting workshops and training courses for science teachers and supervisors to use infographic in teaching science.

In Oman also, Al-Jabri (2017) aims to investigate the impact of using concept cartoons on academic achievement and development of visual thinking skills among 5th grade basic education female students (N=60). The results of the study showed that there were statically significant differences at ($\alpha = 0.05$)

between the means of two study groups in academic achievement test in favor to the experimental groups. In addition, the results also showed significant differences at ($\alpha = 0.05$) between the means of two study groups in visual thinking skills test favor to the experimental groups. The list of activities based on concept cartoons was recommended because of their importance in the application of knowledge and information in life situations. It also recommends conducting similar studies of concept cartoons on different classroom grades.

In 2017, Sheikha Al-Araimi also did a study aimed to investigate the effect of teaching using caricature drawings in the acquisition of scientific concepts, developing creative thinking skills and attitudes of 4th grade students for basic education towards science. The sample of the study consisted of (N=162) students from 4th grade divided into two groups using the experimental research design. The results of the study revealed that there were statistically significant differences at ($\alpha = 0.001$) between the two groups in acquisition of scientific concepts in favor of experimental group scores in the post-test. In addition to that, there were statistically significant differences at ($\alpha = 0.001$) between males and females in favor of females scores in the post-test, while the interaction between group and gender was not significant. The results also showed that there were statistically significant differences at ($\alpha = 0.001$) between the two groups in Torrance test - overall score and (fluency, flexibility and originality) skills - in favor of experimental group. On the other hand, the results showed that there were nosignificant differences between students regarding gender (male / female) and the interaction between group and gender. The results also showed statistically significant correlation values at ($\alpha = 0.001$) between the student's scores in both measuring tools (Torrance test and creative thinking activities). The results also indicated that there were statistically significant differences at ($\alpha = 0.001$) between the two groups in the attitudes towards science scale in favor of experimental group. The gender factor has also a significant impact on developing positive attitudes towards science in favor of female's students, while the interaction between group and gender was not significant. Accordingly, the study recommends the use of caricature drawings in order to help students acquisition scientific concept, developing creative thinking skills and developing positive attitudes towards science among students.

Al-Qurashi (2017) in her study aims to see the impact of the use of caricatures in teaching science on the academic achievement of the fourth grade primary students (N=50) in Holy Mecca in the Saudi Arabia. In order to achieve the research objectives, the researcher used Semi-experimental research method. The result shows that there are statistical significance

differences at the level of (0.05) in dimensional collection between the average of the experimental group degrees (taught using caricatures) and the average of the control group degrees (taught using the traditional way) of fourth primary grade science curriculum at the level of remembrance. The study recommended the necessity of encouraging science teachers to use caricatures in teaching, and the importance of carrying out similar studies. Also, to train the teachers and educational supervisors in service as well as pre-service teachers to use the caricatures drawings.

In their study, Albukeya, Al-Hdidabi, and Alhjami (2017) they aim to investigate the impact of teaching science by using cartoons to change 4th pupils' misconceptions in science. The sample consisted of female pupils (N=90) who were divided into three groups, first experimental group consisted of 30 pupils, who were taught by the teacher using the cartoons drawing software, the second is experimental group consisted of 30 pupils, who used cartoons software by the pupils themselves (self-learning). The third group tested (the control group) consisted of 30 pupils where the teacher used the traditional method. The result showed statistical significant differences between the means of the three groups. The recommendations were offered such as holding workshops for training science teachers to empowering them to activate computer in teaching and learning science subject and using suitable devices such as PowerPoint and Switch Max.

Al-Zahrani (2017) aims to find out the effects of using two and three-dimensional animation cartoons to acquire concepts in chemistry by secondary stage students. The researcher used the quasi-experimental method. The sample of the study consisted of (N=43) second year secondary students divided into two experimental groups. The study results showed that there were a statistical significant differences at ($\alpha \leq 0.05$) between the mean of the first experimental group in the achievement test for understanding concepts in chemistry which varied according to the type of assessment (pre-test or post-test) in favour of the post-test; and there were a statistical significant differences at ($\alpha \leq 0.05$) between the mean of second experimental group' scores (who studied the content by using three dimensional animation cartoons) in the achievement test which varied according to the type of assessment (pre-test or post-test) in favour of the post-test. This study is ended with some recommendations such using two and three-dimensional animation cartoons to teach concepts in chemistry with much emphasis on three dimensional animation cartoons that were more effective in raising students' academic achievements.

