

Perceptions towards E-learning in Times of COVID-19 Lockdown Phase in the Tertiary Education

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Abstract

C OVID-19 pandemic had a huge effect on people's lives and lifestyles all over the world since its first spread in China between late 2019 and early 2020. The educational systems in all countries were among the first concerns that had to be dealt with to complete the academic year for students. The only and rapid solution was the use of e-learning. Thus, The advent of online learning (e-learning) has also encouraged the widespread acceptance of learner-centric education and other improvements in education practices. The present study aimed at exploring the perceptions of students and teachers on the use of e-learning during the COVID-19 lockdown phase. Participants represented samples of the students from various Egyptian private and governmental universities that depended on e-learning in completing the courses and evaluating students. Many challenges and difficulties faced different universities as it was the first time for some of them to depend on e-learning completely. Instruments included a teachers' reflection survey and a students' reflection survey. They were used to determine the perception of the respondents. Findings showed general agreement among teachers and students on using e-learning during and after the lockdown phase, despite some challenges.

Keywords: *e-learning, virtual teaching, online education, COVID-19, pandemic, COVID-19 epidemic*

Introduction

Using online tools to automate learning is the latest trend in the professional training and development market and has been identified as the e-learning revolution. In today's organizations, most e-learning is asynchronous. Asynchronous e-learning refers to 'pre-recorded' e-learning that is accessible to workers at any time of the day, likely from every place (Rosenberg, 2001). Less popular is

synchronous e-learning or e-learning that is 'real' and demands that all learners be in front of their computers simultaneously (Welsh et al., 2003). The COVID -19 outbreak had a very important influence on worldwide education systems. After the beginning of COVID-19 pandemic at the beginning of 2020, Egypt's educational system has faced a significant challenge concerning the form of curricula being provided to learners. Our education system relies on conventional educational settings, where the teacher uses books, chalkboards as a teaching aid, and our new classroom education, where the classrooms are fitted with smart boards, and interactive digital devices (Basilaia & Kvavadze, 2020). With the advent of the first case of the COVID-19 coronavirus in Egypt, the educational scenario has changed, particularly after the quarantine was introduced. There was a growing need to shift from face-to-face to teaching online. Since the pandemic, numerous countries around the world have adopted different approaches to maintaining the same level of education. In at least 96 nations, electronic archives, television shows, guides, tools, video tutorials, multimedia channels have been launched. (Basilaia & Kvavadze, 2020). The attitudes of students in tertiary education towards e-learning can be influenced by distinctive individual elements. Previous technical experience, technology acceptance, and individual style of learning are among the factors that affect perceptions for e-learning (Keller & Cernerud,2002). Throughout this study, the researcher aimed at investigating the expectations and attitudes toward its use by both the students and the teachers.

Literature review

Definition of e-learning

In education, the term e-learning has been commonly used since the mid-1990s. The concept of e-learning however was not explicitly accepted (Lee et al. ,2009). Holmes & Gardner (2006, p14) defined e-learning as " *online access*

to learning resources, anywhere and anytime". Clark & Mayer (2016, p 7) defined e-learning as "*instruction delivered on a digital device that is intended to support learning.*". They differentiated between the major types of e-learning design; asynchronous e-learning, led by the instructor and designed for self-study and synchronous e-learning. The concept has three components : 'what, why, and how ' denoting the content, the digital device, and how learning objectives are achieved. Mayes & Freitas (2004) defined e-learning as *learning enhanced by technology that focuses on the use of technology to support and enhance the learning experience.*

Afifi & Alamri (2014). Defined e-Learning as a learning style that focused on the learner's needs and abilities and the use of electronic media on the internet that is used synchronously or asynchronously to provide e-content (readings, lectures, discussions, assessments, and tests) and to control it, whether indoor or outdoor, through a university platform, to promote and encourage learning at any time..’.

Features and Benefits:

Clark & Mayer (2016, p 8) listed features of forms of e-learning as follows:

- an electronic form that is used to transmit information on external or internal places.
- The material that meets the purpose of learning.
- Media features, such as content provisioning tools.
- Methods of instruction that improve learning.
- (synchronous e-learning) or (asynchronous e-learning).
- virtual rooms or discussion boards.

According to Clark & Mayer (2016) and Welsh et al (2003), organizations required e-learning to; a) save time for preparation and travel related to traditional face-to-face education; provided that e-learning develops awareness and

skills that help achieve desired job goals. b) have standardized instruction across several locations.. c) fast delivering of training to many people. d) improve learner comfort. e) handle the rise in the number of knowledge workers need to know. F) track learner behaviors and subject mastery. In the following points they outlined five expectations for e-learning:

1. **Customized Training:** Asynchronous self-study e-learning can tailor learning to each learner's specific needs. Customized training means styling content, methods of instruction, and recommendations according to the needs of students.
2. **Engagement in Learning:** There are two types of commitments: cognitive and psychological. Through attention to actions, we mean every direct action that a learner takes during the process of instruction. By psychological engagement, we mean cognitive content processing in ways that lead to the acquisition of new knowledge and competencies.
3. **Multimedia:** You could use a mixture of multimedia in e-learning to express the content and help the learner develop applicable information and skills.
4. **expertise enhancement By Scenarios:** Nevertheless, e-learning provides opportunities to delude trainees into career real settings enabling them to solve difficult problems or fulfill tasks in a few moments that would take a long time to complete in the real world.
5. **Learning Through gamification:** The introduction of games as a means of interaction, known as gamification, is an evolving trend in workplace education. Gamification aims to offer inspiring, engaging, and successful learning experiences. Mayer (2014) reports the following features of games: (1) virtual structures based on rules, (2) receptive to the player, (3) demanding, (4) cumulative, allowing

evaluation of progress towards goals, and (5) encouraging, providing an aesthetic value to the learner. Carliner & Shank (2016) added to the advantages of e-learning, organizations that minimize costs by class elimination-related travel costs as well as the cost of distributing training programs. Thus, e-learning will deliver cost-effective, just-in-time, customized mobile learning. This view agreed with many others such as Hall (2000), Walker (2002), Rochester (2002), and Robbins (2002).

Pitfalls of e-Learning

The main strengths of E-learning are a double-edged sword, as there are some drawbacks to be considered: (Carliner & Shank,2016, p18)

1. To express your content using an engaging blend of Animations, images, audio, and text in written form, e-learning is minimalist since it does not use apps that have been demonstrated to promote learning. And at most, most learners lose focus within 15 minutes.
2. Independent of the method of delivery, every training design process must identify key skills that support operational goals and create a curriculum on the activities that constitute those skills.
3. One lesson we have learned from over 50 years of pure discovery learning research is that it is rarely working. Instead, we suggest a standardized method of e-learning that provides learners with sufficient guidance.

Welsh et al (2003) reported other drawbacks such as; A) expenses, b) lack of interplay between practitioners in many e-learning courses (c) increased effort and planning, (d) training needs in design, IT infrastructure, and change management.

E-learning classifications:

Negash et al. (2008) classified e-learning into six types based on the redefinitions of the terms "presence" and

“communication. They are illustrated in the following table:

Table 1. E-Learning classifications

Classification	Presence*	eCommunication**	Alias
Type I	Yes	No	Face-to-Face
Type II	No	No	Self-Learning
Type III	No	Yes	Asynchronous
Type IV	Yes	Yes	Synchronous
Type V	Occasional	Yes	Blended/Hybrid-asynchronous
Type VI	Yes	Yes	Blended/Hybrid-synchronous

* Presence is defined as real-time presence where both instructor and learner are present at the time of content delivery; it includes physical and virtual presence

** E-communication refers to whether the content delivery includes electronic communication or not.

Source: Negash et al. (2008)

Type 1: Face-to-face learning

The teachers meet the learners face to face in the classroom at the time of the content delivery, using traditional aids such as PowerPoint slides, and audiovisual aids. Thus, there are no e-learning tools used.

Type 2: Student-centered learning.

There is no communication here between teachers and students. The learners depend on themselves using recordings of materials.

Type 3: Asynchronous

Students access the material through pre-registered content, without any virtual or physical presence. Communication happens through e-learning technologies.

Type 4: Synchronous

It is synchronous e-learning, often called "real-time." The teacher and learner may not interact physically in synchronous e-learning, yet they still interact remotely through content delivery because e-learning technology mediates virtual training.

