A Meta-analysis for Results of Research on Virtual Classrooms' Use and Utilization

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Abstract

The main aim of the study is to analyze the results of the uses of the research and its impact on the environment from 2006 to 2010.All these facts will provide a theoretical information in the scientific field.

This will be achieved through accessing a virtual learning and by studying the expected problems in the scientific field. Educators and communicators have to be informed with the research results which can help in improving the educational system.

Research Procedures:*The research process is to show and analyze the previous studies that is related to the topic of the research.*

Research Results & Findings:*The general conclusion is the effective uses of the environmental learning style. It is either an immediate achievement or delayed one) it depends on the skills required, the learners thoughts towards using the virtual learning system and this also according to the subjects learnt, the stage and the source of the study except some changes, we didn't prove its validity.*

Introduction

In the light of the rapid changes and transformations the world witnesses in all fields of life, and at the beginning of the twenty first century, a great advancement occurred in the area of educational technology. Educational technology is one of the most educational specializations affected by the great developments in the area of cognitive and technological developments. Education can be enhanced starting from the kindergarten stage to the university stage through utilizing educational technology. This is because educational technology,

if used well, can make the educational experience more realistic, closer to life and more applicable (Saied, 1991:7).

Recently, many terms related to e-learning, in general, and virtual learning environments (VLEs), in particular, appeared and are still quickly growing. Many computer applications especially those used on the internet such as virtual reality environments, classrooms, museums, schools, libraries and universities which are used for serving the educational process and made the world a small village in which the educational community interacts face-to-face, were used.

The word environment is confined to its connotation. It generally refers to the surrounding place in which the living creature lives with all his elements. The educational environment indicates the place in which the learner learns and the resources, equipment and conditions it includes and gives the learner his personality and uniqueness. Virtuality entails using computer and communication technology basically in building a nontraditional society. Thus, VLEs are integrated technological environments (such as e-learning management systems) in which the learner lives alone or within a group of learners who exchange opinions and ideas within a two or three- dimensional virtual environment that takes varied forms and models such as virtual reality programs, games, schools, libraries and worlds (Azmy, 2014: 453).

VLEs are the product of contemporary technology that were novel in the field of education and training since they depend on using the computer and its applications in the curricula, management of the educational process, the information process and the training fields. This is done through designing an interactive electronic site published on the internet in which information is built as dynamic pages and makes a kind of interaction and communication among participants through that electronic environment as if they were under one ceiling working together as one team for building their own learning and training under their distant teacher (Alfiky, 2009: 22).

There are many studies in this area such as Shatat (2008: 10) who mentioned that VLEs is one of the e-learning techniques in which the learning environment is web-based. Nasreddein (2008: 25) pinpointed that VLEs are a group of programs or e-learning management systems which present programs and curricula electronically through the computer or the internet. This is done synchronously or asynchronously. These programs provide a group of educational tools and aids which aim at serving the learner and the teacher, enhancing the learning process in addition to utilizing internet services and the characteristics of e-communication in order to facilitate presenting these programs and courses to the learners in varied patterns and styles.

Context of the problem

Analyzing the results of the previous studies and through the exploratory study conducted by the two researchers in the university libraries and the well-known databases on the internet to identify the studies and research papers on using VLEs, the researchers concluded that there are many Arab studies and research papers which used VLEs as a technology that contributes in developing and enhancing the educational process as a whole from 2006 to 2015. Therefore, a need existed to conduct systematic and detailed analyses on these studies and research papers to achieve integration among them, formulate new generalizations and guide the currently available and future studies to the right direction.

According to Bernard Berlson, content analysis is the objective, organized and quantitative description of the overt content of communication (**Ahmad, 2013: 343).** Kaplan sees that it aims at quantitatively classifying certain content in the light of a system of categories designed to give suitable data for specific hypotheses specific to this content.

There are many studies conducted in this respect in the area of educational technology. Saleh (2003) analyzed the content of the e-documents available on the internet on training programs for the working force at the general education in the

area of information and its future trends. Saleh (2008) identified the trend of scientific research in the second generation of e-learning concerning conceptualizing the second generation of e-learning, identifying its tools and how to make use of them, and the trends of its research. The study presented suggestions in the form of research areas within the framework of the second generation of e-learning that go in line with the international directions of research on this generation and meet the researchers' queries and interests. Consequently, there is a must to identify the techniques used in analyzing educational studies more widely such as content analysis, bibliometric analysis, and meta-analysis or post-hoc analysis.

The researchers chose meta-analysis for its accuracy, simplicity and efficiency. It is a use of the previous research repository to explain methodological questions related to the previous studies it introduced. This is one of the most accurate techniques since it answers many questions posed by educational researchers and stakeholders as a result of the massive accumulation of the results of studies and research papers in a specific field. It usually aims at comparing the results of these studies to achieve the integration among them and formulate new generalizations based on these comparisons and their results. It also directs future research. Thus, meta-analysis with its concern with effect size through the formulas developed by experts is considered the most suitable method of studying the relationship between the results of previous studies and their variables (Ahmad, 2013: 367 & 374)

Glass, an American scholar, is considered one of the pioneers who wrote about meta-analysis since 1976. Glass defined it as "analyzing the results of analyses and using the systematic quantitative method to reach information from the results of previous studies and present them in a specific field objectively to judge the effectiveness of these studies (Ahmad, 2013: 368). Although meta-analysis method is one of the recent ones, it introduces new broad horizons to the educational scientific research, not to mention the benefit gained by

educational policy and decision makers (Abou Hatab and Sadeque, 2010: 129).

Meta-analysis is considered a statistical method applied to the quantitative results of previous studies aiming at the integration of the varied results of these studies. Thus, it makes the process of analysis scientifically objective (Albos, 2001: 3).

Therefore, some studies were concerned with studying the effectiveness or effect size. The following are examples of the studies on meta-analysis of the results in the area of educational technology.

Alhosary (2001) analyzed the results of studies on computer assisted instruction in some dependent variables such as immediate and delayed achievement, attitude towards the subject and the computer, developing some thinking patterns and developing some practical skills. Alhosary also used some classifying variables such as educational stage, program type, school subject, type of learners and source of study. The study concluded that computer assisted instruction is effective in developing immediate and delayed achievement, some thinking patterns and some practical skills.

Aly (2004) dealt with the benefit from the results of the studies on educational interactive videos and investigating their effectiveness in developing some dependent variables such as cognitive achievement, practical skills, duration of learning, and attitude towards the subject. She used a number of classifying variables such as school stage, school subject, type of learners and source of study. The study revealed the effectiveness of educational interactive video programs in developing variables under study.

