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Examining and Comparing the Use of Technology in Medical Education in Egypt and the United States of America: A Literature Review

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EXAMINING AND COMPARING THE USE OF TECHNOLOGY
IN MEDICAL EDUCATION IN EGYPT AND THE
UNITED STATES OF AMERICA: A LITERATURE REVIEW

A Thesis

Submitted to the School of Graduate Studies and Research

in Partial Fulfillment of the

Requirements for the Degree

Master of Arts

Ramy Moustafa Kamel Shaaban

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Title: Examining and Comparing the Use of Technology in Medical Education in Egypt and the United States of America: A Literature Review

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This study examined the current state of medical education in Egypt, and how it has been affected by the current political, financial and educational situation. It also examined the barriers to adopting technology in medical education and the reasons behind the need for integrating technology into medical education in Egypt. This study also examined the emergence of technology-based education in the U.S. in order to provide a conception of what the potential is for mediated medical instruction.

This study consisted of a literature review of studies from three databases, EBSCO, PubMed, and Cochrane library. Relevant studies concerning the subjects were identified.

As a result of this study, reform in Egyptian medical education can be made by using the U.S. approach customized to Egyptian situation. Recommendations from what is found were made for improving the integration of technology in medical education in Egypt. Recommendations for future research are also provided.

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LIST OF ABBREVIATIONS

CME	Continuous Medical Education
EMRO-WHO	Eastern Mediterranean Regional Office of World Health Organization
HEEP	Higher Education Enhancement Project
HPE	Health Profession Education
IIME	Institute of International Medical Education
LMS	Learning Management Systems
MCAT	Medical College Admission Test
OECD	The Organization for Economic Co-operation and Development
SP	Standardized Patient
VLE	Virtual Learning Environments
VP	Virtual Patient
VR	Virtual Reality

CHAPTER I

INTRODUCTION

Rationale

Evolution of Medical Education started in the 1900s in the form of simple skills. Quick improvements have been occurred as medical education became scientific-based learning with predefined objectives that measure knowledge, skills, and behaviors (Rosen, 2008). Several major steps have contributed in the evolution of medical education such as the development of patient simulation in the 20th century. Computers led to mathematical conversion of physiology and pharmacology into what is called “virtual worlds” (Rosen, 2008).

Information and telecommunications technologies provide a chance to reform medical education in Egypt (El-Seoud, El-Sofany, Taj-Eddin, Nosseir, & Mahmoud, 2013). Rapid growth of the Internet and distant learning are changing the nature of continuous medical education (CME). Internet continuing education is satisfying the users, who find it to be a successful learning format (Harden, 2005). In 1990s, E-Learning has been established which offered a bridge between the cutting edge of education and training in CME (Harden, 2005). At this time, the web became fully developed as a viable delivery method for education. Almost all physicians now have computers and Internet access either at their home or at the workplace, which in turn has enhanced their Internet information-seeking behaviors (Harden, 2005).

Despite the huge challenges that face the implementation of educational technology in medical education, such as technical, financial, and time, technology continues to promise to make a good integration with medical education if a good implementation plan can be developed (Kebaetse, Haverkamp, & Nkomazana, 2013).

According to Kazley et al. (2013) there are four themes that can be used to help

understand the causes that affect the use of educational technology. These themes are:

1. The variation in educational technology use among the faculty,
2. The belief of students in the role of educational technology in enhancing the learning experience,
3. The quick changes that occur in the technology could be used in both effective and ineffective ways.
4. The barriers that face the faculty in their adoption of educational technology.

In Egypt, as a developing country, health professionals who are working as teaching faculty members do not have any training on methods of education (Mohamed, Ghanem, & Kassem, 2012). Staff members of the Egyptian colleges are the cornerstones of the process of education. In order to enhance Health Profession Education (HPE), a recommendation from the Egyptian National Quality Assurance and Accreditation Agency and the Eastern Mediterranean Regional Office of the World Health Organization (EMRO-WHO) to establish a quick training plans for health professions education Faculty in medical education (Talaat W. et al., 2007).

Medical Education, as a part of higher education in Egypt, is mainly centralized (governed by the Ministry of Higher Education) (Hammad, 2013). The period of study of Medicine in Egypt is 6 undergraduate years. Regarding the cost of the study, the public universities offer free education to Egyptian students while the private ones require fees to study medicine (The World Bank, 2010). The Ministry of higher education funds about 85% to 90% of the university's education fees; over 70% of these funds are spent on the salary of the staff, and 30% are spent on infrastructure. The Ministry of Scientific Research funds research works in Egypt (Oxford Business Group, 2013).

Mohamed, Ghanem, & Kassem (2012) mentioned the problems that are faced by medical

education in Egypt can be summarized into the following points:

- 1) Infrastructure problems.
- 2) Private tutoring led to decrease the quality of education.
- 3) The administration is central.
- 4) Insufficient teaching facilities.
- 5) Large number of students in relation to the staff members and the university's equipment.

In the past year, a major change has occurred in Egypt regarding the integration of technology into Egyptian life. Social media was the main cause of Egypt's 25th January revolution (Eltantawy & Wiest, 2011). Egyptians depend mainly on social media to obtain the news of the country (Eltantawy & Wiest, 2011). Regarding medical education, Alexandria Faculty of Medicine, one of the public medical schools in Egypt, recently underwent huge efforts to integrate technology into the curriculum (Aboshady et al., 2015). In response to surveys students indicated that they need more online materials as it saves them time and effort studying some parts of their courses through online learning rather than coming to the overcrowded university to get the same knowledge (Aboshady et al., 2015).

However, there are a lot of barriers in adopting technology in medical education in the Egyptian medical schools. The main barrier is the resistance of the teaching staff to the change (Ayuob, Eldeek, Alshawa, & Alsaba, 2012). Staff members have shown high levels of resistance to changing their method of delivering information from traditional over-crowded, lecture-based teaching to the use of technology-based teaching, even though they currently use technology in the lecture to facilitate understanding of the knowledge (Lane, 2007).

Another barrier is lack of interest of using technology in education among the majority of

Egyptian students as they use computers and tablets mainly for entertainment rather than learning purposes (El-Zayat & Fell, 2007).

There are a lot of educational reforms that have occurred in United States. Technology is well integrated into the medical curriculum. For example, the use of plastic cadavers and virtual simulation patients has become a main source of learning for medical students (Roy, Sticha, Kraus, & Olsen, 2006). In addition, virtual reality simulation is widely used in surgery training. (Roy et al., 2006).

This study examines the current state of medical education in Egypt, and how it is affected by the current political, financial and educational situation. It also examines the barriers to adopting technology in medical education, and discusses the reason behind need for integrating technology into the medical education. This study also examines the emergence of technology-based education in the United States in order to provide a conception of what the potential is for mediated medical instruction.

In this study, a review on the general development of technology for education is presented. The development of technology in medical education follows the general development. After that, a review of the development of the medical education system, and the technology-based medical education in the United States is conducted to provide an example of what can be done to improve technology-based medical education in Egypt. In order to understand the actual situation including the financial, political and educational situation, a general review on these situations in Egypt is conducted focusing more on the situations that are related to and affect the development of the technology-based medical education. A review on the development of the medical education system in Egypt, the pros and cons of the system, and barriers and challenges that face the improvement of the medical education system in Egypt is

also discussed. A literature review is conducted in which the recommendations for development of medical education in Egypt according to the U.S. approach is discussed. This analysis examines whether the U.S. approach is suitable to be considered as a good approach for developing the medical education system in Egypt, and the modifications that should be made to make the U.S. approach more suitable to the Egyptian case.

Problem Statement

The purpose of the study is to examine the use of technology in medical education in Egypt and also to examine this use in the United States of America in order to develop an understanding of the potential for the implementation of mediated medical instruction in Egypt. This examination will be within a historical context, addressing the socio-historical issues that have created the current status in both settings.

Research Questions

The aim of this literature analysis is to answer the following questions:

1. What are the challenges that face the integration of technology into medical education in Egypt?
2. What are the U.S. approaches to develop the medical education system?
 - a. To what extent does the way in which the U.S. has used technology in continuing medical education actually offer viable solutions for Egypt?
 - b. Given the political, economic, and social conditions in Egypt, how realistic it is to actually try to implement the U.S. model of technology in Egypt?
 - c. How will the U.S. approach need to be modified to work in Egypt?
3. What are the realistic goals for the Egyptian medical community for adopting technology in light of the political, social, and economic situation in Egypt?