Type 5: Blended asynchronous

This type is a mix of asynchronous and face-to-face e-learning. Content is learned through frequent face-to-face meetings and e-communication

Type 6: Blended synchronous

It is an e-learning platform that is mixed or hybrid and still has a presence. E-communication is widely used in this environment much as in an asynchronous format. Class sessions are directed with conventional face-to-face sessions and virtual presence.

E-learning theories

Mayes & Freitas (2004, p5) pointed out that 'learning theories provide empirically-based accounts of the variables that influence the learning process and describe how that influence takes place.' Behaviourism, Cognitivism, Constructivism, and active learning are the foundation for good practice and the creation of approaches for e-learning(Pange & Pange,2011). Holmes and Gardner (2006) discussed these main theories in detail. Socio-constructivism encompasses our conception of how individuals learn in a social setting, which applies to the learning community that enhances their practices by mutual reflection which exchange knowledge through the definition of their members learning together.

Behaviourism

Behaviorism is undoubtedly the oldest and most commonly known of the three primary theoretical structures that underpin the theory of education and e-learning. Classical behaviorism is based on the idea of stimulus and response in humans or animals. The 'operant' conditioning predicts that specific behaviors can be 'taken' by enhancing desirable behaviors with suitable stimuli, with ample reinforcement of experience. In this way, an individual will develop a specific behavior that will emerge in the future when the correct stimulus or experience is given. This

eventually became the most popular theory of learning predicting success in using rewards as stimulants for reinforcement and penalties as deterrents. Behavioral approaches tend to be frowned upon in learning, mainly because they deny the role of the individual in learning by focusing on automation as the main reason for responding.

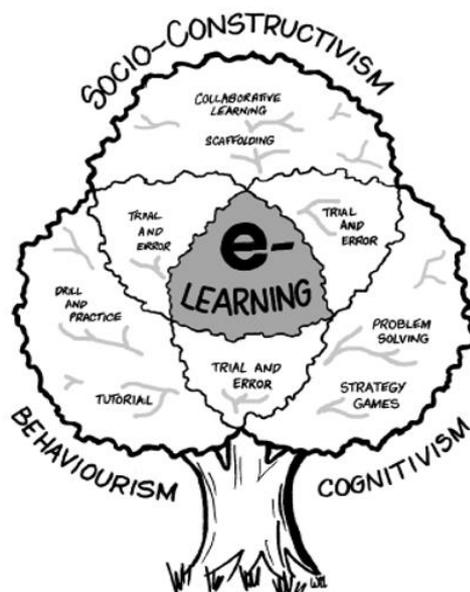


Figure 1. Overlapping theoretical underpinnings for e-learning
Source: Holmes and Gardner

Cognitivism

Cognitivism is the complete opposite of behaviorism because it emphasizes the mind and the brain's thinking processes. Piaget argued that the children undergo a maturation cycle that determines what form of learning they can achieve. Bruner, too, envisaged the development of a learner in terms of a series of steps to increase the potential to learn. Such steps must be climbed by the learner in the manner of a staircase, which means that

certain learning skills rely on the acquisition of others before they can come into action. David Kolb argues that learning must be experiential in terms of introducing, reviewing, and implementing a new program, in creating Kurt Lewin's action cycle study plan. Vygotsky Maybe the most influential of all cognitive psychologists, mainly because his work is closely associated with the constructivist theories that dominate today's field of education. Unlike the Piagetian concept that the learner must achieve a certain phase of growth before being able to learn in that style. The theory focuses on the difference between what the learner can do now and what is beyond its control. The learner can be given problem-solving or strategic thinking tasks in e-learning contexts, which position them firmly at the core of the learning activities.

Socio-constructivism

Piaget's (1970) constructivist information theory was built on the assumption that learners do not copy or absorb ideas from the outside world but their principles must be built through active and personal research and observation. According to the cognitive constructivist theory, the learners "turn" their intelligence, knowledge, or understanding from their own intellectual and reasoning abilities into the socio-constructivist theories that are prevalent today. Those others are perhaps tutors or trainees. The model developed includes authentic learning contexts to promote learner motivation by making the learning purposeful and meaningful.

Communal constructivism

Communal constructivism refers to such an expansion in which e-learning provides the participants with the means to produce new learning for themselves and to apply and maintain their new knowledge, in whatever form it may be, in a shared body of knowledge for the benefit of existing and new students in their community(Holmes et al., 2001).

E-learning promotes different types of interactions, with enormous opportunities for joint learning support. Developers of e-learning recently embraced a Constructivist methodology and the majority of current e-learning services are based on this. They state that the learners interpret, encode, and circumambient information. And learners learn best when they can assign knowledge to a specific value. (Pange & Pange (2011).

Reviewing closely the theories of learning discussed above, it is clear that there are parallels between the basic principles and concepts. Therefore, the design of an online learning program should follow the concepts of all the theories suggested. Behavioral concepts could be used to teach the truth, so that the « what », the concepts of cognitivism can be used to teach practices and principles. Consequently, the « how » and the precepts of Constructivism could be used to instruct the causal relationship and the more complicated conceptions, and thus the « why » (Ally, 2004).

Table 2 shows the schematic summary of the four main

Table 2. A schematic representation of the main theoretical currents

Traditional pedagogy	Behaviorist	Cognitivist	Social Constructivist
Teaching is about ...			
Presenting information in a structured, hierarchical, and inductive way.	Stimulating, creating and reinforcing appropriate observable behaviors.	Presenting information in a structured, hierarchical, and deductive way.	Organizing learning situations conducive to dialogue with a view to provoke and resolve sociocognitive conflicts.
Learning is about...			
Following the course: unfolding the course and the tutor.	Associating, by conditioning, a reward to a specific response.	Treating and storing new information in an organized way.	Co-constructing his / her knowledge by comparing his/her own representations with those of others.
Appropriate teaching methods			
Learning by course, exercises and assessments	Assisted self-study program	Formal presentation, problem-solving situations.	Projects, discussions, exercises and work based learning.

Source: Quadoud et al. (2018).

currents by linking them to the act designs of teaching and learning that correspond to them. Table 2. Shows schematic representation of the main theoretical currents.

COVID-19 pandemic

More than 90 percent of the world's students have been affected by the COVID-19 pandemic (UNESCO, 2020). Web service providers such as Google Classroom, Blackboard, Zoom, and Microsoft Teams have supported the resources that are commonly used to improve student education and learning. Such networks certainly contribute significantly to the transformation of the way education is delivered (Nagar,2020). The government of Higher education in Egypt adopted several paths to pass the crisis. The most promising and prominent one was the use of online learning through virtual platforms. The education institutions in tertiary education were advised to use virtual classes/e-learning for the continuation of the learning process for the students. Uscher-Pines et al. (2018) report that group prevention techniques, such as social distancing, may affect the spread of the virus in schools and local areas during an emerging influenza pandemic. Studies have focused on prolonged school closure. But they admitted that research is needed to develop social distance policies.

Effective online education in emergencies

For effective online education in times of emergencies, Huang et al. (2020) identified the following seven core elements:

1. Enhancing effective communications infrastructure that is capable of supporting millions of users at once providing them with online synchronous teaching through video conferencing, interactive learning tools that enable them to engage with peers across social media.
2. Utilizing friendly learning platforms is helpful for students in discovering and storing information,

building knowledge, engaging with others, communicating understanding, and concretely assessing learning results.

3. Providing appropriate interactive resources for online learning, including online media and activities.
4. Directing learners to implement successful learning strategies individually or in groups.
5. Fostering efficient approaches to teaching by implementing varied techniques and methods of teaching.
6. Offering teachers and learners support services on learning as well as initiatives, using effective learning agendas, instruments, and references.
7. Strengthening partnerships among governments, companies, and educational institutions.

Barriers of E-learning during the COVID-19 phase

Oxford Dictionary (2015), defines a barrier as “*a fence or an obstacle that prevents movement or access*”. Also, Schoepp (2005, p. 2) gives another definition of a barrier, which is “*any condition that makes it difficult to make progress or to achieve an objective*”. E-learning implementation is not always smooth or efficient. It differs from one country to another, due to various factors such as culture, context, and readiness (Almaiah, 2020). During the COVID-19 outbreak, e-learning was quickly adopted by schools and universities. Therefore, schools with little or no experience with e-learning tools are experiencing obstacles and problems, especially teachers as they are not trained on how to use online applications (Zaharah & Kirilova, 2020).