Abdel-Ghany (2011) dealt with the trend of studies on using the Internet in education and identifying its effect on achievement and attitude towards some practical skills, using the Internet in education and the school subject, thinking patterns, self-efficacy and achievement motivation according to classifying

variables such as school stage, school subject, pattern of using the Internet in education and source of study. The study concluded the effectiveness of using the Internet in education in developing achievement, some practical skills, attitude towards using the Internet and school subject, thinking patterns, self-efficacy and achievement motivation.

Bernard et al. (2004) used meta-analysis comparing distant education to the traditional method in the studies published from 1985 to 2002. The study included 232 studies with an effect size reaching 599. It aimed at assessing the synchronous and asynchronous approaches in distant education compared to the traditional one. Asynchronous applications were found to be better than the synchronous and the traditional one.

Wolf (2006) used meta-analysis of the studies on using educational technology in teaching reading for the handicapped. It aimed at providing the prep and secondary school teachers with the results that dealt with using educational technology in teaching reading for the gifted. It analyzed the studies conducted from January, 1995 to March, 2006. The results showed that using educational technology had a great effect in teaching the reading skills for the handicapped.

Cook et al. (2008) aimed at analyzing the results of the studies that dealt with internet- based learning from 1990 to 2007 and comparing it to the traditional learning in health studies. The results indicated the effectiveness of internet- based learning.

Dragon (2009) meta-analyzed 35 studies on technology – based learning. It aimed at identifying the difference between the field-dependent and the field- independent students in technology- based learning environments. The results revealed the difference in the ratios of performance in favor of the field-independent students.

This study depended on the quantitative statistical form in analyzing the results of the previous studies that dealt with VLEs to reach generalizations and interpret them in an objective

systematic way that depends on statistical quantitative methods in estimating frequencies and the units to be analyzed to help the pioneers in this area.

Problem of the study

Through the researchers' feeling the necessity of reaching standard solutions, conclusions and generalizations for the integration between the results of previous studies in the area of VLEs through analyzing the results in the light of objective criteria, comparing the results in the light of the set criteria and directing the currently available and registered for future research in the area of VLEs, the problem of this study may be formulated as trying to identify the effect of VLEs in the educational process. The study seeks to answer the following two questions:

1. What is the effect of using VLEs in the educational process?

This question has the following sub-questions:

1. What is the effect of using VLEs on achievement?
2. What is the effect of using VLEs on immediate achievement?
3. What is the effect of using VLEs on delayed achievement?
4. What is the effect of using VLEs on developing some practical skills?
5. What is the effect of using VLEs on patterns of thinking?
6. What is the effect of using VLEs on students' attitudes towards using them in the educational process?
7. What is the effect of using VLEs on self-efficacy?
8. What is the effect of using VLEs on achievement motivation?

2. What is the relationship between using VLEs in the educational process, on the one hand, and each of the following on the other: achievement, immediate achievement, delayed achievement, developing some

practical skills, thinking patterns, students' attitudes towards using VLEs in the educational process, self-efficacy and achievement motivation. The analysis will be conducted according to the following classifying variables: school stage, school subjects, pattern of using VLEs and source of study.

Purpose of the study

The study aims at conducting a meta- analysis of the results of studies on using and utilizing VLEs from 2006 to 2015 and its role in setting a map that benefits researchers in future research through reaching new facts for answering the proposed questions.

Importance of the study

This study is important in:

1. Enriching the theoretical knowledge in the scientific field through giving an indicator of the effect of using VLEs.
2. Directing the currently available studies and those to be conducted in the area of VLEs to the study of new scientific problems by throwing the light on the curriculum, pattern of use, and tools used, and studying the relationship between these uses and the results through comparison.
3. Benefiting educators, those responsible for the educational process and researchers, from the results of the research by reaching some generalizations based on the meta-analysis for enhancing the educational process focusing on theoretical principles to reach the best style of using virtual classrooms in the educational process.

Delimitations of the study

This study was limited to:

1. The Arabic studies conducted from 2006 to 2015.
2. The Arabic studies that have enough data for calculating effect size.

3. M.As, Ph.Ds, journals and proceedings of conferences in education.
4. Meta-analysis of the selected Arabic studies was limited to the following variables: achievement, immediate achievement, delayed achievement, developing some practical skills, thinking patterns, students' attitudes towards using VLEs in the educational process, self-efficacy and achievement motivation.
5. The studies were classified according to the following classifying variables: school stage, school subject, pattern of using VLEs and source of study.

Method of the study

This study used meta-analysis. It is a qualitative technique that depends on statistical methods in organizing and extracting information from data and results of studies in a specific field.

Terms of the study

Meta-analysis

It is analyzing the results of analyses. It is the quantitative organized technique of getting information from the results of varied studies and presenting them objectively in a way that aids judging the effectiveness of these results (Ahmad, 2013: 368). The researcher adopted this definition.

Virtual Learning Environments (VLEs)

The researchers adopt Azmy's (2014: 453) definition of VLEs as an integrated technological environment (such as an e-leaning management system) in which the learner lives alone or with a group of learners exchanging opinions and ideas inside a two or 3- dimensional environment that takes varied forms and models such as virtual reality programs, and virtual games, classrooms, schools, libraries and worlds.

Effect Size

The researchers adopted Abou Allam's (2004: 108) definition of effect size. To her, it is a statistical tool that shows the extent of the effect of the experimental variables on some

dependent variables and that shows whether this effect is strong or weak.

Theoretical Background

First dimension: Meta-analysis

The development in educational research results from the concern of researchers and those responsible for setting policies and taking practical decisions. It comes through following educational journals and conferences leading to the growth of the research movement in the different sciences. Because the accumulation of information and the integration of the results of studies is a basic condition for the growth of science, a need for a technique that aids the coordination among the results of the different educational studies and getting general conclusions and generalizations for building and developing the social sciences and humanities occurred.

Abou Hatab and Sadeque (2010) mentioned that the reasons for using meta-analysis are that "one of the characteristics of research in social sciences is its frequent failure in reaching consistent results. This means that studies conducted on one topic may not support each other". Perhaps, those responsible for setting policies and taking decisions are the most suffering from this when they want to depend on the results of studies and find conflicting results.

Recently, the field of educational technology, as one of the research areas, witnessed great development and the quantity and quality of research increased. Such development necessitates an increase in meta-analysis of the studies after classifying them into areas. The development and broadness of research in each sub- areas of theory and application of educational technology impose a direction towards conducting a meta- analysis of the results of these studies.

Meta-analysis is one of the statistical techniques that help the researchers and those working in the development of educational research to reuse the heritage of previous studies to answer the methodological questions related to genuine studies.

These relations, which may look like practical problems, the research method used in them, the variety of variables tackled, studying one filed of these fields of specializations, and variation in the school stages on which the studies were conducted, are identified. This is done to conduct methodological comparisons that can enrich theoretical knowledge (**Abdel Hameed, 2013: 367)**

Haig (1988) considers meta-analysis a recent trend that started to expand. He agrees with Basta (1997) that it includes integrating the group of studies that dealt with a certain topic and gathering their results and treatments to reach a general conclusion. This requires recording the characteristics of these studies and their results applying the suitable statistical methods.