Within the international perspective, Al-Balushi and Ambusaidi (2017) also published a chapter entitled

"Using Drawing to Reveal Science Teachers' Beliefs about Science Teaching" in the book of Katz (2017) entitled "Drawing for Science Education". This chapter was focused on student-teachers' beliefs about teaching and learning science education. This chapter is a continuation of the previous study they did in (Ambusaidi & Al-Balushi, 2011). In this chapter, Al-Balushi and Ambusaidi (2017) indicate that research has shown that teachers rely on their belief system rather than academic knowledge when determining classroom actions. Therefore, they investigate and explore science teachers' beliefs during their classroom practices using the Draw-A-Science Teacher-Test Checklist (DASTT-C) as a mean approach in their investigation. In this chapter, they describe how drawing can be used to explore science teachers' beliefs. Moreover, this description will be supported by some previous research in the field of science education. The authors' experience of using such a method with Omani prospective science teachers is included. Furthermore, besides direct lecturing, the DASTT-C instrument was able to give indications of the types of instruction sought by prospective science teachers in terms of teaching methods and visual representations. The appearance of these instructional techniques might reflect the frequently used teaching approaches by teachers. If so, then the use of the DASTT-C instrument could be extended to include not only the beliefs but the practice of science teachers. The DASTT-C instrument drawings reflected a view of the teacher as dominant figure in the classroom. This chapter shows different level of drawings such as "Draw a picture of yourself as a science teacher at work?", "Draw a picture of one of your science lessons", and "Draw a picture of your science classroom at work?"; all these visual representations need more investigation as they required more deep analysis.

V. FINDINGS AND DISCUSSION

From the above presentation, it shows that the significant role of art integration in developing student understanding as well as achieving the academic standard. In the most studies presented in this current research there was a positive result when integrating art and science in the process of teaching and learning. The results also referred to the big size effectiveness in student learning which can be implemented with any other school curriculum to address further improve in the process of education.

It also can be said that the art and science integration studies includes different themes and concepts that related to each discipline that help to address common knowledge and connection between these sprite fields. Themes such as Scientifics Images, Drawings, Cartoon Drawing, Caricature Drawings, Science Misconceptions, Visual Thinking, Creative Thinking, Teachers' beliefs about Teaching and

Learning in Science. On the other hand, only three studies focused on art discipline and the researchers were investigating the important role of art on the other school discipline and giving examples of how to integrate art with others including science, as well as investigating art teachers and students' perceptions of the knowledge integration between art and science curricula. Also, there were specific research design and methodologies used in these kind of research studies such as experimental research method which more used in science discipline. Moreover, most of these studies came from science side rather art, which suggesting something relating to "who use who" or "who needs the other" and the most the studies mentioned in this research come from discipline of science and they used art as aid to serve in teaching science no more where literature show art as mean vehicle for improving teaching and learning. The research is continuing to be for more investigation. The main aim of this study is just to review and represent these study here for further analysis in the future as it will be more structured and more focused.

VI. CONCLUSIONS

Knowledge integration has resulted to showing major effects in students teaching and learning with typical references to the students' academic achievements in both art and science disciplines. In the current literature there was more support to the notion of integrating art and science as a unique approach to develop our understanding of the world today. This approach has real potentials and factors to make the education better by what learners exploring, imagining and making, which should go beyond intrinsic value as straight types of thoughts as it explained previously.

There is a recognition and understanding of the important of knowledge integration between art and science in the Arab and Middle East countries. This research shows a great deal of interesting and understanding this topic which was seen in different implementations of art and science integration studies in the region. However, some repetition was strongly presented in these Middle East studies with using same research methodology design and hypotheses. Therefore, the recommendations and suggestion came in the same way in the most studies represented in this research with little differences among them.

As a conclusion, the primary objective behind this research was to review art and science integration studies in the Middle East Region. The research methods used in this study have provided enough evidence to represent some studies in terms of research aims, main topics examined, research design and methodology used, the results and findings, and final the most important recommendations and suggestions. Also, it shows that there are several

factors affecting the outcomes of the art and science integration studies as represented in the current research. Finally, it appeared that there is a need to further investigation and researches in the area of art and science integration studies with more structured research for deep understanding.

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