Similarly, Almanthari et al (2020) reported four main barriers to e-learning implementation: Teachers, school, curricula, and students. Furthermore, there was a correlative relationship among barriers. They affect each

other positively and the barrier that has the highest effect is the student level on others.

Table 3. Classification of barriers faced by teachers in using e-learning

Type of Barrier	Description
School Level	Availability of software and hardware, internet, textbooks, school policy, time and technical support
Teacher Level	Confidence, knowledge, belief and experience
Curriculum Level	Structure of contents, assessment, e-learning resource that is in line with the curriculum
Student Level	Skill and knowledge, motivation, e-learning infrastructure

Source: Almanthari et al (2020)

Reviewing the literature, there are many barriers to e-learning, such as hardware, access, technical support, pedagogy, belief or personal preferences (Ertmer, 1999); lack of ICT resources; knowledge and skills of teachers; (Pelgrum,2001); levels of teachers, schools and system (Balanskat, et al.,2006). Reviewing the literature, we find the obstacles of e-learning include a variety of concerns of the nature of different types. Accessibility to IT technology, and the absence of an e-learning course and techniques for evaluating student progress efficiently limit what educators can instruct. Motivation and attitudes towards online learning and teaching, and faith in the use of e-learning technologies affect how and when learners learn. These obstacles must be taken into consideration when dealing with phases such as a pandemic that requires teachers and students to adjust their teaching styles and techniques to a new style of teaching and learning (Almanthari et al., 2020). The overall student satisfaction with the applied teaching-learning process is a necessary condition for effective e-learning. (Teo, 2010). In the same vein, many other studies reported many challenges and difficulties in applying e-learning. These studies reported the failure of using e-learning in many contexts. Main reasons for failure are highlighted in table (4)

Table (4) different reasons for the failure of e-learning

Reasons for failures	Description	studies
Technological Challenges	Students facing technological difficulty in using e-learning system	Almaiah and Almulhem (2018) Almaiah and Alyoussef (2019), Al-Araibi et al. (2019)
Lack of technical support	Unavailability of technical staff and lack of support of facilities to do various activities and Slow speed of internet and connection problems during e-learning process.	Eltahir (2019) Al-Azawei et al. (2016).
Lack of Awareness	Lack of knowledge of technology and computer skills and students' hesitation of bearing their e-learning responsibility to learn.	Alajmi et al., (Ali et al. 2018), Al-Araibi et al. (2019), Naveed et al. (2017), Al Gamdi and Samarji (2016).
Readiness of universities to use e-learning tools and platforms	Students possessing inconsistent e-learning readiness over time	Al-Araibi et al. (2019), Eltahir (2019), Naveed et al. (2017)
Course quality	Content Course having less quality for interactive communication	Almaiah and Almulhem (2018), Almaiah and Alyoussef (2019)
compliance of content	Lack of compliance of course content to students needs	Ozudogru and Hismanoglu (2016), Almaiah and Almulhem (2018), Almaiah and Alyoussef (2019) Almaiah and Man (2016)
Course content	Course content may not be accurate or relevant to students' needs	Almaiah and Almulhem (2018), Almaiah and Alyoussef (2019) Almaiah and Man (2016)
IT skills of Faculty members	Weak IT skills of faculty members	Almaiah and Alyoussef (2019), Iqbal and Ahmad (2010), Radijeng (2010), Nawaz and Khan (2012)
Teachers' acceptance of e-learning systems	Teachers' may not accept technology use.	Vershitskaya et al. (2020), Teo (2011), Almaiah and Almulhem (2018)

Perceptions of e-learning

The perception of students is a crucial component that evaluates their acceptance of e-learning courses; positive attitudes and potentials of aims and tasks reflect the perception of students about online courses (Martín-Rodríguez et al. , 2015; Aviram & Tami, 2004). Student satisfaction is only one more measure of educational quality. There is a positive correlation between a high level of satisfaction and the likelihood of learning process

success, which means progress in academic achievement. According to Teo (2014), E-learning research has generally focused on student engagement with a teacher or the perception of a particular LMS, and little knowledge is available about the key elements that inspire educators to engage in e-learning. Thus, it was revealed that perceptions of students and instructors are among the most important factors that guarantee the success of system application and it is affected by other factors such as, design of the course, progress, and skill in using technology, design of the system, and environment (Wang & Bagakas, 2003).

Previous Studies

Germann et al. (2019) and Faherty et al. (2019) addressed the possibility of closing schools during the pandemic influenza as well as rearranging classes, restricting the community works movement of students in the classroom and creating incentives for distance learning for days off. Ash (2014) suggested that distance learning can be facilitated during the Flu Crisis by technology such as the internet, mobile, radio, television, or mobile messaging, or email. Muirhead's study (2000), admits that online learning is new to schools and can be considered to improve traditional schools and home-schooling. Various studies have shown that while there are some instances of a plan to use distance / online learning during the pandemic, they are mainly focused on small situations and not a global crisis as in COVID-19 pandemic of 2020. Results from various studies indicate that in school or higher education, virtual teaching environments can be used effectively in the event of providing sufficient technological environment and support.

Smart & Cappel (2006) explored students' expectations of incorporating online elements into two Business Undergraduate courses where students completed online

learning modules before class discussion. The study revealed that the students in an elective course considerably rated the online modules better than those in a required course. Koochang & Durante (2003) measured the perceptions of the learners towards a portion of the blended program's web-based distance learning activities/ assignments. Their study concluded that overall students perceived that the portion of their hybrid program's web-based distance learning activities/ assignments promoted learning. In his study, McEwen (2001) found that the learning process occurred in both classes, whether conventional instruction aided by the web or provided online. He concluded that online learning offers better access to the populations in which we live.

Volery & Lord (2000) investigated the Australian university's online business course to determine their attitudes to and use of the online course delivery method. Keller & Cernerud (2002) investigated students' perceptions of e-learning in Sweden. The findings of the study proved that the strategy of implementing the e-learning system at the university level was more effective in affecting students' perceptions than the individual background variables. Learners did not consider access to e-learning on campus as an advantage. Nagar (2020) identified the perception of students towards e-learning amid the COVID-19 lockdown period in India.

All previously mentioned studies agreed on the effectiveness of using online learning in achieving the desired learning goals as well as the positive perceptions of students towards online learning. Batara & Rapat (2020) applied an online learning system that is based on the Internet. The implemented framework is a software that facilitates the ongoing teaching and online learning process across the internet. The software is mounted on the server

and can be accessed by participants in online learning programs on their PC / cell from browser applications and the development of a university that is not restricted. Teo's study (2014) explored the factors that explain satisfaction with e-learning among pre-service teachers. They analyzed the following variables: satisfaction (student), quality of tutors (teacher), perceived usefulness (course), perceived ease of use (technology), delivery of courses (system design), and ease of use (environmental) conditions. The research question was “Which factors are significant in explaining pre-service teachers’ e-learning satisfaction?” The findings showed that all factors were significant predictors of e-learning satisfaction. However, the facilitating conditions construct was found to be a significant mediator of perceived ease of use and satisfaction.

The problem of the study

Technologies used in other parts of the world cannot promote student learning, because they endorse lecture-based teaching and do not strengthen student-centric pedagogy. The above-mentioned realities indicate that expectations of technology adoption by teachers and students play a crucial role in the positive incorporation of technology into language learning and instruction. In Egypt, the readiness to use ICT differs from private tertiary education to the governmental sector. Private universities use e-learning platforms as a base and integral part of their education. But, the case is different in the governmental universities. They try to use e-learning which depends on providing some PDF and PPT documents that support lectures. This is because of many obstacles such as the cost of infrastructure and availability of the internet and other barriers. The lockdown phase of COVID-19 necessitated that a solution must be found immediately to help students complete the semester and fulfill their requirements. So, all

universities in Egypt, as it was the case all over the world, began to activate e-learning with all forms whether synchronous or asynchronous. The current study tries to discover students' and teachers' perceptions about the use of e-learning during this critical period which still at the time of preparing this study not passed yet. Challenges that face the implementation of e-learning will be dealt with through reviewing literature and surveying perceptions.