Thus, meta-analysis is one of the techniques used to synthesize the digital or quantitative results of the previous studies. It is a relatively recent technique that is characterized by its ease of use even to non-specialists in statistics and it can lead to useful results.

Steps of conducting meta-analysis

Abdel Hameed (2013: 372) agrees with the experts that design and procedures of meta- analysis studies do not differ from other studies depending on primary or secondary data. They can be summarized in the following basic steps: (1) Identifying the scientific problem, (2) data collection, (3) evaluating data, (4) analysis and interpretation and (5) reporting the results.

Glass, McGow and Smith (1981), Abdel Hameed (1987), Shreef (1993), Basta (1997) and Abdel-Ghany (2011) identified the steps of meta-analysis as (1) gathering scientific studies, (2) examining the studies, (3) classifying them, (4) mining data, (5) calculating effect size and (7) evaluating the value of effect size.

Advantages of meta-analysis

Meta-analysis technique is considered the quantitative parallel of the traditional review of studies but it is much better

than it. **Glass** (1981: 22), Allam (1998: 329) and Basta (1997: 11) explain the advantages of meta-analysis as follows:

1. Meta-analysis is distinguished by its system, method, and statistical method as quantitative since it does not make an initial judgment on a study based on its kind only. Rather, there is a quantitative estimation of the results for each study separately and a classification of each one's characteristics for reaching general results through summation of these quantitative estimations.
2. It helps the researcher in showing the gathered effect of the available evidences from previous studies in a way that the traditional review cannot make.
3. It can deal with huge numbers of previous studies. It is appropriate and has a powerful statistical effect beside its explanation of the relationships among psychological and educational variables.
4. It allows generalization of the trends available in the previous studies and identifying the changes and the dimensions reached and do not need to be re-dealt with in future studies.
5. It can be used with correlational studies and those using ratios and other measures in addition to the studies that compare means. Abdel Hameed (2013: 380) pinpoints that the researcher's success in meta-analysis is restoring scientific knowledge in the past and linking it to the recent developments in the same area. This achieves a scientific added value. Therefore, the researcher must be cautious dealing with previous studies deficient in method, tools and the database that affect results.

Second: Virtual Learning Environments (VLEs)

The concept of VLEs

VLE is a concept that spread as the essence of a life that the learners live to learn through an artificial world using the computer. It may be non- existent in reality or it may be an alternative for a reality that can not be dealt with. VLE is a logical

extension for the computer technology development. Thus, it is one of the patterns of computer instruction. It is a system that aims at supporting and serving the educational process as a whole through an environment that simulates the real educational environment.

Basically, it depends on computer and communication technology to form an educational social identity that has no time or place limit. These environments were basically created for distant education and works through online computer applications such as virtual classrooms, schools, universities, libraries, museums, tours, labs and VLEs. Abderrahman (2008: 10) pinpoints that a VLE is one of the e-learning styles in which the learning environment is web-based.

It consists of a number of elements which are the infrastructure comprising web linking devices, computers, necessary software in addition to the educational materials, tests, registration systems, system for controlling how to present these materials and tools that enable the learner to communicate with the teachers, the other learners or parents and conducting written or oral discussions with them, synchronously or asynchronously, such as e-mails and chats.

Nasreddein (2008: 25) adds that VLEs are a group of programs or e-learning management systems that introduce programs and curricula electronically through the computer or the internet, synchronously or asynchronously. These programs provide a group of instructional tools and aids that serve the learner and the teacher and enhance the learning process in addition to utilizing internet services and e-communication characteristics to facilitate presenting these programs and courses to the learners in varied methods and styles.

Uses of VLEs

Salem (2009) identified some uses of VLEs in education as follows:

1. Direct experience.

2. Variation in learning strategies and styles in VLEs since all traditional instructional strategies and styles can be presented in VLEs.
3. They provide the learner and the teacher with a big number of services and resources that enhance the quality of the educational experiences and develop the efficiency and effect of web- based teaching processes.

Reasons for using VLEs

Fargoun (2013) identified reasons for using VLEs as follows:

1. Mutual support and encouragement among students when assessing their works.
2. The increasing need for lifelong learning which stimulated persons for more learning to enhance their skills and knowledge.
3. Effective communication among the participants and the content of the curricula.
4. Cooperation among the students and between them and the teacher.

Patterns of VLEs:

There are many patterns that usually work through online computer applications such as virtual classrooms, schools, universities, libraries, museums, tours, labs and virtual reality environments.

Virtual classrooms

Abderraouf (2007: 99) defined them as a group of activities that resemble the traditional classroom activities that a teacher and students, separated by vast distances, carry out while working together synchronously regardless of where they are. They interact through online dialogue and print messages that all web- connected persons can see and read; consequently, understand and interact with.

Shatat (2008: 47) defines virtual classroom as the class that works on the computer and international and national

information webs through tools, techniques and programs that enable the teacher to present lessons, identify objectives, set assignments and study activities, and communicate with students through varied techniques. It enables each student to read instructional objectives and lessons, answer assignments, send tasks, participate in discussion boards and dialogues, and preview the procedures of the lesson and the score gained.

Azmy, Megahed and Hamed (2014: 453) explain that virtual classrooms include:

1. Giving lectures in the form of a text, sound or video.
2. Evaluating students: After finishing the lecture, each student is asked to answer a group of questions and to send it through e-mail. The teacher sends the result or the student gets immediate result of feedback.
3. Using chat rooms to discuss the topics and ask questions or make a query.
4. Using the white board for making important announcements.
5. Sending files and exchanging them between the teacher and the students.
6. Using asynchronous tools and techniques such as discussion boards, file and documents' transfer and e-mails.

Kinds of virtual classrooms

Asynchronous virtual classrooms:

Sometimes called self e-learning systems. These are not confined by time or place.

Synchronous virtual classrooms:

These look like classrooms but the teacher or the student uses time- bound tools or programs, i.e. both teacher and students should be present but in different places.

Advantages of virtual classrooms

Almousa and Almobarak (2005: 245) point out some advantages of virtual classrooms such as (1) low cost of equipments, (2) covering a great number of students without age or geographic limits and (3) high speed of follow up and continuous response.

Virtual schools

Abderraouf (2007: 89) defined them as these schools that use computers, varied digital multimedia, and different communication networks for communicating digital information electronically in its varied forms to the students inside the school or outside it, at home. Azmy, Megahed and Hamed (2014: 454) and Shatat (2008: 47) add that the virtual school is similar to the traditional one in the presence of the teachers and students but the student joins the school through the internet and gets the school guide which usually includes:

1. How to register at school.
2. Components of the virtual classroom.
3. The school subjects required.
4. Making assignments and method of school testing.
5. Getting to know teachers and students, and how to contact them.

