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No portion of this work has been submitted or is currently being submitted in support for another degree of qualification in this university or any other educational institute.

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Abstract

In this global village we live in, education is not restricted to a special place like a school. All learners should be life-long learners, and learning should not be restricted to a time and place. Like any other kind of education, e-learning, a process to create and provide access to learning when the source of information and the learners are separated by time and distance, has special kinds of barriers which need to be known and considered, for instance the high drop-out rate of e-learning and the suitability of e-learning to cover different subjects. These problems appear to be related, directly or indirectly, to the issue of interactivity. Interactivity in e-learning is considered to be more than just clicking a mouse. Interactivity encourages both active learner reflection and manipulation of learning content; it reduces the feelings of isolation and of anxiety of not learning the curriculum. Interactivity facilitates the integration of learned content into existing schemata and in particular into real-life work situations. In the context of e-learning, interactivity is viewed as the principal method of engaging with learners and helping them to attain, retain and sustain the knowledge and skills they are learning. This thesis argues that an in-depth understanding of interactivity in e-learning will reinforce and enhance the capabilities of this learning mode, and consequently have a measurable positive impact on student drop-out rates, and widen the suitability and subject coverage of e-learning.

Keywords: e-learning, synchronous, asynchronous, blended, interaction, e-content, e-teacher, drop-out.

Chapter 1 – Introduction

1.1 Thesis Problem (Current Situation)

"Distance Learning" (DL) and "Online Learning" (OL) are two terms generally used synonymously in education, but in fact each term has its particular uses and characteristics. Distance learning has been a method of teaching and learning for many individuals for at least a century starting with **correspondence** learning (home study) via postal mail (Moore and Kearsley, 1996). Through the introduction of the Internet and the spreading of its network to almost every home, distance learning materials have been transformed into an online mode called "Online Learning". In other words, online learning is a subset of distance learning with the two added values of technology and flexibility (Anderson, 2003). All online learning is distance learning, because using information technology online learning provides access to instructional programs for students who are separated by time or physical location (CDLP, 2005), but conversely not all distance learning is online learning, since learning can occur using physical books sent by post, and tutoring can be conducted by phone – this is for example the case in developing countries where both computer access and online bandwidth is limited (Online and Distance Learning, 2011). Accordingly, the correct terms to be used are:

- “Traditional Distance Learning” if it is the case of a self-study process based on written materials rather than a physical presence in lecture rooms listening to lectures.
- “Web-Based Distance Learning” if it is the case of a self-study process based on course website on the internet which provides an interactive learning environment (Benaya and Azur, 2007).

In this thesis, the main concern is "online learning" (OL), which is referred to by many researchers as "distance learning" (DL) since it is in the end a process of transferring knowledge while instructor and learner are separated by time or distance. The course designs, instructional methods and the way of communication media which are to be considered here are those of OL in particular, but although OL is uniquely defined, "DL" and "e-learning" will be used synonymously throughout the thesis to comply with the usage of many researchers.

As a force contributing to social and economic development and technological revolution, many people consider OL the optimal way to develop existing skills to increase their chance for better jobs, or even to start a new career. In the UK

during the recession, for example, the numbers of students enrolled in distance learning courses were 30% higher between October and December 2008 compared to the same period in 2007 (RDI, 2007). Evidently, OL is becoming an accepted and vital part of the mainstream educational system in the UK.

The situation in the US is similar - according to Edweek2, the Obama administration plans to spend \$1 billion on education technology: the Democrats' 2009 "American Recovery and Reinvestment Act" includes provision for "\$1 billion for 21st century classrooms, including computer and science labs and teacher technology training" (Ash, 2009).

In spite of its potential to provide, through computer-based and web-based training, a flexible learning environment and deliver flexible learning to more people than traditional classroom training ever could, DL has two main drawbacks.

On the learner's level, online learning alone does not work for everyone, because it fails to address individual learning styles. Moreover, even though some content lends itself to self-paced learning, this may leave students feeling isolated, having educational relationships mostly separated in time or place or both, and this can result in a lack of motivation (Wright, 2006) and high drop-out rates (Hamtni, 2008). According to Smith (2006) the problem of dropout rates in e-learning has been argued over at length without any consistent conclusions; the reason behind this lack of conclusive results, it has been suggested, is the high number of variables involved in this problem. In this thesis the main factor to be discussed in relation to this issue is the lack of interactivity in OL.

On the content level, the reduced social and cultural interaction poses a challenge as it affects OL's capabilities to teach a greater variety of subjects at a distance, and limits its abilities to a relatively small number of online courses such as in the Sciences, Engineering, Mathematics, and English as a Second Language (Clerke, 2003). This has led some researchers to suggest that not all contents may be suitable to be delivered via e-learning (Codone, 2001).