Questions of the study

The current study attempted to answer the following questions:

- What are teachers' perceptions of using e-learning during the COVID-19 Lockdown Phase?
- What are students' perceptions of using e-learning during the COVID-19 Lockdown Phase?
- Is there any difference between students' and teachers' perceptions of using e-learning during the COVID-19 Lockdown Phase?
- What are the main challenges that face the e-learning system usage during COVID-19 Pandemic?

Significance of the study

The significance of the current study arises from the importance of integrating technology in the field of education specifically during times of crisis. During the time of COVID-19 lockdown, there was an urgent need to save the situation by completing the courses and exams online to activate the idea of "*Stay Home, Stay Safe*". So, the only solution was online learning. the study here uncovers the challenges of relying on e-learning during this phase as well as students' and teachers' perceptions. Thus, trying to benefit from pitfalls for future promises.

Method

The current study used a qualitative and quantitative approach to **treat data gathered** from the **participants** of the study through the instruments used. The study used two

surveys that ended with open-ended questions. They were analyzed statistically using the SPSS program.

Participants

Participants of the study were chosen from four universities in Egypt (two foreign universities and two governmental universities) which applied e-learning during and at the end of the second semester 2019-2020. Universities included BUE (British University in Egypt), RUC (Russian University in Cairo), Cairo University, and Zagazig University. The number of participants was (77) for students and (13) for staff members.

Instruments

1. A students reflection survey (App. A)

The survey consisted of (39) statements with responses based on a 5-point Likert scale ranging from *strongly disagree* to *strongly agree*. The survey included (36) closed questions and (3) open ended questions. It was adopted from Filimban (2008), Newsome (2008) and Mamattah, (2016) . For the sake of reliability, Alfa Cronbach's reliability was used. Reliability was (0.947) which proved to be greatly suitable.

Students reflection survey was classified into 10 categories as follows:

1. Ease of Use
2. Instructional Design
3. Learning Outcomes
4. Empowerment
5. Critical Thinking Skills
6. Online Program
7. Professionalism
8. Alignment
9. Assessments

2. An instructors' reflection survey (App. B)

The survey consisted of (25) statements with responses based on 5 Likert scales ranging from *strongly disagree* to

strongly agree. The survey included (18) closed questions and (7) open-ended questions. The survey was adopted from Filimban (2008) with adaptation and modifications. For the sake of reliability, Alfa Cronbach's reliability was used. Reliability was (0.783) which proved to be reliable. The instructors reflection survey was divided into 6 categories as follows:

1. Instructional Design and Delivery
2. Student Learning Outcomes:
3. Assessment
4. Students empowerment
5. Critical Thinking Skills
6. Alignment

Data Analysis and Results:

To answer the questions of the study, the quantitative and qualitative data were obtained from the teachers' and students' surveys. Data were analyzed using SPSS program according to the following steps:

Question 1:

What are teachers' perceptions of using e-learning during the COVID -19 Lockdown Phase? To answer the first question, data received from the instructor's reflection survey was analyzed using the SPSS program. Table (5) shows frequencies, means, standard deviations, and general attitudes of teachers' responses.

Table (5) shows the main categories of instructor's perceptions as follows:

1. Instructional Design and Delivery

Figure (2) shows the means of the students' responses to instructional design delivery items which imply the general agreement attitude of instructors. Mean of the item; "*The course structure and materials are well organized*" was (3.92). whereas the mean of the item "*The course is designed with various visual, textual, and/or auditory activities that improve the students' learning*" was (3.76).

The mean of the item " *The course content is appropriate and up-to-date* " was (3.61) This reflects the general attitude of agreement towards the instructional design delivery of the e-learning course

Table (5) Teachers' reflection survey

	Stamen	Freq.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	M	SD	General attitude
Instructional Design and Delivery	1	F %	0	1 7.7	0	10 84.6	1 7.7	3.92	.64	Agree
	2		0	2 15.4	0	10 76.9	1 7.7	3.76	.38	Agree
	3		1 7.7	2 15.4	00	8 61.5	2 15.4	3.61	1.19	Agree
Student Learning Outcomes:	4		0	1 7.7	1 7.7	8 61.5	3 23.1	4	.81	Agree
	5		0	0	0	10 76.9	3 23.1	4.23	.43	Strongly agree
	6		0	0	0	11 84.6	2 15.4	4.15	.37	Agree
Assessment	7		0	0	0	11 84.6	2 15.4	4.15	.37	Agree
	8		0	0	5 38.5	8 61.5	0	3.61	.50	Agree
	9		0	0	0	10 76.9	3 23.1	4.15	.43	Agree
Students empowerment	10		0	0	1 7.7	6 46.2	6 46.2	4.38	.65	Strongly agree
	11		0	2 15.4	2 15.4	4 30.8	5 38.5	4.38	1.11	Strongly agree
	12		0	0	2 15.4	6 46.4	5 38.5	4.23	.72	Strongly agree
Critical Thinking Skills	13		0	0	0	0	13 100	3.92	.75	Agree
	14		0	0	0	0	13 100	4.15	.80	Agree
	15		0	0	00	0	13 100	4	.81	Agree
Alignment	16		0	0	2 15.4	8 61.5	3 23.1	4	.64	Agree
	17		0	0	0	11 84.6	2 15.4	4.15	.37	Agree
	18		0	0	0	8 61.5	5 38.5	4.38	.50	Strongly agree

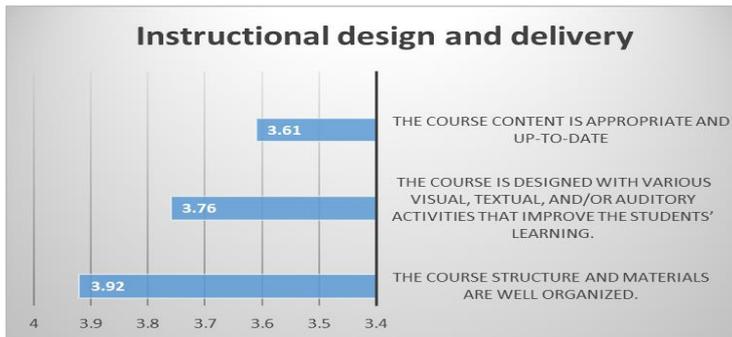


Figure (2). Instructional design and delivery

Student Learning Outcomes

Figure (3) shows the means of learning outcome items. Mean of the item "*Sufficient time is allowed for achieving outcomes*" was (4.15), mean of the item "*The tasks that are required to complete the class are clearly defined*" was (4.23) and the mean of the item "*The learning outcomes outlined in the syllabus are clearly explained*" was (4). All means show the general attitude of instructors' agreement towards learning outcomes.

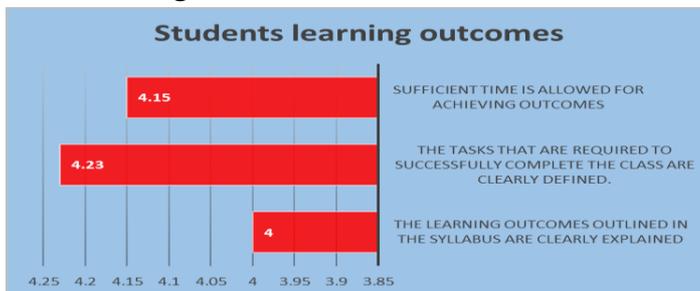


Figure (3). Students learning outcomes

2. Assessment

Figure (4) shows means of assessment items as follows: the mean of the responses to the item "*Feedback on assignments is provided within a reasonable time frame.*" was (4.15), whereas the mean of the responses to the item "*Assignments with appropriate levels of difficulty are provided.*" was (3.61). the mean of the responses to the item "*How students will be graded in*

the class is clearly explained." was (4.15). thus the general attitude of instructors towards assessment was agreement.