Advantages of virtual schools

Abderraouf (2007: 110) sees that the advantages of virtual schools include (1) increasing the efficiency and effectiveness of the educational process, (2) low cost of instructional material compared to printed ones and (3) low cost of study compared to the equivalent traditional one.

Virtual universities

The establishment of virtual universities as academic institutions aims at providing the students with the most unique international university educational level at their residence through the internet by creating an integrated educational environment that depends on a highly developed network. It

introduces a group of university certificates from the oldest international recognized universities. It also provides all kinds of support and help supervised by web virtual community that includes the expertise of university experts and professors in the world (Moustafa, 2009).

Azmy, Megahed and Hamed (2014: 455) agree with Aziz (2007: 175) that virtual universities are based on two basics:

1. Self- and continuing education for all persons through the use of information and communication technology in education and teaching and using simulation, i.e. simulating reality through introducing a virtual reality or models that are similar to reality so that practice is done through the computer.
2. Using the World Wide Web that makes the process of simulation and interaction easy such as the simulation models at the faculty of medicine for making operations or Physics and Chemistry lab experiments, and design, production and use of educational computer programs.

Advantages of virtual universities

Abdellatif (2010) presents some advantages of virtual universities as follows:

1. They make the student able to learn anywhere and anytime.
2. They often introduce varied programs that suit the needs of the society and students.
3. The programs and what they include are continuously updated.
4. They allow the students to exchange varied kinds of lectures through the internet.

Virtual libraries

Alkhannak (2012) defined them as a group of digitally computerized information repositories composed in a particular way suitable for use through the information network that enable people to reach information regardless of distances and introduce all services introduced by the traditional libraries.

Tareque (2009) identified the following advantages for virtual libraries:

1. The possibility to provide new forms of information that can't be stored and broadcasting them through traditional channels.
2. Possibility of sharing information.
3. The virtual library carries its groups to the user where he is since the library exists where there is a computer connected to a network.
4. Making use of computers' ability to restore and explore information.

Virtual Museums

Ismail (2009: 92) explains that virtual museums may be confused with virtual reality and the equipments and devices attached to it to enable the audience to interact with this reality. However, this concept is not completely correct. Not every museum using virtual reality technology is a virtual museum; rather, a virtual museum basically depends on a network for its existence and carrying out its diverse functions and tasks.

Characteristics of a virtual museum

Saleh (2009: 371) mentioned that the characteristics of the virtual museum are:

1. It is an imaginary site on the internet not a real identity.
2. Museums use hypermedia technology in linking exhibits to the studies and comments related to them.
3. Some virtual museums use 3-dimension virtual reality technology for showing their museum possessions. The user's role is exploring using the mouse cursor through panoramic snapshots of a hall in a real museum.

Advantages of virtual museums

Ashsharkasy (2015) and Ismail (2009: 121-125) see that "virtual museums gain their importance due to the advantages attributed to the network and its potentials". Alhalafawy (2009: 174-175) add that they are "integrated educational

environments that have many advantages". The advantages can be summarized as follows: making the museum possessions available online, exceeding the time and place limits, overcoming the problem of limited space, providing many services for special needs students, redesigning the museum show easily and at a few cost, enhancing the quality of teaching and learning, stimulating motivation towards learning, and concentration and power of effect.

Virtual Tours

They are one of the technological novelties that appeared powerfully through the internet, and were caught by educators and teachers. Virtual tours were first used in 1994. They were derived from the interpretation of the name "the visitor's museum". The first one who used the virtual tour was Queen Elizabeth II when she officially inaugurated the center of visitors which was called "a virtual tour" that was done through virtual reality.

Azmy, Alhalafawy and Anwar (2014: 500) define virtual tours as an interactive tour that includes a group of varied digital tools that can be utilized through the internet for presenting a group of alternatives that simulate specific places and provide learners with varied opportunities for recognizing the components of these places without any time or place limits.

Types of virtual tours

Bedard et al. (2005) mentioned that the types of virtual tours are:

1. Text- based virtual tours: This is the simplest and least expensive type of virtual tours since they do not use any visual tools.
2. Image- based virtual tours: This is one of the simplest tours since it depends on synchronization of text with a group of images that support them.
3. Sound- based virtual tours: This type depends on sound since most of them are audio-visual. Most of them use sound when the tour is characterized by walk through

which allows the learners to feel walking through the virtual tour. This is suitable for the special needs learners.

4. 3-d virtual tours: This kind depends on a group of 3D-images, drawings and scenes.
5. Panoramic virtual tours: These tours give learners a better feeling of reality since they present their content in a 3D format. They depend on a group of images linked together to form a panorama with 360 degree. This type requires accuracy in producing images and assembling them together. The images should be of high quality.

Advantages of virtual tours:

Azmy, Alhalafawy and Anwar (2014: 502) summarized advantages of virtual tours as follows:

1. They present the required information from different perspectives.
2. They present a group of tours in unreachable regions.
3. They enhance and consolidate the students' experience in a specific field.
4. They help the learners to explore the trip places before real visit.
5. They provide learners with the possibility of visiting sites, walking through them anytime, anywhere.
6. They are available for learners at different levels.

Virtual labs

They were introduced by Ismail (2011) as programmed labs that simulate real labs through which the learners learn by conducting distant practical experiments for unlimited times. They compensate for the absence of lab equipments. Most of the course topics may be covered by virtual experiments which is difficult to achieve in reality due to the limited time devoted to practice and limited number of labs. Besides, Zaitoun (2005: 165) defined them as a virtual teaching and learning environments that aim at developing lab experimental skills among learners on one of the internet sites. This site usually includes a main page that has a number of links or icons (tools)

related to lab experiment activities and their achievements and evaluation.

Advantages of virtual labs

Ismail (2011) and the E-Learning National Center (2010) mention some advantages of virtual labs as follows:

1. Compensating for the lack of real lab facilities due to lack of financial support.
2. Conducting lab experiments that are difficult to conduct in real labs due to their danger such as nuclear power ones.
3. Visual presentation of data and phenomena that cannot be presented through real experiments and protecting learners from dangers of practical training at the beginning of learning.
4. The possibility of interacting with other people in conducting the same experiment at a distant.
5. Making the lab experiments available from any place and for unlimited trials according to the learner's comprehension.

Virtual reality environments

The concept "virtual reality" is one of the important concepts that information technology added to our contemporary group of concepts. It refers to forming 3D environments using computer drawings and simulation equipments to prepare someone to sense them and use his different senses interacting with them and changing their givings to enhance the feeling of engaging with this environment.