Methodology

This study consisted of a literature review of studies from three electronic databases, EBSCO, PubMed, and Cochrane library; each database was queried separately. The search terms for Egypt's literature review were: medical education in Egypt, educational reforms in Egypt, technology-based education in Egypt, and education, economy, and politics in Egypt. The search terms for the U.S. literature review were: medical education in the United States, technology-based medical education in the United States, and medical education reform in the United States. Peer review articles, reports, and books were included in the search. Relevant studies concerning the subjects were identified. Recommendations from what is found were made for improving the integration of technology in medical education in Egypt.

This study analyzed the collected articles. The approach to this analysis was in the form of reviewing the intentions and assumptions of the authors in their researches with a different perspective to examine the appropriateness of the studies to understanding of the situation in Egypt and the suitability of this situation for the technology implementation and integration into medical education system. The medical community in Egypt has a lot of failures and successes. The U.S. educational reforms throughout the past two decades can be considered as a potential model for the medical system in Egypt to make applicable reforms similar to that of the U.S., especially given the fact that the Egyptian medical curriculum is very similar to the U.S. medical curriculum.

CHAPTER II

TECHNOLOGY DEVELOPMENT IN EDUCATION IN USA

Technology has played a great role in the evolution of the educational system in the United States over the past decade. It is important in achieving many improvements in the methods and delivery of education. Education has changed dramatically, from conventional ways of delivering instruction to highly complex and smart learning tools and management systems that offer instructors high flexibility in shaping their learning materials. This chapter discusses in general the development of technology in education, and more specifically the development of technology in medical education the United States.

General Development of Technology in Education

The original involvement of technology in education cannot be determined because this term has a large scale of definitions. Educational technology is considered to have originated by the emergence of simple primary tools, for example: caves walls' paintings (Seattler, 2004). The use of current technology to enhance education in the United States began in the early 20th Century when the mass media was used by the military in World War II to cope with the problems that results from the shortages during the war (Seattler, 2004). Another early technological innovation was the emergence of educational films in the 1900s. In the 1950s, Skinner developed the term "Programmed Instruction" which is the formulation of behavioral objectives (Dempsey & Sales, 1993). In 1960, the University of Illinois used of computer terminals linked to each other to transfer learning materials between the networked computers (Coordinated Science Laboratory, 1967). In 1963, Bernard Luskin was the first person that installed computers in a community college for instruction. In 1968, the Xerox Palo Alto

Research Center created what is called “Dynabook” which was a computer in a size of a book to run learning materials (Kay, 1972).

From 1970 to 1990, Computer Assisted Instruction (CAI) was developed. Murray Turroff and Starr Roxanne Hiltz initiated computer-based learning in the New Jersey Institute of Technology (Turroff & Hiltz, 1993). In mid 1980s, the digitized communication and networking in education emerged through the development of World Wide Web (WWW), emails and online forums (Das & Jain, 2011). In this same time period, the University of Phoenix started using the term “Virtual Learning” (Das & Jain, 2011). The development of Multi-Object Oriented Sites began in the 1990s and had various types of learning materials (Bates, 2008). In the same year, Palm OS was used as a platform for learning. The earliest online school was established in 1994. Practitioners “Harasim” first used learning networks to deliver learning in 1995.

In the 2000s, the development of technology in education underwent very rapid changes and improvements. Mobile learning and ubiquitous technologies emerged, and the use of new concept of integrated learning or blended learning played a rule in enhancing education. In 2003, a huge project called “Hello China” was initiated to enhance the use of mobile phones in large-scale training (Alonso, 2013). In 2010, the use of mobile phones in learning was improved dramatically by the competitive improvement of the different phone operating systems such as Windows Mobile, Android, Blackberry, and IOS (Alonso, 2013). In 2011 and 2012, authoring tools appeared to enhance the authoring phase of developing learning materials such as Adobe Captivate, Articulate, Lectora and GoMoLearning (Alonso, 2013).

Nowadays, technology is incorporated in all aspects of the educational process. Technology obviously is engaged in all school levels, including higher education, and non-school training. Such engagement can be seen through the use of mobile devices such as tablets,

phones, and notebooks in the learning process. Learning Management Systems also play a major role in all levels of education. Nowadays, it is obviously improved to offer all possible tools for teachers to create good learning contents. In 2009, according to the U.S. Department of Education and the National Center for Education Statistics, 97% of instructors in public schools had one or more computers inside the classroom every day, while 54% had their own computers brought into the classroom. Ninety three percent of the computers have Internet access every day and for 96% of their own computers in the classroom. Students to computers ratio in the classroom every day was 5.3 to 1 (Gray, Thomas, & Lewis, 2010).

Advantages and Disadvantages of Technology in Education

As a part of rapid development in educational technologies in the recent years, educational technology plays an important role in enhancing the educational process. There are many studies that were conducted to determine the benefits and the drawbacks of using technology as a supplement of the classroom, especially, the use of E-learning as an important type of technology for improving the learning process.

After reviewing the improvements of educational technology from the early 1900s to today, the use of technology in education can be summarized using the two major points below:

1. The importance of technology in education and its significance in enhancing learning process.
2. The drawbacks of using technology in education and areas in which traditional learning can be improved without the use of technology.

The Importance of Technology in Education and Its Significance in Enhancing Learning Process

In November 2007, Page (2007, p. 1) identified ten fundamental reasons why technology is vital for education:

1. *Expansion of time and place:* he mentioned, “Technology is no substitute for an inspiring teacher. However, online materials are far more available. Twenty times more”.
2. *Depth of Understanding:* this is provided through interactive simulations and illustrations, which can promote greater depth of understanding of the concept.
3. *Learning vs. Teaching:* As he said that technology allows reversing the process instead of teaching which means pushing of knowledge to students, student can learn (pull) the knowledge anytime, anywhere. So, students are not obligated to physically present to learn.
4. *New Media for Self-expression:* Technology provides students with tools that enables them to better express their thoughts by using, for example PowerPoint, audio recording, photography, video, etc.
5. *Collaboration:* In the digital world, students can work with each other on the same project.
6. *Going Global:* Internet enables student to interact with each other distantly, even around the globe.
7. *Individual Pacing and Sequence:* Technology diminishes the problems resulting from different personalities,
8. *Weight:* Of course, technology enables students to access huge number of textbooks instead of carrying them physically.

9. *Personal Productivity*: Technology provides a lot of productive tools that students need.

10. *Lower Cost*: Usually any e-book is cheaper than the printed one. Virtual classrooms are also cheaper than the traditional ones.

The Drawbacks of Using Technology in Education Areas in Which Traditional Learning Can Be Improved Without the Use of Technology

Pearson (2013, p. 1) discussed the problems that can accompany the use of computers in education. These problems are:

1. **Technical Problems**: online courses need a good network access, so these courses may face a lot of technical issues especially if big numbers of students attends these classes.
2. **Spelling and Handwriting skills**: students who depend mainly on computers in their education suffer from a deficiency in their handwriting ability and fall in a lot of spelling mistakes.
3. **Cheating**: cheating is a common problem that accompanies using technology in evaluation.
4. **Financial Problems**: the cost of developing educational applications and training of teachers on how to develop online courses is another major problem of this technology.

Development of Technology for Medical Education

According to the FY 2010 Annual Performance Report (2010), healthcare occupations are among the top 20 occupations with fastest growth. The aging population and the overall longer life expectancies are the main reasons for this rapid growth, and the longevity of patients is increased by technological developments.

However, the medical complexity associated with this longevity is also increased ("The Future of Nursing: Leading Change, Advancing Health," 2010). The identification and management of long-term care of the patient should not be the only need for healthcare professionals, but the assessment and management of the life-saving technology used by the patients and the navigation of information management systems must also occur instantaneously ("The Future of Nursing: Leading Change, Advancing Health," 2010).

The early World Wide Web (web 1.0) had a great impact on connecting clinicians, patients and materials. In the past decades, the advancement of health care delivery led to increased loads on health professions educators. So, medical educators nowadays face challenges that are differing from their predecessors in medical education (Ellaway & Masters, 2008).

Technology-enhanced learning has been used in almost every educational institution. Medical education is one educational area that has been enhanced by technology. In medical education, students are learning theoretical, laboratory, practical and clinical topics. Integrating technology into the educational process can enhance each of those areas.