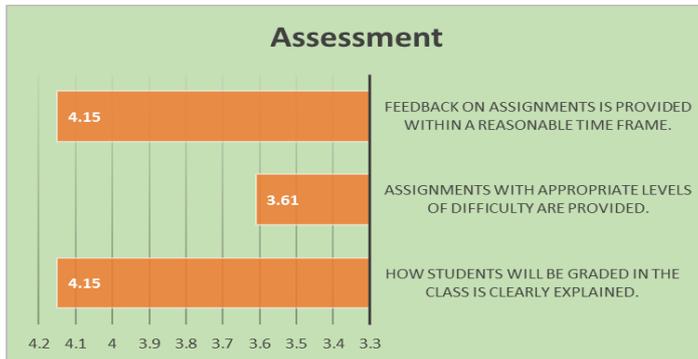


Figure (4). Assessment

3. Students' empowerment

Figure (5) shows the means of assessment as follows: the mean of the responses to the item "*The students are given a voice in how they will be graded.*" was (4.23) whereas the mean of the responses to the item "*The students are given opportunities to share their cultural backgrounds.*" was (4.38) . The mean of the responses to the item "*The students are given opportunities to express themselves.*" was (4.23) which all denote the general attitude of strong agreement.

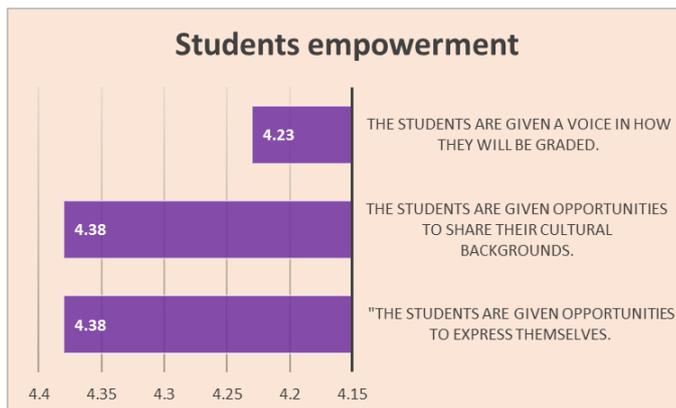


Figure (5). Students empowerment

4. Critical Thinking Skills

Figure (6) shows the means of critical thinking item responses. The mean of the responses to the item "Students are required to problem-solve" was (4). the mean of the responses to the item "Students are required to analyze, synthesize, and interpret the information" was (4.15). The mean of the responses to the item "Students are required to think in-depth about a subject." was (3.92). Thus, the general attitude was "agreement".

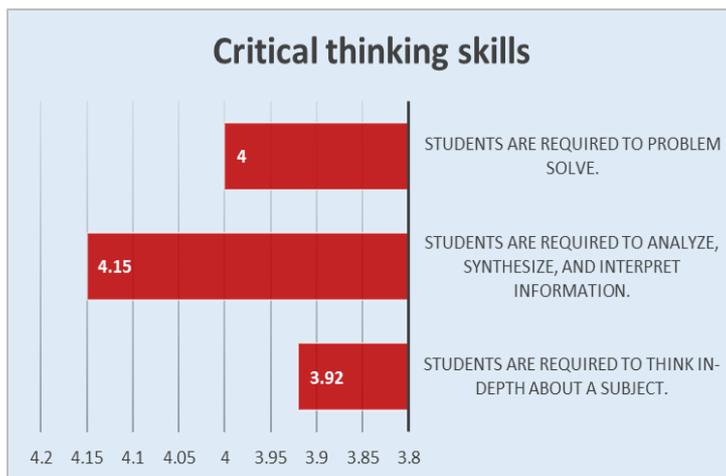


Figure (6). Critical thinking skills

5. Alignment

Figure (7) shows the means of alignment item responses. The mean of the responses to the item "Course assessments are in 4ment with the course content and learning objectives" was (4.38). The mean of the responses to the item "Learning outcomes are in alignment with the course requirements" was (4.15). The mean of the responses to the item "Assignments that reflect student interests and abilities are provided." was (4). Thus, the general attitude is agreement.

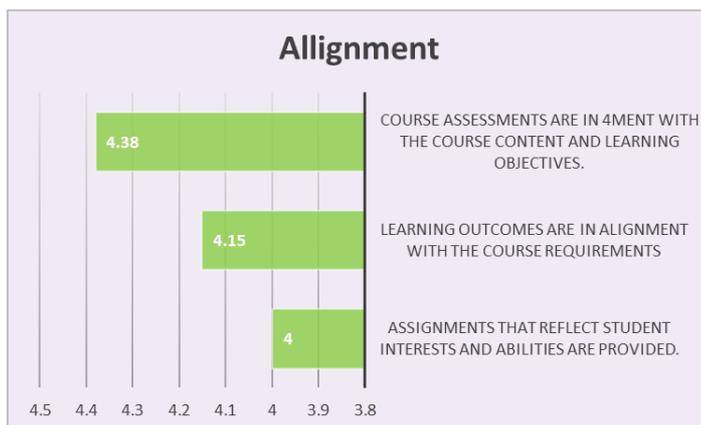


Figure (7). Allignment

Open-ended questions

The teacher reflection survey included (7) open-ended questions that received different responses. In response to the question; *'What do you think are the greatest benefits of online courses?'* collaboration received (34 %), whereas accessibility received (21%) and flexibility and student-centered received (21%, 13%) respectively. In answering the question; *'What do you think are the greatest drawbacks of online courses?'*, 57% of responses were directed to *'lack of face to face'*. Whereas 19% of the total responses were directed to *'lack of technological skills'*, and *isolation* and *'time-intensive'* received 14% and 0.09% of total responses. When asked about whether the web affected their teaching methods or styles, 76% of instructors agreed that, through online teaching, they could attach a video, manage students easily and give them more assignments that enrich their critical thinking. They added that online teaching adds to their competence as teachers and they could cope with the technology and attract students' attention through varying their teaching strategies. 24% of the total number disagreed saying that nothing is affected, however, face to face interaction was missed which affects the students' participation in the class.

The third question was; 'What assessment tools would you suggest using to evaluate the effectiveness of an online course?'. The answer included various tools such as Quiz Pedia, BB tools, presentations, electronic quizzes and tests, questionnaires, observations, interviews and exams, qualitative assessment, oral exams, tests, open discussion, student feedback, objective questions, and fill in the blanks. The question about the critical component of effective online courses included many answers such as;

- students' engagement in the online learning-teaching process.
- its usefulness as well as interest for the learners .
- assessment, motivation, and participation .
- Flexibility methods to make it more interesting.
- High-speed internet, effective platform, trained teachers or professional and skillful instructors
- Well-organized material, availability of tools .
- lack in interaction with students
- Presentations, and
- Lecturing

Question 2: What are students' perceptions of the use of e-learning during the COVID-19 Lockdown Phase? Table (6) shows frequencies, means, standard deviations, and general attitudes of students' responses.

Table (6) Students reflection survey

state ment	State ment		Strongly disagree	Disagree	Neutr al	Agree	Strongl y agree	M	SD	General attitude
Perceived Ease of Use of E-Learning	1	Freq	6	4	21	41	5	3.45	.98	agree
		%	7.8	5.2	27.3	53.2	6.5			
	2		4	4	18	39	12	3.66	.98	agree
			5.2	5.2	23.4	50.6	15.6			
	3	Freq	4	9	15	34	15	3.61	1.09	agree
			5.2	11.7	19.5	44.2	19.5			
	4	Freq	4	2	23	36	12	3.64	.95	agree
		5.2	2.6	29.9	46.8	15.6				
5	Freq	4	9	21	36	7	3.42	.99	agree	
		5.2	11.7	27.3	46.8	9.1				
6	Freq	10	24	17	19	7	2.85	1.19	Neutral	
		13	31	22.1	24.7	9.1				
7	Freq	3	13	9	37	15	3.62	1.1	agree	
		3.9	16.9	11.7	48.1	19.5				