However, the main concern of this thesis is to discuss possibilities for DL to have almost the same instructional contact and interaction for students as traditional learning in order to overcome these drawbacks of OL.

To whom, then, is OL dedicated? The learning style of OL is especially suitable for learners who study a course fully online, whether they are students or employees. For those looking for flexibility in learning due to family or work commitments, e-learning is an option to consider. Furthermore, for students who have had negative experiences with formal education or who are disappointed with learning as a whole, whether because they are minority language speakers, have

disabilities, or simply prefer a different learning style, the flexibility of e-learning can inspire and motivate and provide a return to education (Clarke, 2003). For organizations and institutions looking to train employees without a trade-off in productivity, time, cost, or the effort of hiring a consultant, this is also an option to consider. The big challenge for OL is not to attract students, but to keep them interested once they have begun studying (Hardman and Dunlap, 2003), and to develop their intention to complete a given course (Moore and Kearsley, 1996). Before embarking on any online course, it is essential to ensure that e-learning is the best choice for any given situation.

1.2 Major Thesis Research Questions

In general this thesis is trying to answer the question whether online courses which are designed from constructivist principles, relevant, interactive, student-centred, collaborative, and providing learners with some choice or control over their learning to build up their dynamic experience, can contribute in solving the problem of the two main drawbacks of e-learning mentioned above.

In order to answer this question, it is necessary to have a deep understanding of interactivity as not just "clicking a mouse". Interaction focuses more on designing experience and instruction (Schone, 2007) than just on applying the newest technologies in multimedia and communication (Duval et al, 2007). Interactivity means creating students' knowledge to be fluid, moving in all directions (push/pull), which, it is hypothesized, would keep the student interested and mentally stimulated during the learning process.

Additionally, the main interaction catalysts of the learning process (i.e. Student – Teacher - Content) should be highlighted regarding the interaction of each element with the others and with itself. By tracing the expected interactions for learners through the model of learning catalysts, one can ensure that an appropriate mix of interaction between student, teacher, and content is designed and introduced.

1.3 Thesis Rationale

This thesis attempts to prove that online education can be at least as effective as traditional classroom instruction if the obstacle of the isolated learner and limited interaction with an instructor or other students is overcome. This could be achieved by allowing rich interactive distance learning experiences that could even surpass the interactivity of a traditional classroom. However, with the full understanding of interactive e-learning, certain changes are expected to occur in the three sides of the learning process triangle of Student-Teacher-Content.

1.3.1 OL-Learner

By applying the right level of interactivity in distance learning, learners can apply the learned knowledge through simulations and educational games, and by exchanging experiences with peers through social networks. They can thus process information more in-depth, being able to recall the information and transfer it to the real world. This may lead to the development of the so-called informal (personal) learning, which is managed completely by the students themselves. The students search and access their own resources (blogs, podcasts, etc.) as well as create them and store them for retrieval, and through interaction in social networks they can collaborate and co-create these contents.

The trend in learning will thus be from formal to informal, and from personal to social. According to Hamitin (2003), if the student does thus not feel socially isolated, but is engaged with the online study, this would reduce the high drop-out rates and result in an increased number of enrolled students in online courses.

1.3.2 OL-Teacher

It has been shown that online instructors play a different role than traditional classroom instructors (Elf, 2006). Teachers are not only teachers, but simultaneously act as facilitators, mentors, and sometimes course designers. A new specialization in online teaching is expected to develop, providing adequate training and selecting suitable teachers qualified for online teaching, so that there will be teachers qualified and experienced in the development and delivery of either synchronous or asynchronous teaching, or both. This might be a new challenge for teachers, as they will have to learn how to manage human interaction in online modes by such means as live chat, phone calls or video conferences. According to Lehmann (2008) even text-based messaging can produce high level of communication after training is provided, but in any case a teacher's relationship to technology will be intensified.

1.3.3 OL-Content

The successful incorporation of social interaction and a student's engagement with e-content would result in online content being developed collaboratively and appropriately with a technical pedagogical content (Assareh and Bedoukht, 2010). Consequently, e-learning programs could be extended to be suitable to cover many subjects, and Smith (2006) also suggested that a more student-centred e-content could help a great deal in resolving the problem of the high drop-out rate in OL.