Azmy, Said and Ibrahim (2014: 112) defined it as an interactive environment that simulates a physical or imaginary reality to allow the learner free walk through inside this environment and acquiring the desired learning experience. Alkhannak (2012) assured that the concept virtual reality is a 3D- environment virtually generated and the learner wishes to interact with. It can be generated using the computer technology and simulation from physical components and programs in

addition to other equipments to achieve different educational, medical, entertainment, purposes.

Types of virtual reality

Anwar (2010) classifies types of virtual reality as:

1. (Desk Top virtual reality) Immersive: These depend on common computers but they should be provided with high quality screen card. Other tools are also used to embodiment of things. Another kind is panoramic virtual reality that allows watching the virtual environment with an angle reaching 360^0.
2. Semi-immersive VREs: These allow a high degree of tele-presence of learners more than the previous type. It allows walking through the environment using some tools such as 3D- mouse, joystick and gloves.
3. Fully immersive VREs: In these environments, some tools of tracking such as helmets and gloves which allow concrete seeing of things and more engagement in the environment.

Procedures of the study

This study aimed at conducting a meta-analysis for the results of studies on using and utilizing VLEs from 2006 to 2015 to reach new facts. This was done through reviewing and analyzing related literature and previous studies that dealt with meta- analysis to (1) answer questions, (2) identify the sample of Arabic studies (M.A., Ph.D., periodicals and proceedings of conferences issued by specialized educational institutions, faculties of education or educational research institutes), and (3) identifying the independent variables of the studies to explore the effect of using VELs on the educational process, in general, through the following dependent variables: immediate achievement, delayed achievement, developing some practical skills, patterns of thinking, and attitude towards using VLEs in the educational process.

This will be done in the light of the following classifying variables: school stage (primary, prep, secondary ...), school

subject (Math, Science, Social studies …), pattern of using VLEs, and type of study (M.A., Ph.D., periodicals and conferences). In addition, data needed for estimating value of effect size was identified, procedures followed and effect size values were evaluated.

To achieve this, the researchers followed some procedures suggested by Glass, McGaw and Smith (1981), Gamaleddin (1987), Basta (1997) and Alhosary (2001) which are: collecting the studies, examining and classifying them, writing down the results then calculating effect size.

The researchers collected the Arabic studies and made sure they match the set conditions and the classifying criteria. The M.A., Ph.D., conferences and periodicals conducted from 2006 to 2015 were collected. They were 47 (34%) studies. Sixteen studies, that did not contain the statistical data for calculating effect size, were excluded while 31 (66%) were accepted.

A checklist was designed for analyzing the studies. It included four items. The checklist was submitted to a group of jury members for validity. The checklist in its final form (Appendix 1) became applicable and it contains the following data:

1. Bibliographic descriptive data for the study (general information that included the researcher's name, title of the study, date, universality, …)
2. Independent and dependent variables.
3. Pattern of using the VLEs which include virtual classrooms, schools, universities, museums, tours, labs, and virtual reality.
4. Statistical data through which effect size will be calculated. They include number of participants in the experimental group and the control group, mean score of the experimental and the control group, standard deviation of the experimental and the control group, mean score of the pre- and post-tests for the experimental group, standard deviation for the experimental group pre-

and post-test, F- ratio, t- test value, degree of freedom, percentage of the experimental and the control group, sum of differences between groups, Chi square, sum of squares between groups and total of sum squares.

Calculating effect size

The researchers used many equations for calculating effect size. Each equation was used in the light of the data available in each study. These equations are as follows:

1. Glass, McGaw & Smith's (1982, 102) equation was used when the data available in the study included the mean scores of the experimental and the control groups, and standard deviation of the control group.
2. Glass, McGaw & Smith's (1981, 185) equation was used when the data available in the study included the mean scores of the pre-posttest of the experimental group and standard deviation of the pre-test.

Calculating the value of mean effect size

After calculating effect size for every dependent variable in each study, the mean effect size was calculated by dividing total values of effect size by their number (see Albos, 2001: 11 and Abdel Hameed, 1995: 97).

Assessing the value of effect size

To assess the value of effect size, the researchers followed the following steps:

1. The big value matching the mean score of effect size was identified using equinoctial distribution table for standard grades (Alkanany, 2002: 12), (Appendix 6).
2. The value of change in the big area matching the value of effect size, gained from the previous step, out of 0.50 (the maximum change in area) was assessed.
3. If the value of change resulting from the previous step was more than 0.25 (i.e. 50% or more of the value of maximum change in area), the independent variable had a significant effect on the dependent variables. On the other hand, if this value was less than 0.25, the independent

variable had insignificant or weak effect on the dependent variables (Alhosary, 2001: 11).

Results of the study

Results related to the first question which states "What is the effect of using VLEs on the educational process?" included answering eight sub- questions which identified the effect of using VLEs on achievement, immediate achievement, delayed achievement, some practical skills, patterns of thinking, students' attitude towards using them in the educational process, self-efficacy and achievement motivation. Table 1 presents the number of the Arabic studies, number of effect size, mean effect size number and value of change in the area for each dependent variable.

Table 1: Number of the Arabic studies and effect size, mean effect size number and value of change in the area for each dependent variable

Variable	Number of the Arab studies	Number of effect size	Mean effect size number	Value of change in the area
Achievement	27	35	3.4125	0.4996
Immediate achievement				
Delayed achievement				
Developing some practical skills	17	28	9.2493	0.4999
Patterns of thinking	4	6	4.2967	0.4999
Attitude towards use of VLE in the educational process	7	7	15.1271	0.4999
Self-efficacy	1	1	0.74	0.2704
Achievement motivation	3	3	2.39	0.4918
Total number of studies (31)	59	80		

It is clear from table 1 that although the number of the Arabic studies that were analyzed was 31, the results showed an increase in the number of the studies after the analysis since the number of variables reached 59 and effect size reached 80. The increase is attributed to the fact that some studies used dealt with more than one variable and sometimes more than one experimental intervention for the same variable with more than one effect size. Considering variables, the achievement variable

(immediate and delayed) came in the first rank since 27 studies with 35 effect size dealt with it. The variable developing some practical skills came in the second rank with 17 studies and 28 effect size. Attitude towards using VLEs came in the third rank with seven studies and seven effect size. In the fourth rank came pattern of thinking variable with four studies and six effect size. Achievement motivation came in the fifth rank with three studies and three effect size. Then, in the sixth and the last rank came the variable self-efficacy with one study and one effect size.

Table 1 also shows that the value of change in area was more than 0.25 for each dependent variable. This gives a strong indicator of the effectiveness of using and utilizing VLEs in developing achievement (immediate and delayed), developing some practical skills, attitudes towards using VLEs in the educational process, patterns of thinking, achievement motivation and self-efficacy.