	8		6 7.8	13 16.9	23 29.9	26 33.8	9 11.7	3.24	1.11	Neutral
Instructional Design and	9		2 2.6	8 10.4	17 22.1	45 58.4	5 6.5	3.55	.86	agree
	10		4 5.2	10 13	24 31.2	34 44.2	5 6.5	3.33	.96	Neutral
	11		1 1.3	3 3.9	23 29.9	41 53.2	9 11.7	3.7	.77	agree
Student Learning Outcomes	12		5 6.5	3 3.9	25 32.5	39 50.6	5 6.5	3.46	.92	agree
	13		2 2.6	7 9.1	20 26	42 54.5	6 7.8	3.55		agree
	14		3 3.9	3 3.9	30 39	33 42.9	8 10.4	3.51	.86	agree
Student Empowerment:	15		6 7.8	9 11.7	19 24.7	34 44.2	9 11.7	3.40	1.9	Neutral
	16		8 10.4	15 19.5	22 28.6	26 33.8	6 7.8	3.09	1.12	Neutral
	17		7 9.1	8 10.4	27 35.1	31 40.3	4 5.2	3.22	1.02	Neutral
Critical Thinking Skills	18		3 3.9	10 13	26 33.8	31 40.3	7 9.1	3.37	..96	Neutral
	19		1 1.3	7 9.1	24 31.2	40 51.9	5 6.5	3.53	.80	agree
	20		3 3.9	7 9.1	27 35.1	36 46.8	4 5.2	3.40	.87	Neutral
Online Program	21		6 7.8	7 9.1	25 32.5	34 44.2	5 6.5	3.32	1.00	Neutral
	22		5 6.5	14 18.2	22 28.6	26 33.8	10 13	3.28	1.11	Neutral
	23		4 5.2	8 10.4	21 27.3	38 49.4	6 7.8	3.44	.96	agree
	24		6 7.8	10 13	16 20.8	41 53.2	4 5.2	3.35	1	Neutral
	25		3 3.9	9 11.7	23 29.9	31 40.3	11 14.3	3.49	1	agree
	26		4 5.2	5 6.5	28 36.4	33 42.9	7 9.1	3.44	.93	agree
Professionalism	27		2 2.6	6 7.8	21 27.3	39 50.6	9 11.7	3.61	.89	agree
	28		2 2.6	3 3.9	16 20.8	45 58.4	11 14.3	3.77	.83	agree
	29		1 1.3	2 2.6	25 32.5	41 53.2	8 10.4	3.68	.74	agree
	30		8 10.4	7 9.1	17 22.1	34 44.2	11 14.3	3.42	1.16	agree
Alignment ..	31		3 3.9	9 11.7	26 33.8	35 45.5	4 5.2	3.36	.88	Neutral
	32		2 2.6	7 9.1	22 28.6	40 51.9	6 7.8	3.53	1.13	agree
	33		2 2.6	2 2.6	20 26	45 58.4	8 10.4	3.71	.79	agree
Assessments	34		4 5.2	6 7.8	14 18.2	49 63.6	4 5.2	3.55	.91	agree
	35		3 3.9	7 9.1	21 27.3	42 54.5	4 5.2	3.48	.88	agree
	36		7 9.1	13 16.9	16 20.8	34 44.2	7 9.1	3.27	1.13	Neutral

Table (6) shows the main categories of students' perceptions. They are represented as follows"

1. Perceived ease of use:

Figure (8) shows the means of students' responses to perceived ease of use items. Mean of being "*comfortable with the fully face-to-face than online learning*" responses was (3.24) which expresses neutral level as well as the item;" I prefer fully-online learning to face-to-face " with mean of (2.85). Responses to other items gave general agreement with means of (3.62), (3.42), (3.64), (3.61), (3.66), and (3.45) respectively. So, the general perceptions of students in terms of the ease of use of the e-learning tend to be satisfying.

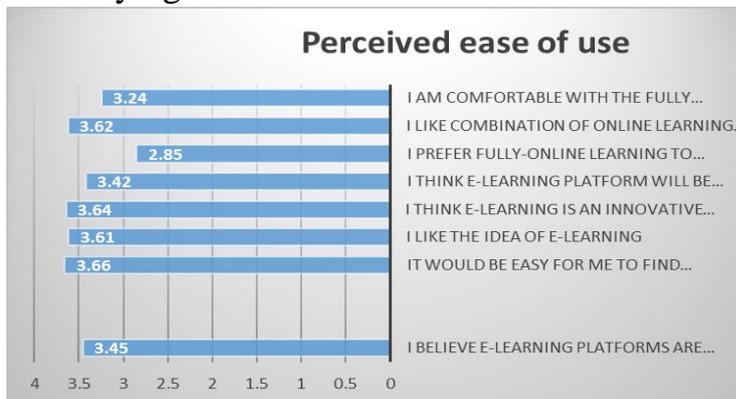


Figure (8) Perceived ease of use

2. Instructional Design and Delivery

Figure (9) shows the mean of students' responses to the items of the category, instructional design, and delivery. Students' mean perceptions towards appropriates of course content are (3.7), while the mean responses to the item; "The course is designed with various visual, textual, and/or auditory activities that improve my learning" was (3.33) which is a neutral attitude. The mean of students' responses to the organization of the course and material was (3.55) with a general attitude of agreement.

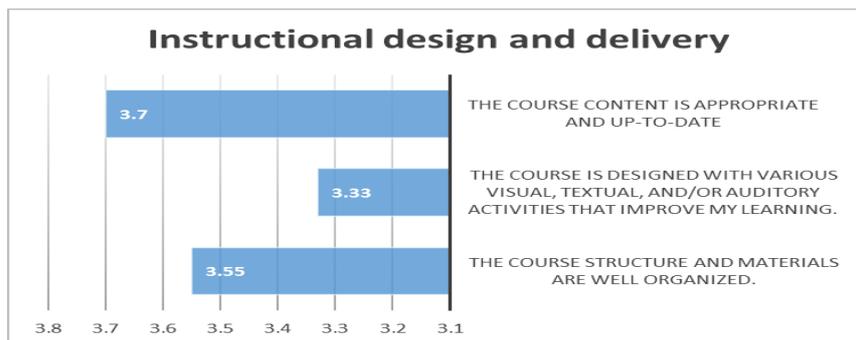


figure (9) Instructional Design and Delivery

3. Student Learning Outcomes

The general perceptions of students towards the category; "students learning outcomes tend to be agreement. Mean responses to the items; "*My instructor clearly explains the learning outcomes outlined in the syllabus*", "*My instructor clearly defines the tasks that are required to complete in the class .*" and "*My instructor allows sufficient time for achieving outcomes*" are; (3.46), (3.55) and (3.51) respectively.

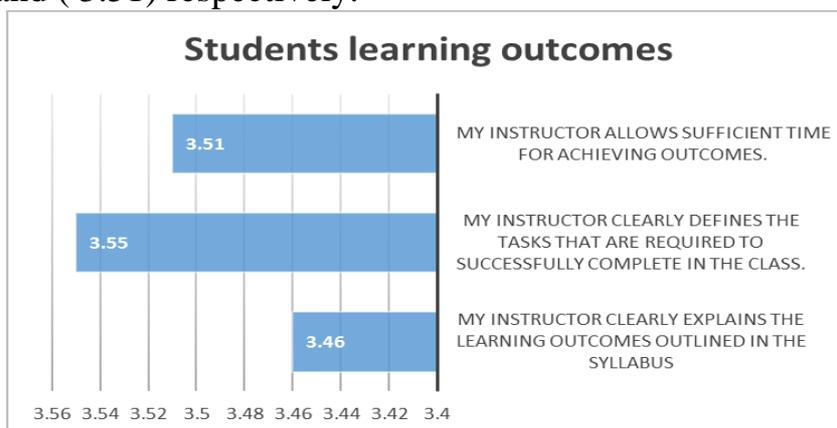


Figure (10) Students Learning Outcomes

4. Students' empowerment

According to the mean responses of students towards the category "students empowerment", the general attitude is neutral. Students could not assure that they share in the

process of self – evaluation. So, mean responses to the items: *"I feel free to express myself, my instructor allows me to have a voice in how I will be graded "* and *"I have opportunities to evaluate my assessment or grades"* are (3.4). (3.09) and (3.22) respectively.

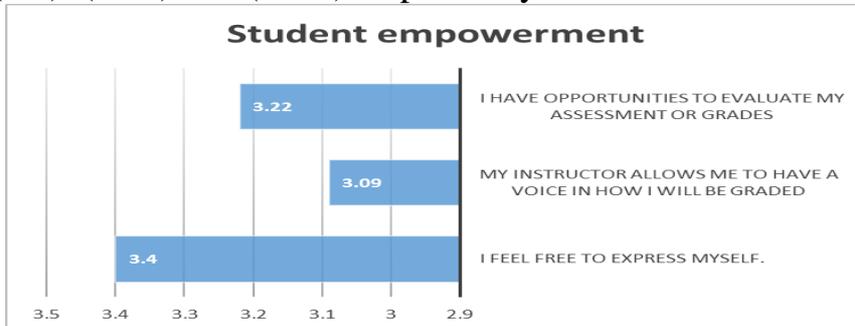


Figure (11) Students empowerment

5. Critical Thinking Skills

Mean responses for students to the critical thinking skills items were as follows:

The item *'My instructor requires me to think in-depth about a subject '* (3.37) which expressed a neutral attitude. Whereas the item *' My instructor requires me to analyze, synthesize, and interpret information'* expressed general perception of agreement among students with mean of (3.53). the item *'instructor requires me to problem solve'* expressed general attitude of neutral with mean of (3.4).