The integration of technology in education does not depend only on the tools one needs to use; but also is a complex process that includes people, processes, securing and managing instructional and non-instructional resources, and analysis of learning and performance problems among others (Solis, 2007). Regarding the preparedness of students towards the use of technology in medical education, students may have to have high levels of computer skills in order to be prepared and ready to use technology-based medical education (Fadeyi, Desalu, Ameen, & Muhammed Adeboye, 2010).

Despite the huge challenges that faces the implementation of educational technology in medical education such as technical, financial, and time costs challenges, technology continues

to make a good integration with medical education if a good implementation plan developed (Kebaetse et al., 2013). Kazley (2013) mentioned four themes that facilitate understanding the reasons to use or not use educational technology. These themes are:

1. The variation in educational technology use between the faculties.
2. The belief of students of the role of educational technology in enhancing the learning experience.
3. The quick changes that occur in technology could be used both in effective and ineffective ways.
4. The barriers that face the faculty in their adoption of educational technology.

E-Learning is one of most well-known forms of educational technology. In 2011, a study was conducted in the department of forensic medicine at SSR Medical College. As a result of this study, the majority of students considered that E-learning technologies plays an important role in their learning (Agnihotri & Agnihotri, 2013). About 88% of students found that it is easier to participate in an online discussion than to speak out in the classroom, and about 50% of them did not agree with the total replacement of the lectures with E-learning programs (Agnihotri & Agnihotri, 2013).

Medical simulation is now being used by many health professionals in schools (Rosen, 2008). The purpose of using simulation in medicine is to prepare students for clinical situations they may face in the real life. The simulation tries to create a virtual environment where students can gain the required skills virtually. The evaluation of the simulation may be a challenge because simulations are variables in themselves. Its simplicity or complexity is determined by the user's needs. (Rosen, 2008)

Virtual campuses have been developed on the web by many institutions. The virtual campuses contributed in replacing the paper-based administrative procedures and the traditional learning materials. This led to increase efficiency and cost of the administration of large students' cohorts (Al-khalifah, McCrindle, Sharkey, & Alexandrov, 2006).

In the mid-1960s, simulations of clinical patient management problems were in a written form that provides a standardized approach in which students could be examined on the same clinical problem (Levine, Schwartz, Bryson, & DeMaria, 2012). However, students tend to gain more clinical data than they would if they interacted with a real patient. This, in turn, raises questions about the validity of the evaluation of written simulations (Levine et al., 2012).

In order to overcome these limitations, Barrows and Abrahamson (1968) proposed standardized patients (SPs). Levine et al. (2012, p. 144) defined SP as: "a non-physician, often an actor, who has been trained to act like a specific patient in a consistent, standardized mode". In this approach, students take the patient history from the SP and the SP responds to the students throughout the physical examination process. The interaction is the same as the interaction with an actual patient. The SP is able to fill a checklist of the items performed by the examinee. The communication skills and performance are evaluated by SP on a 5-point rating scales (Levine et al., 2012).

Nowadays, SP interactions are used to train medical students on communication skills, but the disadvantages of SPs are the high cost and effort required to train them and the limited access to SPs by students. Thus, computer simulation and virtual reality represents innovative tools to overcome the disadvantages of SPs. The advantages of virtual patients (VPs) over SPs is that, it saves the effort and cost of SP training and it provides a lot of scenarios that are extremely difficult to be presented via SPs (Deladisma et al., 2007).

The first description of using web-based programs in the training of history taking and evaluation in medical education was in the 1990s, when the Department of Learning Information Management and Ethics at Karolinska Institute in collaboration with the School of Medicine at Stanford established a project called the Interactive Simulated Patient (Rosen, 2008). With this program students were able to take history, perform physical examination and obtain laboratory data (Rosen, 2008).

Deladisma (2007, p. 757) defined VPs as “interactive computer programs that simulate real-life clinical scenarios in which the learner acts as a healthcare professional obtaining a history and physical examination and making diagnostic and therapeutic decisions”.

Cook and Triola (2009) described virtual patients as clinical scenarios where students can access, via the computer program. Student can take the patient history, and obtain information about the physical examination and laboratory investigations virtually.

In the 1950s and 1960s, the foundation of modern virtual reality (VR) began. Two Philco employees designed the first head-mounted display. In 1965, Ivan Sutherland invented the first stereoscopic display (Rosen, 2008).

In 2003, Second life (<http://slife.com/>) was published to give a new era of what is called virtual worlds. These web-based highly-graphics programs enable users to create their own virtual characters called Avatars. The user can live, work, play and study virtually in this virtual world. Second Life is the most popular virtual world software in use today (Boulos, Hetherington, & Wheeler, 2007). In May 2007, Second Life reached more than six million virtual citizens (Boulos et al., 2007). Boulos et al. (2007, p. 233) defined virtual world as “a computer-based, simulated multi-media environment, usually running over the Web, and designed so that users can ‘inhabit’ and interact via their own graphical self-representations

known as avatars". The economy inside Second life boasts millions of monthly-transactions in US dollars. The currency in Second Life is called Linden Dollar, which can be converted into US Dollars through specific US banks (Boulos et al., 2007).

Second Life also contains a lot of medical and health education projects. Many medical schools have their own virtual campuses inside Second Life and one of the most famous virtual campuses is that of the Imperial College of Medicine (Nuthall, 2009). Imperial College virtual campus contains a marvelous interactive facility for medical students such as virtual patients. Virtual patients in the virtual campus of Imperial College are interactive program that can respond to student's questions and physical examination (Nuthall, 2009). The communication with these virtual patients can be through text chatting or via microphone (Nuthall, 2009).

The Importance of Flexner Report in U.S. Medical Education

The development of medical education in the United States has gone through many reforms over the past decades. A review of Flexner Report (1910) is essential in order to understand the causes of the major changes in medical education in the U.S. As a result of the Flexner Report, Medical education in the U.S. went from being unsystematic, private, with no rules to the university setting in which there were many regulations and rules.

Flexner's report (1910) opened the door for medical education to move to the university and to stand against the proprietary schools, the private schools ruled by medical scientists without any regulations from the government. So, in order to describe the evolution of medical education in the United States, the period of the development must be divided into three stages: before Flexner's report age, Flexner's report, and after Flexner's report age. The following paragraphs describe these three stages in detail.

Before Flexner's Report

In mid-nineteenth century, there was no official system for studying medicine in America. No one cared about admissions or getting the M.D. degree to become a physician. Teaching was by lecture alone and there were no clerkships, laboratory trainings, or clinical training in teaching hospitals. Actually the term teaching hospital did not exist in this period. Student only went for two, four-month terms, got the M.D. degree, and did not have to pass a standard form of examination (Orr, 1960). In the post-Civil War era, the typical faculty consisted of only seven or eight instructors. The schools were not government owned or supported, they were owned by the professors who operated them for profit. So, medical schools at this time were called “proprietary schools” (Watts, 2013).

France was the first country to develop modern pathology, physical diagnosis, the application of statistical techniques to clinical research and the development of the hospital as a medical educational institute (Cooke, Irby, Sullivan, & Ludmerer, 2006). After that, German medical science became more prominent by the end of nineteenth century (Cooke et al., 2006). Examples of the German influence include the cell theory of Schleiden and Schwann, the restructuring of modern physiology by Muller, Ludwig, Helmholtz and others, the cellular pathology theory of Virchow, and the emergence of experimental pathology by Cohnheim, Weigert, and Virchow (Orr, 1960).

After the Civil War, between 1865 and 1890, the modern American university appeared. With this development, universities began a huge step in improving medical education (Drake, 2014). In 1893, when Johns Hopkins Medical School opened, it possessed the features of a modern school. The greatest innovation of Johns Hopkins was clinical teaching. The clerkship became the primary way of clinical instruction in internal medicine, surgery, obstetrics, and

gynecology. The hospital became the medical school and students began dealing with real patients (Drake, 2014).

Flexner's Report

In 1910, when the medical education became highly proliferated, Abraham Flexner made his famous report "Medical Education in the United States and Canada" to attack the proprietary schools and to provide acceptance to only one type of medical schools, the university school with full-time faculty and vigorous commitment to research (Flexner, 1910). The report resulted in stimulation of further development of strong schools and ended the era of proprietary schools.

Flexner was a journalist at the Carnegie Foundation for the Advancement of Teaching. He received a request to write a report about medical education in the United States (Orr, 1960). In order to prepare such a report, Flexner visited each of the 155 medical schools in the United States and Canada at this time (Flexner, 1910). He described all 155 medical schools, showing the strengths and weaknesses of each. After his visits he wrote his report concluding the ideal system in his point of view and attacking most of the schools that did not follow his views for the modern medical education system.