Second: Results related to the second question which stated: "What is the relationship between using VLEs in the educational process and each of the following: achievement (immediate and delayed), developing some practical skills, patterns of thinking, attitudes towards using VLEs in the educational process, self-efficacy and achievement motivation. These relationships will be examined in the light of the following classification variables: school stage, school subject, pattern of using VLEs and source of study. This question and its sub-questions were answered by presenting the results related to the relationship between using VLEs in the educational process and the classification each of the aforementioned variables.

Answering the first sub-question: Table 2 presents results on the relationship between using VLEs and achievement in the light of the classifying variable "school stage".

Table 2 shows that the value of change in area was more than 0.25 for each dependent variable in the light of the classifying variable "school stage" as follows:

1. ***Developing achievement***: The values give strong indicators of the effectiveness of using and utilizing VLEs in the educational process in developing achievement (immediate and delayed) in kindergarten, primary, prep, secondary, and university stages. On the other hand, a poor indicator is shown concerning the effectiveness of using and utilizing VLEs in the educational process in developing achievement (immediate and delayed) in the other stages.
1. ***Developing some practical skills:*** The values give strong indicators of the effectiveness of using and utilizing VLEs in the educational process in developing some practical skills in all educational stages: kindergarten, primary, prep, secondary, university stages and the other stages.
2. ***Developing patterns of thinking***: The values give strong indicators of the effectiveness of using and utilizing VLEs in the educational process in developing patterns of thinking in the prep and university stages.
3. ***Developing attitudes towards using VLEs in the educational process:*** The values give strong indicators of the effectiveness of using and utilizing VLEs in the educational process in developing attitudes towards using and utilizing VLEs in the educational process in the secondary, university and the other stages.
4. ***Developing self-efficacy***: The values give strong indicators of the effectiveness of using and utilizing VLEs in the educational process in developing self-efficacy among primary stage pupils only.
5. ***Developing achievement motivation***: The values give strong indicators of the effectiveness of using and utilizing VLEs in the educational process in developing achievement motivation among the primary and prep stages students.

Table 2 also showed that the value of change in area was less than 0.25 for the achievement variable in the other stages. This gives an indicator of the ineffectiveness of using VLEs in the

educational process for developing achievement in other stages. The reason may be that the other stages may need practice and direct experience which affected the results of the experiment under analysis.

In brief, using VLEs in the educational process is highly effective in developing the variables under investigation at all educational stages except achievement in the other stages where results revealed the poor effect of using VLEs in its development at this stage.

Table 2: Number of the Arab studies and effect size, mean effect size number and value of change in the area for the classifying variable "school stage"

Independent variable / School stage		Achievement	Immediate achievement	Delayed achievement	Practical skills	Pattern of thinking	Attitude	Self-efficacy	Achievement motivation
Kindergarten	N	1			1				
	NEF	4			1				
	MES	1.12			1.84				
	CA	0.3686			0.4671				
Primary stage	N	3			1			1	1
	NEF	3			1			1	1
	MES	3.84			2.98			0.74	4,64
	CA	0.4999			0.4986			0.2704	0.4999
Prep stage	N	4			3	2			2
	NEF	5			6	2			2
	MES	3.37			2.95	6.59			1.265
	CA	0.4995			0.4984	0.4999			0.3962
Secondary stage	N	2			3		1		
	NEF	2			6		1		
	MES	1,38			3.13		1.17		
	CA	0.4162			0.4991		0.3790		
University	N	13			8	2	4		
	NEF	17			13	4	4		
	MES	4.84			16.67	3.15	24.07		
	CA	0.4999			0.4999	0.4992	0.4999		
Graduate studies	N								
	NEF								
	MES								
	CA								
Other stages	N	4			1		2		
	NEF	4			1		2		
	MES	0.65			0.96		9.07		
	CA	0.2422			0.3315		0.4999		

N= number of studies NES= number of effect size

MES= mean of effect size CA= change in area

Answering the second sub-question: This presents results related to the second classifying variable "school subject"

Table 3 shows the relationship between the independent variables and the classifying variable "school subject" through the number of Arabic studies, number of effect size, mean of number of effect size and value of change of area.

Table 3: Number of the Arabic studies and effect size, mean effect size number and value of change in the area for the classifying variable "school subject"

School subject \ Independent variable		Achievement	Immediate achievement	Delayed achievement	Practical skills	Pattern of thinking	Attitude	Self-efficacy	Achievement motivation
Educational technology	N	11			7	1	4		
	NEF	14			12	1	4		
	MES	5.78			17.99	8.65	24.07		
	CA	0.4999			0.4999	0.4999	0.4999		
Arabic	N								
	NEF								
	MES								
	CA								
English	N	1							
	NEF	1							
	MES	5.29							
	CA	0.4999							
Other languages	N								
	NEF								
	MES								
	CA								
Science	N	6			5	3	1	1	1
	NEF	6			11	5	1	1	1
	MES	3.11			3.19	3.426	1.17	0.74	2.40
	CA	0.4990			0.4993	0.4996	0.3790	0.2704	0.4918
Mathematics	N	3			1				1
	NEF	6			1				1
	MES	1.74			2.98				4.64
	CA	0.4591			0.4986				0.4999
Social studies	N								
	NEF								
	MES								
	CA								
Art education	N	1							
	NEF	2							
	MES	0.20							
	CA	0.0793							
Physical education	N								
	NEF								
	MES								
	CA								
Musical education	N								
	NEF								
	MES								
	CA								
Other subjects	N	6			4		2		1
	NEF	6			4		2		1
	MES	.62			1.28		4.535		0.13
	CA	0.2324			0.3997		0.4999		0.0557

N= number of studies NES= number of effect size
MES= mean of effect size CA= change in area

It is clear from Table 3 that the value of change in area was more than 0.25 for each of the dependent variables under study in the light of the second classifying variable "school subject" as follows:

1. ***Achievement:*** The values give strong indicators of the effectiveness of using and utilizing VLEs in the educational process in developing achievement (immediate and delayed) in Educational Technology, Mathematics, Science and English.
2. ***Developing some practical skills:*** The values give strong indicators of the effectiveness of using and utilizing VLEs in the educational process in developing some practical skills in Educational Technology, Mathematics, Science and other subjects.
3. ***Patterns of thinking:*** The values give strong indicators of the effectiveness of using and utilizing VLEs in the educational process in developing patterns of thinking in Educational Technology and Science.
4. ***Attitudes towards use of VLEs in the educational process***: The values give strong indicators of the effectiveness of using and utilizing VLEs in the educational process in developing the students' attitudes towards using VLEs in the educational process in Educational Technology and Science.
5. ***Self-efficacy:*** The values give strong indicators of the effectiveness of using and utilizing VLEs in the educational process in developing self-efficacy in Science only.
6. ***Achievement motivation:*** The values give strong indicators of the effectiveness of using and utilizing VLEs in the educational process in developing achievement motivation in both Science and Mathematics. On the other hand, a poor indicator is shown concerning the effectiveness of using and utilizing VLEs in the educational process in developing achievement motivation in the other subjects.