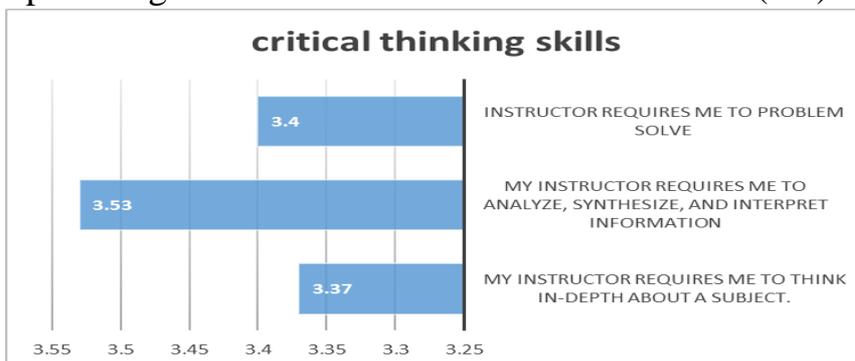


Figure (12) Critical Thinking Skills Online Program

Figure (13) shows the means of students' responses to online programs ranged between 'agree' and 'neutral'. The items: 'The appearance of the online program is attractive and easy to read' (3.44). 'I feel like I am mastering the material. (3.49). 'Any problems I reported with the web program were resolved on time'. was (3.44). This expressed the general attitude of agreement, whereas the items; 'The online program runs smoothly (3.32). 'I find the online program more convenient than meeting as a class monthly.' (3.28) 'I commonly worked with other students when completing assignments' (3.35) expressed the general neutral attitude.

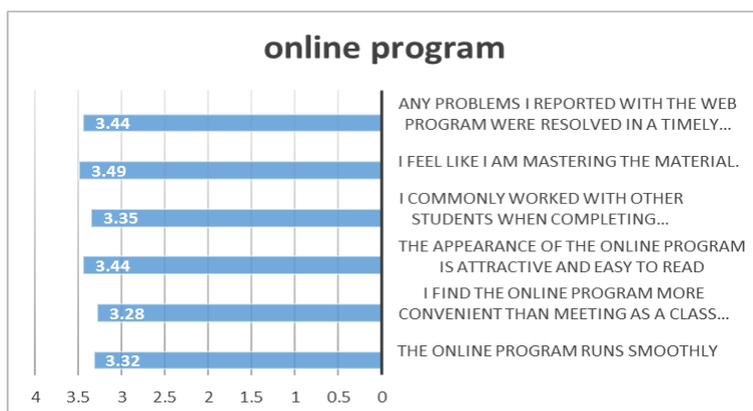


Figure (13) Online Program

6. Professionalism

Means of students' perceptions towards teachers' professionalism expressed general agreement. This is clear in the following items: 'The instructor is on time for all appointments' got (3.61). 'The instructor is helpful and courteous' got (3.77). The instructor is knowledgeable and demonstrates mastery of the subject got (3.68). I found face-to-face meetings helpful and would like to include them in further courses got (3.42).

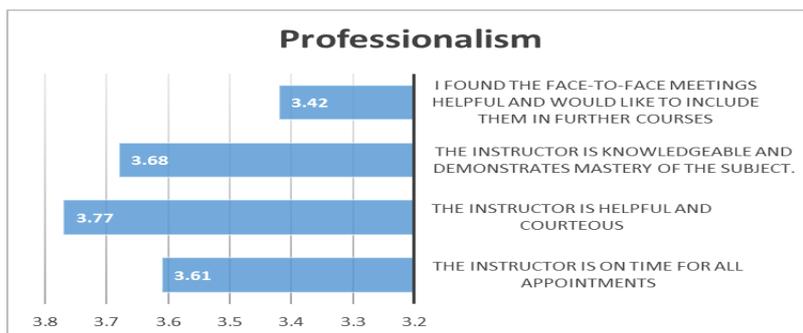


Figure (14) Professionalism

7. Alignment:

Students' perceptions towards alignment of assessment to outcomes and content agreed on the following two items: 'The learning outcomes are in agreement with the course requirements' and 'Course assessments are in agreement with the course content and learning objectives', with means of (4.15) and (4.38) respectively. Whereas they expressed general neutral perception towards the item; ' My instructor provides assignments that reflect my interests and abilities' with mean of (3.36).

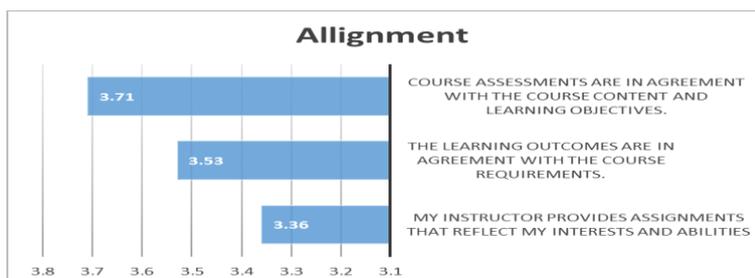


Figure (15) Alignment

8. Assessments

Figure (16) shows neutral perception for the item ' My instructor provides feedback on assignments within a reasonable time frame ' with a mean of (3.27). Whereas, the general perception of the agreement is shown with the other two items as follows; 'My instructor explains

how students will be graded in class.' , ' My instructor provides assignments with appropriate levels of difficulty' with mean of (3.55) and (3.48) respectively .

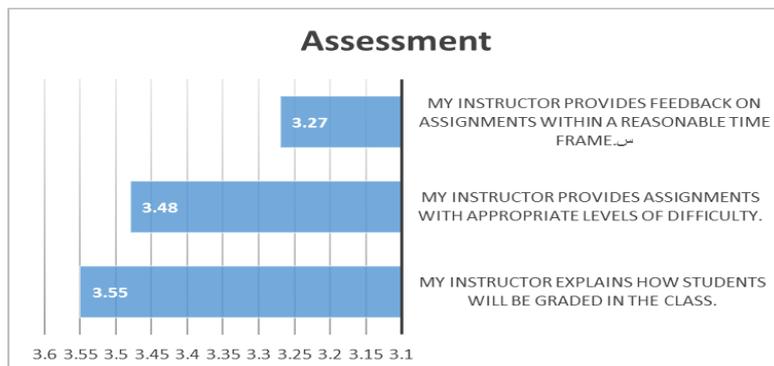


Figure (16) . Assessment

Open-ended questions

In answering the question ' *Aside from the technological aspects, has the web affected your learning style?*', most of the students ' responses (70.2 %) agreed, and (29.8%) of them denied that their learning styles were affected by the use of the web. In answering the question about the greatest drawbacks of online courses, '*lack of face-to-face interaction*' received (33.62 %) of responses, while, '*time-intensive*' received (25 %) of responses. the problem of '*Lack of technological skills for students*' received (26.72 %) of responses. Finally, the isolation problem was received (14.65 %) of the students' responses.

Question 3: Is there any difference between students' and teachers' perceptions of the use of e-learning during the COVID-19 Lockdown Phase?

To compare students' and teachers' perceptions towards the use of e-learning during the COVID-19 Lockdown Phase, the Mann-Whitney test was used, and table (7) shows the rank means and the significance.