The report, in brief, had recommendations for reform, which included:

- Medicine must be based on experiments
- Medical education must be experimental.
- Medical schools must have regulations and prerequisites for students' admission.
- Experiments and medical practice must be scientifically based in order to produce accurate results.
- Students studying at medical schools must learn by doing rather than listening to traditional lectures.

- Research must be one of the main missions of the medical schools.

In addition to the above recommendations, he attacked the proprietary schools and he also recommends reducing the number of medical schools from 155 to just 31 schools. These 31 schools were the schools that had a university setting education, which he recommended being the only type of modern medical schools. He thought that the medical schools that were geared for profit must disappear. Financial support and vigorous funding must be available for the schools in order to establish advanced laboratories and hospitals (Flexner, 1910).

After Flexner's Report

From the proprietary schools to Johns Hopkins, the medical education system changed dramatically to have standard curriculum, entrance requirements, longer period of medical study, and oral and written examinations were introduced to evaluate students. The role of students changed from passive observer to active participant (Cooke et al., 2006).

The system has changed dramatically through the last century till now. Medical education has become more developed, complicated, and consists of multiple types of education rather than just lectures (Galofré, 1987). Examples of these developed forms of medical education are clinical clerkships and laboratory instructions. Medical schools also changed from being simple proprietary schools owned by individuals to huge organizations funded annually by the government with billions of dollars. Medical schools have become educational institutions consisting of academic schools, teaching hospitals, and sophisticated laboratories, with large numbers of fulltime faculty (Galofré, 1987).

Nowadays, the American medical schools have series of structures and systems; medical school now is a four-year graduate institution where students receive the Doctor of Medicine (M.D.) degree after graduation. Admission has become very competitive. The criteria for

admission include grade point average (GPA), medical college admission test scores (MCAT), letters of recommendation, and interviews (Galofré, 1987). In the last decade, medical schools have incorporated technology into medical education, new medical schools established, even existing medical schools opened its satellite campuses (Piotrowski, 2011). Technology has moved medical education ahead. Virtual learning with holograms is now used in anatomy teaching (Roy et al., 2006). iPads, and social media are used officially in the teaching process inside teaching hospitals. Virtual conferences enabled surgeons to teach surgical procedures through distant learning to overseas students (Harden, 2005). Virtual worlds such as Second Life used as a virtual environment where huge number of medical schools established its virtual campuses, containing complete complex virtual programs that interact with medical student simulating the real patients (Nuthall, 2009). Most of the theoretical learning in the premedical schools are taught through online courses without any physical attendance of students in order to focus more on the practical clinical practice. The immersive, team-based simulations designed around lifelike mannequins made evolution in the pre-clinical training.

After graduation, all physicians must go through several forms of clerkships, internships, and fellowships in order to be well prepared for their career. Residency programs offer real clinical training by immersing young physicians into real clinical situations through working in hospitals for more hours per week than any other career in the USA (Cooke et al., 2006). Physicians also go through observerships to gain knowledge about clinical and surgical procedures. In order to be matched to a hospital, physicians must go through all previously mentioned forms of training and apply for an annual matching program which is extremely competitive (Cooke et al., 2006). The United States of America also opened the door to international medical graduates to come and apply for the matching program after taking three

equivalency exams. This strategy led to enriching the medical system by getting benefits from physicians from all over the world coming with different backgrounds.

Some medical schools offer clerkships that are not only departmental but use a multidisciplinary approach in order to expand the knowledge gained throughout the clerkship period. Physicians must gain general knowledge about every specialty related to their area of expertise in addition to the specialized knowledge in their specific field (Cooke et al., 2006).

Continuing medical education is now well known term for any training, courses or education programs for those who graduated from medical schools. It takes many forms such as medical conferences, workshops, postdoctoral studies, postgraduate courses, and so on (Balmer, 2013). The United States of America has one of the largest continuing medical education systems in the world. Physician from around the world come to USA to participate in highly immersive postgraduate researches, to attend conferences providing research papers, and scholarly posters, and to discuss different new trends in medical and surgical procedures (Balmer, 2013).

CHAPTER III

DEVELOPMENT OF THE MEDICAL EDUCATION SYSTEM IN EGYPT

This chapter reviews the development of medical education system in Egypt. A brief history of different ages in Egypt's history will be mentioned in order to put a light on the role of the changing Egyptian history in shaping the current education system. General development of education in Egypt is also reviewed with reviewing the previous reforms in education. The development of medical education in Egypt is then discussed with special light on the current state of technology-based education in Egypt.

Egypt, a Brief History

Egypt, as one of the oldest countries in the world, can boast of one of the greatest civilizations in history. The country's numerous unique ages have played a crucial role in shaping the current Egyptian education system, as shown below:

- 5500 BC was the Predynastic period.
- 3050 to 2686 BC was the early Dynastic period.
- 2686 to 2181 BC was the old kingdom age.
- 2181 to 1991 BC was the first intermediate period.
- 2134 to 1690 BC was the middle kingdom age.
- 1674 to 1549 BC was the second intermediate period (the Hyksos age).
- 1549 to 1069 BC was the new kingdom age.
- 1069 to 653 BC was the third intermediate period.
- 672 to 332 BC was the late period.
- 332 BC was the Ptolemaic dynasty.
- 30 BC to 600s AD was the Roman period.

- 639 to 1250 was the age of the Arab conquest of Egypt to the end of the Ayyubi dynasty.
- 1250 to 1516 was the age of Mamluks.
- 1516 to 1805 was the Ottoman age.
- 1805 to 1922 was the beginning of the state system.
- 1922 to 1952 was the liberal experiment in Egypt.
- 1952 to 1970 was Nasser's age.
- 1970 to 1981 was Sadat's age.
- 1981 to the January 2011 revolution was Mubarak's age.
- 2011 to present is the post-revolution age.

General Development of Education in Egypt

These political changes have inspired the evolution of the educational system in Egypt. In the early 1990s, the Ottoman rulers introduced a European-style system that provided training to army officers and loyal administrators (Loveluck, 2012). In late 1800s and early 1900s, when Egypt was under British occupation, the educational system changed from being free to requiring fees. After the revolution of 1952, when Nasser became the president of Egypt, education became free for all Egyptian citizens both in schools and in higher education (Loveluck, 2012).

At this time, the Egyptian educational system had an important role in the Arab educational system, as most of the teachers in the Middle East were Egyptians. Every graduate of the Egyptian universities at this time had the opportunity to find employment in the public sector.

Many problems with higher education were raised in Nasser's period (1952-1970). At this time, the educational system expanded dramatically. Higher education was free of charge, and in 1964, the government guaranteed a government job to all university graduates. The

explosion of secondary school enrollments in the 1960s led to a huge increase in university enrollments in the 1970s. Nasser's idea of "Arab Socialism" was behind this dramatic increase in the enrollments. This led to a serious deterioration in the quality of education at this time. This situation worsened with professors immigrating to other Arabic nations which offered higher salaries in comparison to Egypt (Chill, 2007).

In the 1980s, the government began to respond to this problem by suspending the job guarantee system. However, the country's financial problems of the country at this time hampered success and reaching their goals. The quality of education was greatly affected by large class sizes, low faculty salaries, poor educational equipment, and the depressed state of the labor market.

The first university, the Egyptian National University, which was later named Cairo University, was founded in 1908, and became a public institution in 1925 (Dyab, 1983). In 1952, there were only three universities in Egypt: Cairo University, Alexandria University, which was founded in 1942, and the American University in Cairo (Dyab, 1983). Gamal Abdel Nasser established the modern Egyptian educational system. Nasser had a clear mission in his presidency period. National independence, politically and industrially, and Arab socialism were his mission (Chill, 2007).

There were several key challenges that were faced by the education system in Nasser's period. Due to the free education system, the number of students increased in relation to the amount of investment in education. This led to overcrowding in school classes. Most schools were operating in shifts. The teaching career has been associated with a lower socio-economic status. This led most teachers to concentrate in offering paid private courses outside of schools, which led to a dramatic decrease in the quality of education inside schools as students preferred

to take private classes rather than attending public schools. With high rate of corruption among school administrators, students were able to make deals with administrators to avoid attending schools regularly (Chill, 2007).