It is also clear from Table 3 that the value of change in area was less than 0.25 for achievement in other subjects which gives an indication of the ineffectiveness of using VLEs in the educational process concerning achievement in Art education and other subjects. In addition, results revealed that using VLEs was ineffective in developing achievement motivation in the other subjects. This may be due to the weak reliance on one study for calculating effect size which affected the results of the experiment under investigation.

In brief, using VLEs in the educational process is highly effective in developing dependent variables in all school subjects that existed in the studies under investigation except for achievement in Art Education and the other subjects, and achievement motivation in the other subjects.

Answering the third sub-question: This presents results related to the third classifying variable "pattern of using VLEs".

Table 4 shows the relationship between the dependent variables and the classifying variable "pattern of using VLEs" through the number of Arabic studies, number of effect sizes, mean of number of effect sizes and value of change in area.

It is clear from Table 4 that the value of change in area was more than 0.25 for each of the dependent variables under study in the light of the third classifying variable "pattern of using VLEs" as follows:

1. **Achievement in each pattern of using VLEs:** The values give strong indicators of the effectiveness of using and utilizing VLEs in the educational process in developing achievement (immediate and delayed) in all patterns of using VLEs in the educational process (virtual classrooms, libraries, museums, tours, labs, and reality).
1. ***Developing some practical skills in each pattern of using VLEs***: The values give strong indicators of the effectiveness of using and utilizing VLEs in the educational process in developing some practical skills in all patterns of using VLEs in the educational process

(virtual classrooms, libraries, museums, tours, labs, and reality).

2. ***Patterns of thinking:*** The values give strong indicators of the effectiveness of using and utilizing VLEs in the educational process in developing patterns of thinking in all patterns of using VLEs in the educational process (virtual museums and labs).
3. ***Students' attitudes towards using VLEs in the educational process in all patterns:*** The values give strong indicators of the effectiveness of using and utilizing VLEs in the educational process in developing the students' attitudes towards using VLEs in the educational process in all patterns of using VLEs in the educational process (virtual classrooms, museums, tours, labs, and reality).
4. ***Self-efficacy in all patterns of using VLEs***: The values give strong indicators of the effectiveness of using and utilizing VLEs (use of virtual classrooms pattern) in the educational process.
5. ***Achievement motivation in all patterns of using VLEs in the educational process:*** The values give strong indicators of the effectiveness of using and utilizing VLEs in the educational process (virtual labs pattern). On the other hand, results revealed that using VLEs (virtual classroom pattern) was not effective in the educational process.

In brief, it can be concluded that using VLEs in the educational process is highly effective in developing the dependent variables under study and all patterns of using VLEs (virtual classrooms, libraries, museums, tours, labs, and virtual reality). Results also showed that virtual classrooms pattern was ineffective in developing achievement motivation in the studies under examination.

Table 4: Number of the Arabic studies and effect sizes, mean of the numbers of effect sizes and value of change in the area for the classifying variable "pattern of using VLEs"

Independent variable / Pattern of VLEs use		Achievement	Immediate achievement	Delayed achievement	Practical skills	Pattern of thinking	Attitude	Self-efficacy	Achievement motivation
Virtual classrooms	N	12			6		3	1	1
	NEF	13			6		3	1	1
	MES	3.31			6.15		4.853	0.74	0.13
	CA	0.4994			0.4999		0.4999	0.2704	0.0557
Virtual schools	N	-			-	-	-	-	-
	NEF	-			-	-	-	-	-
	MES	-			-	-	-	-	-
	CA	-			-	-	-	-	-
Virtual universities	N	-			-	-	-	-	-
	NEF	-			-	-	-	-	-
	MES	-			-	-	-	-	-
	CA	-			-	-	-	-	-
Virtual libraries	N	2			2	-	-	-	-
	NEF	2			2	-	-	-	-
	MES	3.91			1.87	-	-	-	-
	CA	0.4999			0.4686	-	-	-	-
Virtual museums	N	4			-	1	1	-	-
	NEF	9			-	1	1	-	-
	MES	1.43			-	8.65	64.49	-	-
	CA	0.4222			-	0.4999	0.4999	-	-
Virtual tours	N	1			1	-	1	-	-
	NEF	1			1	-	1	-	-
	MES	7.03			1.84	-	11.31	-	-
	CA	0.4999			0.4617	-	0.4999	-	-
Virtual labs	N	6			6	3	1	-	2
	NEF	6			12	5	1	-	2
	MES	3.05			3.17	3.426	1.17	-	3.52
	CA	0.4998			0.4992	0.4996	0.3790	-	0.4998
Virtual reality	N	2			2	-	1	-	-
	NEF	4			7	-	1	-	-
	MES	7.59			25.49	-	14.99	-	-
	CA	0.4999			0.4999	-	0.4999	-	-

N= number of studies NES= number of effect size
MES= mean of effect size CA= change in area

Answering the fourth sub-question: This presents results related to the fourth classifying variable "source of study"

Table 5 presents the results of the relationship between the dependent variables and the classifying variable "source of study" through the number of Arabic studies, number of effect sizes, mean of number of effect sizes and value of change in area.

Table 5: Number of the Arabic studies and effect sizes, mean of the numbers of effect sizes and value of change in the area for the classifying variable "source of studies"

Independent variable / Pattern of VLEs use		Achievement	Immediate achievement	Delayed achievement	Practical skills	Pattern of thinking	Attitude	Self-efficacy	Achievement motivation
M.A. studies	N	14			8	1	2	1	1
	NEF	18			13	1	2	1	1
	MES	2.61			2.18	11.41	9.76	0.74	0.13
	CA	0.4955			0.4854	0.4999	0.4999	0.2704	0.0557
Ph.D. studies	N	6			4	1	3	-	-
	NEF	7			7	1	3	-	-
	MES	7.16			27.92	1.77	26.883	-	-
	CA	0.4999			0.4999	0.4616	0.4999	-	-
conferences	N	5			4	-	2	-	1
	NEF	8			4	-	2	-	1
	MES	2.06			4.51	-	3.175	-	4.64
	CA	0.4803			0.4999	-	0.4993	-	0.4999
periodicals	N	2			1	2	-	-	1
	NEF	2			4	4	-	-	1
	MES	2.97			4.30	1.43	-	-	2040
	CA	0.4985			0.4999	0,4236	-	-	0.4918

N= number of studies NES= number of effect size
MES= mean of effect size CA= change in area