Table (7) Mann-Whitney test results in comparing rank mean between teachers and students' perceptions towards using e-learning

	group	N	Mean rank	Sum of ranks	U	Z	Sig.
Instructional Design differences	teachers	13	56.19	370.50	361.5	1.628	0.104
	Students	77	43.69	3364.5			
learning outcomes	teachers	13	64.23	835	257	2.887	0.004
	Students	77	42.34	3260			
Assessment	teachers	13	64.32	835	257	2.889	0.004
	Students	77	42.34	3260			
Alignment	teachers	13	69.62	905	187	3.670	0.000
	Students	77	41.43	3190			
Critical thinking	teachers	13	63.69	828s	264	2.759	0.006
	Students	77	42.43	3267			

Table (7) shows that Mann-Whitney test results comparing the rank mean between the teachers' and students' perceptions towards using e-learning. Concerning '*instructional design differences*', they mean rank for teachers is (56.19) while the mean rank for students is (43.69). This means there is no significant difference between teachers' and students' responses. In terms of '*learning outcomes*', teachers' mean rank is (64.23) whereas students' mean rank is (42.34). this means that there is a significant difference between teachers' and students' responses at the level of (0.004) on behalf of teachers' responses. Comparing teachers' and students' perceptions towards '*assessment*', The mean rank for teachers' perceptions is (64.32), whereas the mean rank for students' perceptions is (42.34). This means that there is a significant difference between the perceptions of the two groups on behalf of teachers' perceptions. The same applies the mean rank of teachers and students' responses in terms of alignment which are (69.62)for teachers and (41.43) for students respectively . while the mean rank for teachers in terms of critical thinking is (63.69) and for students

(42.43). This means that there are significant differences in the two areas in favor of teachers' responses. These results are shown in figure (17).

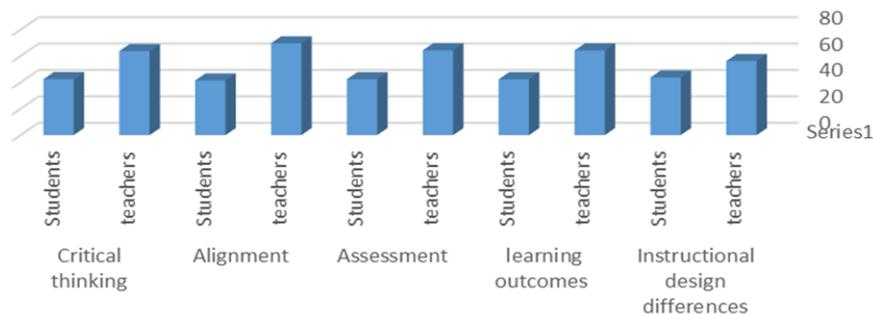


Figure (17). Rank means between teachers and students' perceptions towards using e-learning

Question 4

To answer the question; '*What are the main challenges that face the e-learning system usage during COVID-19 Pandemic?* ', literature was reviewed and students' and teachers' responses were analyzed. Challenges and pitfalls differ according to the educational institution's capabilities and readiness. According to Almaiah and Almulhem (2018); Almaiah and Alyoussef (2019), and Al-Araibi et al. (2019) . The main challenges are represented in students' inability to use technology, which in turn affects the implementation of e-learning using digital platforms and applications. Sometimes this difficulty in using technology faces teachers themselves. That is due to the traditional method of teaching they used to. Lack of technical support and availability of high-speed internet are other challenges that face the implementation of e-learning in educational institutions (Eltahir, 2019) Al-Azawei et al. (2016).

Both teachers and students need continuous support to overcome any problems that may arise, specifically during

synchronous sessions and electronic exams. Al-Araibi et al. (2019), Eltahir (2019), and Naveed et al. (2017) reported that the readiness of universities concerning providing platforms and e-courses to be used for activities, assignments, and tests forms a very important factor that helps to make e-learning runs smoothly. But that is not the case all the time. Many of the universities do not have the budget to provide such services for students. Course quality and content represent a serious obstacle in front of implementing e-learning in education. The courses used with e-learning should be equipped with interactive activities and exercises that engage students and develop their skills. The structure of the course and materials should be well organized and designed with various visual, textual, and/or auditory activities that improve the students' learning. The course content must be up -to- date. Lack of relevance, the inaccuracy of course content, and misalignment, of course, content with learners' needs and learning outcomes (Almaiah and Alyoussef, 2019). Lack of customization/adaptability of course content (Ozudogru and Hismanoglu, 2016) makes it useless to use e-learning with students. Many other challenges face the implementation of e-learning such as the feeling of isolation and the lack of face-to-face interaction and the difficulty of applying for group work.

Discussion of results

The purpose of the current study is to examine teachers' and students' perceptions of using e-learning. In the past times, it was optional to use e-learning as its use proved to be effective and innovative in developing students' technical and academic skills. On the other hand, as a result of the current pandemic of COVID-19 and the necessity of completing the second semester's courses and exams, it became an obligation to find a practical solution that saves the situation and helps pass the critical situation while

staying at home. The study focused on students' and teachers' perceptions of e-learning implementation during the pandemic of COVID-19. It is expected that there is a general agreement between teachers' and students' perceptions. At the same time, the level of agreement may differ according to each group's experience and expectations.

The other two aims were to compare teachers' and students' perceptions and to find challenges and problems that face the implementation of e-learning in tertiary education. Students did not express full agreement to the preference of online learning or even face to face learning. This attitude may be a result of some challenges that face them during the process of e-learning such as technical problems or their lack of IT skills. At the same time, they did not refuse the idea of e-learning as it has more advantages than disadvantages. Perceived ease of use may depend on the methods offered for using the platform and its tools. According to Mohammadi, (2015). Ease of use depends on providing tools of e-mail as well as social networking, availability of recording the session, opportunities for personalized assessment, and providing the greatest interaction options. Supporting users with 'help' options improves user authority to manage their private accounts more effectively. Instructor characteristics and teaching materials as well as the design of learning contents are positively related to perceived usefulness (Lee et al. , 2009; Liaw, 2008).

Instructional design and delivery of course content is a very important factor that affects the success of e-learning. It should be remembered that most theories of learning influenced the new industry of instructional design. Literature survey reveals that this discipline has developed out of the social sciences; the learning theories (cognitive,

behavioral, and constructivism) are the frameworks for the discipline of instructional design (Afifi & Alamri, 2014). Students expressed general agreement of appropriateness of course content, structure, and organization its update and suitability for e-learning implementation. It is advised to provide reliable, detailed, up-to-date, and necessary information that is important to the needs of students and is methodologically structured (Mohammadi, 2015). But they did not show any perception for the course including interactive tools. This may be because the use of online sessions was sudden as a result of the COVID -19 pandemic lockdown phase. The use of e-learning during face to face lectures depended on having assignments and quizzes through the Blackboard platform. But, having interactive activities with audio-visual tools that attract students' attention is one of the most important techniques of e-learning.

Teachers must define and declare the learning outcomes for students whether it is face-to-face or online learning. So, sufficient time should be allowed to achieve the learning outcomes using varied teaching aids. Each task given to students must be accompanied by its aim or aims. Learning outcomes must be not only declared to students (Liaw, 2008), but also, explained to them clearly. So, the success of the e-learning process will not be achieved without understanding how to achieve the learning outcomes.

In the process of e-learning, students need to address their critical thinking skills. It is a technique that helps students to be more flexible and critical in searching for required information and critical searching of facts (Mohammadi, (2015). teachers agreed that e-learning help students solve problems, analyze, synthesize, and interpret information through deep thinking in the subject matter.

Students showed general agreement concerning the professionalism of instructors. In the e-learning process,

teachers must be trained on the use of e-learning and on managing sessions successfully. Additionally, they should be on time and competent in the target course as well as in technical matters that may affect the fluency of the session. When comparing students' perceptions with teachers' perceptions, we find that some differences refer to students' high level of expectations that do not match reality or the authentic situation. Thus, good management, alignment between objectives and outcomes, mastery of the use of platform tools, training opportunities for both teachers and students, and the use of communication strategies guarantee the success of e-learning implementation.

Conclusion

The current study examined both teachers' and students' perceptions of e-learning during the time of COVID -19 in tertiary education. They agreed on most of the survey items which examined many areas that promote success to the e-learning process. The areas included ease of use, delivery of content, learning objectives and outcomes, critical thinking, student empowerment, assessment, and alignment. They never showed disagreement, but sometimes they showed a neutral attitude towards a few of the items. Most perceptions were positive despite some challenges that can be considered in the future.

Suggestions

- It is suggested that e-learning programs be organized to develop English language skills such as reading, vocabulary, and speaking.
- Learning strategies such as gamification can be used through e-learning to develop vocabulary knowledge and retention.
- E-learning can be used with corpus linguistics to develop students' vocabulary and reading comprehension skills.

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