According to CAPMAS (Egypt's Central Statistics and Mobilization Agency), over 60% of the investments in education are spent on private tutoring. The education system in Egypt is controlled centrally through the Ministry of Education, which plays an important role in creating and shaping the curriculum and lesson plans (Loveluck, 2012). This central control prevented teachers from playing a role in designing their courses. In 2010, OECD report, 'Reviews of National Policies for Education: Higher Education in Egypt 2010' mentioned that one of the main obstacles to reform is over-centralization of authority in Egypt's universities ("Higher Education in Egypt," 2010).

Reforms in Higher Education in Egypt began in the early 1980s, but due to financial constraints, the reforms were delayed (Loveluck, 2012). In February, 2000, the National Conference on Higher Education was held to develop a strategy for education reform (Altbach, Reisberg, & Rumbley, 2009).

In April, 2002, Egypt's initiative to improve the higher education system was supported with US \$50 million from the World Bank through a project called Higher Education Enhancement Project (HEEP) (Ginsburg & Megahed, 2011). Loveluck (2012) mentioned three areas this project covered:

1. Efficiency improvement via the reform of governance and management of the higher education system.
2. Quality Improvement of university education to respond to the needs for new learning technologies, equipment, and human resource development.

3. Quality Improvement of mid-level technical education.

After Egypt's January revolution, the funding problems of Egyptian universities have acutely increased due to the unstable transition that happened at this time (Lust, Soltan, & Wichmann, 2010).

However, the current state of higher education in Egypt has many contradictions. The use of social media has increased dramatically among Egyptian youth, especially after the January Revolution. Social media, in fact, was actually one of the main causes of the explosion of protests in Egypt during the revolution, since most of the protesters were using Twitter and Facebook to communicate with each other and to find the places of the protesting (Eltantawy & Wiest, 2011). After the revolution, because of media corruption, false news, and anti-revolution speeches over the media, there was a loss of trust in the Egyptian public and private media (Eltantawy & Wiest, 2011). Egyptians migrated to online social media where they could share their opinions freely and try to find the true picture of the current situation on the Egyptian street ("Egypt, Dimention II-1: Anti-Corruption," 2009).

Moreover, the use of social media actually becomes addictive to many Egyptians who spend most of their time using social media. Actually, According to Socialbaker's (2012) report, Egypt is ranked the second most addicted country to Facebook. Inevitably, then, the use of social media began to shift to education. Many students created groups on Facebook, so they could share educational materials with each other (*Contemporary Media Use in Egypt*, 2014). Recording lectures and posting them on YouTube, scanning educational papers and sharing them on Facebook groups, collecting MCQs and creating online question banks, and creating applications to simulate practical sessions, such as virtual microscopy and virtual anatomy

specimens, all led to engaging in education via technology, which became driven mainly by students and not the educational directors.

Schools began to respond to this shift by creating official pages for their units on Facebook, trying to maintain communications with students through the areas they love. Many professors have profiles on Facebook and have their students as friends. This allows students to communicate with their teachers, even outside the classroom. Consequently, the teacher-student relationship has been improved dramatically during this time.

Medical Education in Egypt

In the following paragraphs, a brief history of the development of medical education in Egypt is discussed. Details on current medical education system are also discussed with a brief description of the pre-university education in order to highlight the problems that accompanying changing learning style and language from the pre-university to the university setting. After that, challenges that face medical education system are discussed. The current state of technology in medical education is discussed to give an image about the possibility of using technology to cope with challenges in medical education.

A Brief History

Egypt is the land of one of the oldest civilizations in history. Regarding the medical sector, Egyptian physicians are considered to be the earliest known physicians in history. Emhotep is considered to be the first physician known in history, along with two other physicians, Hesy-Ra, and the first female physician in history, Merit-ptah. The oldest Bronze or Copper surgical tools in history were discovered in Egypt in a place called Qar. Many medical and surgical procedures were found written on ancient Egyptian Papyri (Mikic, 2008).

The knowledge of medicine in ancient Egypt was taught at first from father to son. Later, when medicine began to grow, temples began to establish medical schools. Good and honest Priests were being chosen to be teachers in these schools. The Per Ankh or “House of Life” was a type of school that teaches all scientific courses (El-Gammal, 1993).

The first medical school in the modern history of Egypt was Kasr El Aine medical school in Kasr El Aine hospital, which was established in 1825. This medical school moved to the university system in 1925 as it joined Cairo University to be one of its colleges (Chill, 2007).

Medical Education System

The education system in Egypt is divided into four levels: the primary level, preparatory level, secondary level, and post-secondary level (university level). In order to be eligible for applying to medical schools, student must pass Thanaweya Amma (the secondary school certificate), or its equivalent from international education in Egypt. After passing the exam, students enter into a matching program, which is totally related to the score on the Thanaweya Amma exam. Medical schools are known to accept applicants with the highest scores. There is no interview or special admission requirements to each university but the only requirement is that the applicant’s score must fall within the highest average determined by the Ministry of Higher Education according to the number of applicants applying to the universities.

Currently, there are 21 registered medical schools in Egypt, 11 are active schools, and 19 are registered schools at the Institute of International Medical Education (IIME) Databases in relation to the 86 million population. The number of schools per 1,000,000 people is 0.25 and the number of doctors per 10,000 people is 28.3 (Abdalla & Suliman, 2013). English is the language of instruction and the duration of instruction is 6 years plus one internship year.

The medical sector of higher education in Egypt consists of five major specialties: medicine, dentistry, pharmacy, nursing, and physical medicine. There is an average student-teacher ratio of 9.5:1 (Abdellah, Taher, & Hosny, 2008).

There are many problems that the medical sector in Egypt is faced with. The secondary school certificate does not measure students' skills, but only measures the ability of the student to memorize the subjects (Ghazal, 2012). Thus, the accepted applicants to medical schools are not those who have the required skills to be good physicians. They only have a high score on a secondary school certificate, which allows them to enter medical schools without prior specific evaluation for the medical field.

Overcrowding in relation to limited financial resources is one of the main problems. The medical education system has a lack of sustainability of the financial policy. Poor infrastructure is another problem either in academic or clinical education. Poor instructional facilities, lack of faculty training, and lack of formal evaluation are also problems that led to many challenges in the medical education system in Egypt (Loveluck, 2012).

The language is also considered an issue for first year medical students. Sabbour et al. (2010) conducted research to explore student and staff perspectives on language barriers in medical education in Egypt and their attitudes towards Arabization of the medical curriculum. The study consisted of a questionnaire survey of 400 medical students and 150 staff members that resulted in 56.3% of students did not consider English instruction an obstacle, and 44.5% of staff considered it an obstacle only in the 1st year (Sabbour, Dewedar, & Kandil, 2010). Despite the poor quality of teaching the English language in schools and despite the fact that students graduating from high school with poor English language skills, many medical students did not

consider learning medicine in English an obstacle. Staff members consider the English language as an obstacle only in the first year (Sabbour et al., 2010).

The first year in medical school is considered the most challenging year for students. The language of instruction is English despite the fact that the language of instruction in pre-university education is Arabic. This fact shows the challenge that students face in their first year of study, as they have to cope with changing the language of instruction from Arabic to English. This problem is considered a temporary problem as most of students adapt to English after completing the first half of their first year (Sabbour et al., 2010).

Medical study consists of three types of education: basic theoretical education, clinical education, and clinical training. In the first three years of study, the student must have theoretical medical education. The second three years are clinical years where the student obtains clinical skills required to graduate from medical school. The seventh year is the internship year, which is not considered an undergraduate year, but considered as postdoctoral training (Aboshady et al., 2015). Students in this year realize that the real medical practice in hospitals is totally different from the ideal practice being taught to them during the second three years of their study. The poor education system, the lack of equipment and under-education of patients that visit public hospitals, force physicians to turn to modified methods for treating patients. They have to make the right diagnosis by using old equipment. Advanced imaging equipment, for example, is not available in public hospitals.

Until now, medical education in Egypt has depended mainly on lecture education (Aboshady et al., 2015). Although technology has started to have a reasonable role in medical education, it still faces major challenges, such as poor infrastructure, poor equipment, resistance

of faculty members to change, and the high cost of the implementation of technology (Gukas, 2007).

In the undergraduate level of education, there is some improvement in medical curriculums as some schools started to consider using theory-based instructional design to build a well-structured curriculum ("Medical Education in Egypt," 1894). But this improvement is not well formed and still has to be generalized as a required procedure in medical education reform.

The evaluation system in medical schools started to improve, instead of using "Give an Account" questions, some schools are using Multiple Choice Questions (MCQs) and Objective Structured Clinical Examination (OSCE) systems in the evaluation process, yet this movement is not generalized and it has occurred individually in some schools (Shams, El-Masry, Al Wadani, & Amr, 2013).