It is clear from Table 5 that the value of change in area was more than 0.25 for each of the dependent variables under study in the light of the fourth classifying variable "source of study" as follows:

1. ***Achievement in source of study (M.A., Ph. D., conference and periodical):*** The values give strong indicators of the effectiveness of using and utilizing VLEs in the educational process in developing achievement (immediate and delayed) in source of the study (M.A., Ph. D., conference and periodical).
2. ***Developing some practical skills in source of the study (M.A., Ph. D., conference and periodical):*** The values give strong indicators of the effectiveness of using and utilizing VLEs in the educational process in developing some practical skills in source of the study (M.A., Ph. D., conference and periodical).
3. ***Patters of thinking in source of the study (M.A., Ph. D., conference and periodical):*** The values give strong indicators of the effectiveness of using and utilizing VLEs in the educational process in developing patterns of thinking in source of the study (M.A., Ph. D. and periodical).
4. ***Students' attitude towards use of VLEs in the educational process according to source of the study:*** The values give strong indicators of the effectiveness of using and utilizing VLEs in the educational process in developing the students' attitudes towards using VLEs in the educational process according to source of the study (M.A., Ph. D. and conferences).
5. ***Self-efficacy according to source of the study (M.A., Ph. D., conferences and periodicals):*** The values give a strong indicator of the effectiveness of using and utilizing VLEs in the educational process in developing self-efficacy according to source of the study (M.A).
6. ***Achievement motivation according to source of the study (M.A., Ph.D., conferences and periodicals):*** The values give strong indicators of the effectiveness of using and utilizing VLEs in the educational process in developing achievement motivation according to source of the study (M.A., conferences and periodicals). Yet, the

values give a poor indication of the effectiveness of using and utilizing VLEs in the educational process in developing achievement motivation according to M.A. source of the study.

To sum up, using VLEs is highly effective in developing dependent variables under examination in this study according to source of the study (M.A., Ph.D., conferences and periodicals). Yet, they are not effective in developing achievement motivation according M.A. studies under examination in the meta- analysis.

Discussion and interpretation of the results

First: The effect of using and utilizing VLEs in the educational process on achievement, developing some practical skills, patterns of thinking, students' attitudes towards using VLEs in the educational process, self-efficacy and achievement motivation.

The results indicated that the values of change in areas were more than 0.25 for each of the dependent variables which are strong indicators of the effectiveness of using VLEs in the educational process in all the dependent variables under examination.

This result may be attributed to many advantages of using patterns of VLEs in the educational process which made these environments positive and effective in developing the dependent variables under examination. Some of these advantages are:

1. Using patterns of VLEs in the educational process has the ability to show experiments realistically and acquiring high quality real learning experiences for implementing varied educational experiences and projects.
2. Using patterns of VLEs in the educational process helps showing objects using realistic perspective and changing transition of images through the learners' control.
3. Using patterns of VLEs in the educational process increases motivation towards learning and sensation of presence.

4. Using patterns of VLEs in the educational process helps the learner to interact with the others and provides tools, techniques and potentials that are more effective in mental imagery through showing 3-D elements and panoramic shows.

The researchers see that these advantages, in addition to others, led to the effectiveness of using VLEs in the educational process in developing achievement, some practical skills, patterns of thinking, attitudes towards using VLEs in the educational process, self-efficacy and achievement motivation.

Second: The relationship between using VLEs in the educational process and achievement, some practical skills, patterns of thinking, attitudes towards using VLEs in the educational process, self-efficacy and achievement motivation. This was examined according to the following classifying variables: school stage, school subject, pattern of VLEs and source of the study.

The results indicated the effectiveness of using VLEs in the educational process for the dependent variables under examination according to the classifying variables except the following:

1. Concerning the school stage classifying variable, the value of change in area was less than 0.25 for achievement in other stages. This is an indicator of the ineffectiveness of using VLEs in the educational process for developing achievement in other stages. The reason may be that these stages may need practice and direct experience which may have affected the results of the study under meta-analysis.
2. Concerning the school subjects classifying variable, the value of change in area was less than 0.25 for the following variables:
    1. Achievement in Art Education.
    2. Achievement in other subjects.
    3. Achievement motivation in other subjects.

4. This is an indicator of the ineffectiveness of using VLEs in the educational process for developing achievement in Art Education and other subjects. The reason for Art Education may be the reliance on one study for calculating effect size which affected the results of the experiment under examination. The reason for achievement in other subjects may be that few studies were used for analysis and the short period of administering the experimental intervention which affected the results of the experiment in the study under examination. Concerning achievement motivation in other subjects, the reason may be depending on one study for calculating effect size which affected the results of the study under examination.

3. Concerning the pattern of using VLEs classifying variable, the value of change in area was less than 0.25 for achievement motivation in the virtual classroom variable. This is an indicator for the ineffectiveness of using VLEs in the educational process for developing achievement motivation in the virtual classroom pattern. The reason may be depending on one study for calculating effect size which may have affected the results of the study under examination. Maybe, if there were a bigger number of studies, the results might have been different.
4. Concerning the source of study classifying variable, the value of change in area was less than 0.25 for achievement motivation in M.A. studies. This is an indicator for the ineffectiveness of using VLEs in the educational process for developing achievement motivation in the M.A. studies. The reason may be that self-efficacy may need practice or that the analysis depended on one study for calculating effect size which might have affected the results of the study under analysis.

Thus, the researchers concluded the effectiveness of using VLEs in the educational process in developing achievement (immediate and delayed), some practical skills, patterns of thinking, students' attitudes towards using VLEs in the educational process, self-efficacy and achievement motivation according to school stage, school subject, pattern of using VLEs and source of the study classifying variables except the following:

1. Ineffectiveness of using VLEs in the educational process for developing achievement in other subjects.
    1. Ineffectiveness of using VLEs in the educational process for developing (1) achievement in Art Education, (2) achievement in other subjects and (3) achievement motivation in other subjects.
2. Ineffectiveness of using VLEs in the educational process for developing achievement motivation in the virtual classroom pattern.
3. Ineffectiveness of using VLEs in the educational process for developing achievement motivation in the M.A. studies.

Recommendations of the study

1. The necessity of establishing an educational library in which all educational studies, conferences and periodicals conducted in Egypt are put and the necessity of obliging researchers to submit a hard and a soft copy before being granted the degree.
2. The necessity of paying concern for the meta-analysis technique or post- hoc analysis and raising the researchers' awareness of its importance in enriching theoretical knowledge in the field, in addition to guiding researchers to study new scientific problems.
3. The necessity that researchers add the data needed for calculating effect size in the procedures of the study since the researchers in this study faced many difficulties in finding these data.

4. The necessity of providing the potentials, tools and applications for using VLEs.
5. The necessity of training teachers on using VLEs and raising their awareness of its importance for developing the educational process.

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