Poor Internet availability in medical schools led many medical students to develop a bad impression of the use of technology in medical education (El-Seoud et al., 2013). Students have low speed Internet that prevents them from attending online courses or taking online exams. Students sometimes need to redo their online exams many times, simply, because their Internet connection is cut while taking the exam which forces the instructor to have the student start the exam again. El-Seoud et al. (2013) conducted a study to examine students' perception about using technology in medical education. Almost all students in his study think the e-learning system has a deficiency in interactions between students and other students, as well as students with their teachers. However, almost all students are "very keen to have e-learning system with effective means of allowing feedback on their work, video streaming for lectures and labs, and links to websites of various academic resources" (El-Seoud et al., 2013).

Most of the decision-making faculty members are old professors who have high resistance towards the change in educational methods (Sayed, 2006). They have the impression that technology will lead to the destruction of the real clinical skills of the student, as the student will depend on virtual applications to develop new skills (Sayed, 2006).

The overcrowding of students in relation to poor facilities makes it a difficult environment to learn and concentrate (Oxford Business Group, 2013). Students cannot examine a patient without being with a large number of colleagues trying to examine the same patient. This led to the poor quality of clinical practice in the internship year.

Integration of Technology into Medical Education

Regarding technology use in medical schools in Egypt, e-learning is becoming one of the basic tools in education, Moodle is the most used e-learning platform in Egypt, followed by Blackboard (El-Seoud et al., 2013). Blackboard is mostly used in private schools rather than public ones because of the high cost that is associated with Blackboard implementation. Some postgraduate courses in the Alexandria Faculty of Medicine are totally distance education. Most of the young faculty members use technology as a main tool in their classes (Abdel-Wahab, 2008). The administrators are also aware of the importance of technology implementation in improving the quality of education. Most of the medical schools have e-learning units responsible for developing online courses (Abdel-Wahab, 2008). Some schools established medical education departments as one of many academic medical departments. The medical education department at Alexandria Faculty of Medicine, for example, made a lot of changes in the education system in the school. The main changes done by this department include changing the system into a credit-hour system, and adding a percentage of distant courses into the medical curriculum.

Most of the departments produce their own books. The department's book is the only official reference for students. Private tutoring is a well-known method among medical students to get the knowledge and skills required to pass exams. The cost of attending medical schools in Egypt is reasonable, but the cost of materials and private courses is high, so many students cannot afford medical study, especially the medical students who come from rural areas, which have low social and economic standards.

In the last ten years, Egyptian medical schools began to establish e-learning units aiming to overcome the problem of overcrowding and to improve the quality of education. The problem in these unit that it lacks the instructional design part. Most of the online courses are just PDF files uploaded to learning management systems.

Medical schools began using e-exams as a form of evaluation. This project is supposed to solve the problem of large student numbers attending exams at the same time. However, due to poor internet connections and high possibility of cheating, medical schools ran these e-exams over a local network and delivered exams to students in computer labs. Such modification of the way of delivering e-exam become very demanding for administrators as they divide students to small groups and delivering the exam tens of times to these groups due to lack of computer labs that can accommodate the large number of students,

Medical simulation is also used in Egyptian medical schools. E-Learning Unit of Alexandria Faculty of Medicine established a project called "Alexandria Virtual Medical School". This project is a simulation program developed using Adobe Flash. Student can access a virtual hospital, see virtual patients, take history, perform examination, and obtain laboratory and radiological investigations. In 2010, this project is awarded Khalifa Award for best

innovative education project in the Middle East. But, due to financial constraints, this project has not been completed yet to cover all specialties being taught in Alexandria Medical Schools.

Pan African e-network project is an Indian project established to make a technological reform in African countries. This project aimed to establish an online network between India and the 53 African countries. As a part of this project, Alexandria Medical School established an educational project to create online medical courses for African students interested in taking continuing medical education from Egypt distantly.

Social media plays an important role in informal medical education in Egypt. Students tend to create study groups on Facebook to share their learning materials. With the increase in the resistance from the faculty to share learning materials with students, students began to audio record lectures, and develop question banks by themselves and share it on Facebook. Almost all Facebook study groups are secret groups to prevent the faculty from punishing students. The technology awareness of medical students has been increased in last years. Students use designing and developing tools such as Adobe Photoshop, Adobe Flash, and Adobe Illustrator to design their own technology-based educational materials. Student-to-student e-learning is a well-established part among medical students. The problem of the student-to-student e-learning is that it is not reviewed. So, it may contain many incorrect information.

Implementation of technology in medical education in Egypt faces many challenges. Economic and political instability have a great effect on the amount of funding of development of technology-aided solutions. Poor technology infrastructure in medical schools such as low performance computers and poor Internet availability led to decrease students' and teachers' perception towards using technology to improve the learning process.

Resistance of faculty staff also hinder the technology-based reform in education. Absence of instructional design plans for online courses created poor quality online materials. This made students see educational technology as a burden rather than seeing it as an enhancer for medical education.

Another key challenge is that the technology-based educational projects are developed mostly by e-learning units located in medical schools. A separated unit that develop educational programs for other department led to resistance from those departments as they think these units will have a sort of power on the faculty of these departments.

One of the most important key challenge is that the education in general is centralized. The Ministry of Higher Education is the governmental institution that has the authority to develop curriculums, implement new ways of teaching, and decide whether online courses follows the governmental regulations. This fact represents a major challenge for reformers who wants to develop new technology-based innovations without being involved in bureaucratic procedures that may lead to stop of any progress towards the reform.

From the above review, technology is already available in Egypt but it has many problems that led to false perception among Egyptian students that the technology is not suitable for education. Challenges were also examined to explore reasons of this false perception. Next chapter will examine the suitability of the U.S. approach for reforming technology-based medical education in Egypt.

CHAPTER IV
EXAMINATION OF SUITABILITY OF U.S. APPROACH FOR REFORMING
TECHNOLOGY-BASED MEDICAL EDUCATION IN EGYPT

This chapter examines the use of technology in education within the United States. This examination comes up with recommendations for medical education reform within Egypt. By using an analysis based upon a system that has successfully integrated technology in education a superior recommendation for medical education reform in Egypt can be made. These recommendations include foundations for future studies in this area.

This review was conducted by reviewing the intentions and assumptions of the authors of the research reviewed in this paper with a different perspective to examine the appropriateness of the studies to understanding the situation in Egypt and the suitability of this situation for the technology implementation and integration into medical education system.

This review is organized according to research questions. Each research question will be answered according to the included articles in order to come up with a foundation for technology-based reform for medical education in Egypt.

Challenges that Face the Integration of Technology into Medical Education in Egypt

In comparison to the United States, Egypt has many challenges for implementation of a good medical education system, and implementation of technology in medical education. The centralized system of education in Egypt is one of the main obstacles to reform (Hammad, 2013).

Medical schools do not have the right to customize learning according to learners' needs. The resistance to change that many faculty staff members have, is another obstacle toward reforming medical education (Lane, 2007). Poor infrastructure creates a major challenge for implementing technology in Egypt (Ginsburg & Megahed, 2011).

Regarding the language barriers, Sabbour (2010) mentioned that the language barrier is not an obstacle for the majority of medical students, but it is an obstacle for first-year medical students. He mentioned that medical students tend to learn patient history in Arabic that is why there are some suggestions towards Arabization of medicine in Egypt (Sabbour et al., 2010). In order to ensure that such suggestion will be beneficial for Egyptian medical students, studies must be conducted to test some questions. How can medical students use English medical articles if they know medicine only in Arabic? Will Arabization of medicine affect medical knowledge exchange with English-speaking countries? Will Arabization of medicine isolate Egypt from the developed medical community around the world? As mentioned in the previous chapter, Egypt is one of the developing countries that need to learn and establish the reform based on successful reforms in the developed countries (Warschauer, 2004).

Faculty members have an impression that technology will lead to the destruction of real clinical skills of students, as students will depend mainly on virtual applications to develop new skills (Sayed, 2006). Lane (2007) mentioned the term “conservatism” in describing educational institutions regarding practice, goals, and culture. “Indeed, strength of higher education has been its effort to preserve traditional culture and values, resisting changes that may not have staying power” Lane (2007, p. 86) said.

Regarding Faculty members, Lane (2007) mentions that faculty members in scientific fields often have little awareness of educational theory and practice. He also mentions faculty members “tend to pass down the dominant educational paradigm that is usually heavily dependent on lectures, and transfer of content knowledge to successive generations of students” (Lane, 2007, p. 87). In medical education, these barriers to change are accentuated. “Faculty

autonomy, strong professional identity, skepticism of educational proposals, time constraints, and inflexible reward system contribute to resistance” (Lane, 2007, p. 87).

Many Egyptian scholars believed that technology would solve many problems in the educational system in Egypt including medical education. El-Seoud et al. (2013) claimed that overcrowding in classrooms can be solved by web-based education. He also mentioned “transportation problems, need for continued education and specialized training, interaction with the international educational community, and the improvement of the level of national education” would benefit (El-Seoud et al., 2013, p. 62). According to El-Seoud’s (2013) study, almost all students in his study think the e-learning system has deficiencies in interactions among students, as well as between students and teachers. However, almost all students are “very keen to have an e-learning system with effective means of allowing feedback on their work, video streaming for lectures and labs, and links to websites of various academic resources” (El-Seoud et al., 2013, p. 74). The students also were keen on “voting on topics and activities, sharing e-learning systems for posting research papers, and voice narration to PowerPoint slides” El-Seoud (2013, p. 74) said. Although his study is very beneficial for describing students’ thoughts about technology there are some issues. El-Seoud did not mention other factors that may affect the results of his study, such as the technology infrastructure, and students’ technology background.

Warschauer (2004) conducted a study to examine a U.S. foreign project to promote the use of new technologies in Egyptian education. This project included a focus on bringing Egyptian educators to the United States and on showcasing U.S. hardware and software with underlying emphasis on Westernization. This project received many criticisms. One of those criticisms is “corporate leaders who aggressively promoted new technologies” (Warschauer, 2004, p. 377). Another criticism is “government officials under the claim that they will transform

education to more readily prepare learners and nations to compete in a technologically competitive world” (Warschauer, 2004, p. 377). Another criticism is “despite the lofty rhetoric of the educational technology, its actual use in the classroom is either marginal or disruptive” (Warschauer, 2004, p. 377). Lastly, “the contradiction between rhetoric and reality is framed by the imperatives of today’s capitalist society. Neither necessarily determine educational practices, but do shape the discourses and relationships of schooling and of the use of technologies in schools” (Warschauer, 2004, p. 378).

The review of scholar's work on the problems Egypt faces in education and technology opened new views based on comparison to the United States education system. The mere observation of the reform occurring within the United States as a natural step in improving education shows Egypt’s educational reform is pertinent. This analysis has led to the creation of many recommendations for the reformation in the Egyptian education system. One major point that must be focused on is the use of technology to establish reform and give a foundation for future studies. The use of technology will accelerate the education reform within Egypt. The discussion of these recommendations and foundations will be more in depth in the next chapter.

Suitability of the U.S. Approaches for Reforming Medical Education System in Egypt

Suitability of Flexner Report for Egypt

As mentioned before, Flexner’s report (1910) was the report that changed the medical education system dramatically in the United States. By visiting 150 schools in the United States and Canada, Flexner wrote his report aiming to make a huge reform in medical education, mainly through moving medical education from old proprietary schools to the university system (Flexner, 1910).

Flexner wrote his report from the point of view of an educator, not a physician (Cooke et al., 2006). So, his report was mainly criticizing the methods of US medical education based on his experience as an educator. Flexner's main interest was reshaping medical education so that it was more like a university education. Flexner's judgment of the quality of education includes criteria such as admission standards, physical facilities and the instruction offered by physician-scientists (Fleming, 2011). From these criteria, he classified schools into three categories. These categories included schools, which compare favorably with John Hopkins, schools considered as standard but need financial assistance to improve, and poor quality schools that should not remain open. These categories derive from the comparison with Johns Hopkins School, as it was the earliest school to change the medical education system to a university system. John Hopkins School used predefined admission criteria, clerkship, and so on. Thus, using a basis of a successful school, adequate recommendations and categorizations were possible (Flexner, 1910).

Flexner's report led to major changes in medical education as proprietary schools diminished after this report, and medical schools moved to the university system. The era after the Flexner's report had a lot of procedures that led to the establishment of solid criteria as prerequisites for admission to medical schools. Medical schools started to hire full-time faculty focused on medical teaching, and medical academic research (Cooke et al., 2006).

However, as Flexner was an educator not a physician, his point of view can be criticized. Immersion in the German tradition began to shape Flexner's philosophy (Cooke et al., 2006). Flexner's interest in including German traditions and Billroth's Medical Education led to the loss of physician authenticity as trusted healers (Fleming, 2011).

Another problem in Flexner's report is that he did not recommend correcting the deficiencies in medical schools but rather closing most of the schools that did not fulfill his

criteria (Miller & Weiss, 2008). To some scholars of medical history, the report led to the death of many schools. Fleming (1987, p. 174) mentioned that Flexner “did to death more bad schools in less time than any other man in the history of the world”. Rosen (1983, p. 144) said, “the consequences of the Flexner report were drastic” with the decline in the number of schools “greatly accelerated by the catalytic effect produced by the Flexner report” (Rosen, 1983, p. 144). Ludmerer (1996) saw the report’s impact as noteworthy, “the Flexner report succeeded brilliantly in expediting the death of the proprietary schools” Ludmerer (1990, p. 360) said. Cooke et al. (2006) made another comment on Flexner’s report, which is: “There was maldevelopment in the structure of medical education in America in the aftermath of the Flexner Report. The profession’s infatuation with the hyper-rational world of German medicine created an excellence in science that was not balanced by a comparable excellence in clinical caring” (Cooke et al., 2006, p. 1339).

From the previous scholar’s comments, it is clear that the Flexner report initiated many changes in medical education in the United States. However, this report provided a reform to medical education as a field of science, but it did not focus on the clinical part of medical education. Flexner could be excused from this criticism as he was an educator, not a physician, and he developed his report based on his educational philosophy.

After Flexner’s report, many schools closed, while others received support from the government to develop a new university system of medical education (Cooke et al., 2006). In the post-Flexner era, technology began to play a major role in reforming the medical education system in the United States. Many schools’ administrators saw technology could facilitate education, despite the fact that technology requires special infrastructure and complicated instructional design (Fleming, 1987).

The High-Performance Computing and Communication Act of 1991 (HPCA) participated in the transition of the Internet from a government-sponsored network to the commercial Internet. Internet has become one of the main tools available in every home. There are many broadband providers in the United States. Technology infrastructure is well developed in the United States compared to many other countries. Many schools use online courses as a part of their curriculum. The evolution of commercial companies that provide technology as a trade has led to a technology revolution in all fields including medical and education fields. The United States has the most innovative technology providing companies such as Google, Apple, Facebook, Adobe and so on (Han, Resch Ds Fau - Kovach, & Kovach, 2013). Each of those companies provides a huge amount of technology-related research. Smart devices are being used nowadays in many schools such as iPads, Android devices and so on.

According to the above, the United States has a developed, active environment to create affordable ways to implement technology successfully in education.

CHAPTER V

SUMMARY AND RECOMMENDATIONS

Overview

The main reform of the medical education in the United States has been established in 1910 when Flexner wrote his report to change the medical education system from being provided by proprietary schools to be provided through the university system (Flexner, 1910). Since 1910, medical education has become a university education that has admission criteria, minimum high school scores, and pre-acceptance interviews. Medical instruction changed from being taught in proprietary schools by one physician scientist transferring his knowledge to his students, to an organized instruction with different elements such as clerkships, laboratory trainings, internships, and so on (Cooke et al., 2006).

Technology has become one of the main tools that are being used by educators to facilitate the educational process. The evolution of technology-based educational tools led to a revolution in the education in the United States. Almost every medical school uses technology to provide distant courses, videoconferences, virtual reality simulations of surgical procedures, and so on (Han et al., 2013). The evolution of social media has contributed in building a huge community of connected learners, no matter how far they are from each other.

This reform of the educational process, and of the tools of education has led to establishment of a well-formed health system in the United States. Using technology to digitalize patients' data created huge databases of information necessary to conduct a huge number of studies, which in turn led to improvements in the quality of medical services and medical education (Bloomrosen & Detmer, 2010).

Egypt has been gone through various reforms throughout the history. Some have resulted in improvements and others have failed. The political and economic instability contributed in the challenges that faced the reform in medical education in Egypt throughout the past decade ("Egypt, Dimention II-1: Anti-Corruption," 2009).

The education system, in general, and the medical education, in specific, has been suffering from the centralized system since its establishment. The centralization is considered a major challenge in the educational system in Egypt. Poverty, political instability, and governmental corruptions, are other forms of challenges that have faced the education system in the past decade (Hammad, 2013).

Technology has played major role in improving the quality of medical education in Egypt as many medical schools in Egypt uses technology-based tools in the educational process (El-Seoud et al., 2013). However, there are a lot of challenges that face the implementation of technology in education. Poor infrastructure, old faculty members' resistance to change, and insufficient funding are forms of challenges that face the implementation of technology in Education.

Major Changes Needed

In order to establish the reform in Egypt, this study examined the United States' medical education reform as one of the successful reforms in the world. The literature review conducted to examine the assumptions of the U.S. researchers in the field of education from different prospective to come up with recommendations that fit the Egyptian situation.

From the above literature reviews, the study identified issues in the medical education system in Egypt. It also identified steps of the reform of the medical education in the United States. The literature review also examined the applicability of using the U.S. steps of the reform

to establish a new reform in the medical education in Egypt. The use of technology in the reform is examined for reliability of the application in the Egyptian system.

Limitations in this study are mainly due to lack of enough studies that describe the medical education system in Egypt. In order to overcome these limitations, this study used studies conducted on the educational system in Egypt in general, and relates findings to the medical education as a part of the educational system in Egypt. Limitations are also due to lack of enough information about the current state of technology-based education in Egypt.

The American medical education, which is shaped by Flexner's report, can be considered a successful case for Egyptian decision makers in order to bring about a major reform in medical education. Egyptian medical education needs another customized Flexner's report in order to start the major change that moves the Egyptian educational system to be among the world's well-developed systems.

In order to make a reform in medical education in Egypt, major changes are needed to cope with challenges. The following challenges must be addressed to establish the reform:

1. Overcrowding,
2. Centralized administration of education,
3. Poor technology availability,
4. Poor technology infrastructure,
5. Resistance to change,
6. Lack of instructional design in the curriculum development,
7. Lack of learner's analyses, and
8. Lack of support to implement the reform.

Implementation of Changes

The following recommendations were resulted from studies that examined similar challenges in the United States.

The effect of the centralized educational system on the implementation of technology in medical education

One of the main problems that represent an obstacle against technology-based educational reform is the centralized administration of the education in Egypt. Studies can be conducted to assess the effect of this centralization on the implementation of technology in education. “Universities need to be given oversight and control over their budgets, and an open and informed discussion about the distribution of public resources should begin. Egypt must also overhaul the way its national universities hire faculty and admit students, and develop new programs that provide students with degrees that are useful in today’s job market” Hammad (2013, p. 1) said.

Effect of using technology as a solution for overcrowding in Egyptian medical schools

Overcrowding is one of main obstacles in the Egyptian educational system in general, and the medical education in specific (Oxford Business Group, 2013). In order to cope with this problem, other educational tools including technology-based educational tools, and distant education can be examined for its applicability for implementation in medical schools. Studies also should put into consideration the current situation of Egyptian economy in order to examine the reliability of using technology to solve the problem of overcrowding.

As social media plays crucial part in Egyptian students’ life, using social media in medical education can be beneficial. Medical schools should establish their official pages on

Facebook and Twitter and provide educational materials via social media. Online discussions and para-curricular activities are very beneficial to attract students' to learn.

The resistance to change and how to cope with it

Many studies mentioned the issue of old faculty members' resistance to change. Other studies examined establishing a paradigm shift and how to cope with the issue of the resistance. Cuban (1993, p. 11) mentioned: "conservative inertia within schools and the broader educational system can hinder the effective use of new technologies".

Lane (2007) put suggestions for overcoming resistance to change as following:

1. Carry the importance or urgency of the need for change acknowledge and protect the strengths of the current system,
2. Educate the organization on the nature of complex change,
3. Seek to understand fears and concerns,
4. Assess levels of resistance over time and plan accordingly,
5. Acknowledge and manage conflict appropriately,
6. Maintain knowledgeable, consistent leadership,
7. Provide sufficient time for complex change to be planned and implemented,
8. Create a strong proposal,
9. Provide evidence to support proposals where available,
10. Break large changes into smaller units for clarity,
11. Use demonstrations and pilot studies where appropriate to convey value of proposal,
12. Communicate frequently,
13. Encourage wide participation, including that of external stakeholders,
14. Communicate effectively,

15. Using multiple methods to collect and convey information,
16. Appeal to both intellectual and emotional concerns,
17. Use various individuals (students, junior faculty, senior faculty, leaders) as opinion leaders to help build consensus, and
18. Maximize face-to-face communication as much as possible.

Another recommendation to overcome the resistance is to encourage faculty to take control of technology. Resistance can result from the perception of the faculty that they don't have the authority to stop the change. Involving faculty into the process of changes and giving them the control of this change can reduce this resistance.

The newly admitted students, their strengths and weakness: learner analysis

One of the problems this study mentioned is that first year students have several learning issues either due to change of language of instruction from Arabic to English or due to the different learning style in the college system than in the high school system. In order to solve this problem, learner's analysis can be done for high school students who got admission acceptance to medical schools.

Effect of using distant learning on performance of medical students

Distance learning is one of frequently used tools in Egyptian medical schools. As mentioned before, students see that distance education has deficiency in students-students interactions and students-teacher interactions (El-Seoud et al., 2013). In order to find an appropriate use of distant learning in medical education, studies can be conducted to examine new approaches of using distant education. Many faculty have problems using online LMSs. Creating a CMS/LMS that will be acceptable to medical education faculty is also important.

Training faculty to proper use LMSs and providing them with the knowledge that make them change their perception of using distant education in their instruction is very crucial.

Introduce instructional design to medical education

One of the main reasons behind failure of previous reforms is that there is no analysis step before establishing the reform. In order to increase the probability of success of a reform, instructional design is very crucial for an effective reform. According to ADDIE model of instruction, instructional design includes analysis, design, development, implementation and examination. Analysis includes needs analysis, learner's analysis, organizational analysis and task analysis. Design phase is the phase of creating and designing a plan for implementation of technology. It depends on the previous analysis which provides a road map for instructional designers to be aware of the needs. The development phase is the phase of developing the designed projects. Implementation phase is the phase of conducting developed projects to target audience. Examination is examining the effectiveness of these projects. All previously mentioned instructional design steps are very crucial to build a successful reform. Instructional design must be integrated in the tasks of medical education departments of Egyptian medical schools

Use of social media to cope with overcrowding

Social media is one of the most used technology among Egyptian medical students. Egypt is ranked the second most addicted country to Facebook. This fact can be useful if a plan created to use social media to improve medical education. Overcrowding represents main challenge to medical students as students do not have the opportunity to discuss their thoughts with their instructors. Lecture-based learning in medical schools negatively affects student-teacher interaction. In order to overcome this problem, social media can be used as students can make

online discussions with their instructors. Informal online discussions between instructors and students are already present among medical community, but at individual bases. The strategy can be supported by medical schools' administrators to build an official online community of medical students and instructors.

Establish groups of stakeholders who are invested in seeing technology succeed

In order to make an effective reform. Groups of stakeholders who are invested in seeing technology succeed must be established. Stakeholders will make an important support for implementation of projects used in the reform. They also decrease the resistance to change especially if stakeholders are selected members from each medical department and who have authority to change in their departments.

Find grants and write good proposals to secure grants.

Another recommendation which is important to accelerate the implementation of the reform is finding grants that support implementing technology in education. Grants always grasp attention of administrators to the proposed project. It gives perception that proposed projects are well-recognized. It also decreases the resistance from administrators as they don't have to find financial resources for implementing technology projects and also decreases the resistance from faculty involved in these projects as they will take the advantage of recognition with these grants.

All of above recommendations resulted from the literature review are very beneficial to establish the reform. In order to take these recommendations to the implementation phase. Future researches must be conducted to examine the challenges that were mentioned in this study. The following section summarize recommendations for future research.

Recommendations for future research

As mentioned before, one of the limitation of this study was lack of research in medical education field in Egypt. In order to establish an evidence-based reform, research should be conducted in examining the following:

1. Students' perception towards using technology in medical education.
2. Effect of centralized system on the implementation of technology in medical education.
3. Use of social medial in medical education.
4. Faculty and administrators' perception about using technology in medical education.
5. Resistance towards implementing technology in education.
6. Introduction of instructional design into medical education.
7. Effect of using distant learning on students' performance.

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