1.4 Thesis Structure and Content

Following the Introduction in Chapter 1, this thesis presents first a Literature Review in Chapter 2, where it discusses previously published relevant studies, and summarizes and synthesizes the arguments and ideas of others concerning the following six questions:

1. What are the perceived drawbacks of e-learning?
2. What does interactivity mean in the context of e-learning?
3. What are the advantages and disadvantages of synchronous, asynchronous and blended learning?
4. What are the different types of interaction in the process of e-learning?
5. Are there any barriers to using e-learning for all subject disciplines?
6. Are there notable differences for educators and learning content when designing e-learning activities?

Chapter 3 then deals with Research Methodology; it explains the applied research approach, the instruments used for collecting data, how the data was collected, issues of sampling, and elucidates the reasons for various choices made in the process. Chapter 4 presents the Results and Findings, using a series of tables and figures to present the data collected more effectively. Chapter 5 contains the Discussion of Results and Findings; it interprets the results with reference to some of the earlier studies of the topic introduced in the Literature Review in Chapter 2. Chapter 6, the Conclusion and Recommendations, explains the remedial action to solve the main research problem mentioned in the introduction, and furthermore includes a discussion of the limitations of the study and suggestions for further work. A Bibliography and various Appendices conclude the thesis.

Chapter 2 - Literature Review

2.1 What are the perceived drawbacks of e-learning?

With the rapid progress of technology into the 21st century, e-learning is quickly becoming the fastest, most efficient and most effective way for businesses to provide job training for employees (Access Technologies Group, 2007). However, while the potential advantages of e-learning make it appealing, organizations embarking on e-learning implementations must keep two things in mind: for one, there are a number of potential drawbacks to using e-learning, and for another, successful implementation requires significant planning and effort. This section will briefly review potential drawbacks that are related to the specified thesis topic.

In 2006, a cross-school comparison was carried out to understand more fully the conceptions, obstacles and incentives involved in the use of e-learning technology by staff in the arts and sciences. One definite conclusion to emerge was that while some academics view e-learning as a passing fashion, others discern a clear benefit arising from its use (Alcoser et al, 2006). In summary, a great deal of care needs to be directed towards full knowledge of the vital but misunderstood tool in education that is e-learning.

The United Kingdom e-University (UKeU) is another example how the relative novelty of e-learning makes it unsuccessful if it is implemented without prior studying - after funding its distance education initiative in excess of \$113 million, UKeU stopped student recruitment in 2004 because of low enrolments (Garrett, 2004). Garrett (2004) explains that there are three main reasons for this failure: the timing of the start of the business, the focus on presenting online education as an alternative instead of as a supplement to traditional learning, and the confusion between the requirements of traditional higher education and online learning. Recently, Bacsich and Davies (2005) added another reason, namely that UKeU decided to develop a brand-new learning environment (platform), but did not even cite platform specifics as one of the critical success factors for UKeU. Although the focus of this paper is not to fully analyze these arguments, Garrett (2004) considered that the UK cannot present the same quality of traditional learning in online mode if it fails to implement best practice as part of the planning process. Garrett (2004) specifies in detail certain elements regarding the course content in UKeU – he criticises that it is too narrowly conceived and too concerned with course management only (rather than with content, pedagogy and instruction in online mode) and that it is too far away from a student-centred approach. Regarding the teaching staff of UKeU, Bacsich and Davies (2005) states that the UKeU appointed few members of staff with a good knowledge of e-

learning. Dawley (2007) drew attention to an important issue in distance learning, namely that we are in an era where learners are more knowledgeable than teachers when it comes to technology and the internet. This is definitely a factor which leads to a lack of students' motivations towards online learning. In summary, this criticism expresses that the three main elements of OL mentioned in the Introduction (e-learner, content, e-teacher) were not considered properly in order to work in online mode.

A report by Sloan in 2010 showed a small but definite decline in the number of chief academic officers who declared online education to be critical to the continued growth of their faculties. This highlights a critical issue - if less than one-third of chief academic officers accepts the value of online education, this means that there is a general discouragement from online education on the part of the decision makers. However, there is no single approach being taken by institutions in providing training for their teaching faculty in this area.

It has been noted that many universities have neither fully recognised nor systematically exploited the innovative potential of learning technologies (Schneckenberg, 2010). It seems that in an educational organization where online learning is used, the pedagogy can differ significantly from face-to-face classes. As the number of online courses and programs has increased, to make online courses a success it has become increasingly important that every faculty should become comfortable with online teaching and gain the necessary skills through staff training. Exploiting innovative technologies in e-learning, identifying the pedagogical differences between face-to-face and online learning, and staff training for online learning should be approved and encouraged by chief officers in academic organizations.

Yet another major reason behind the declining rate of e-learning is that most of e-learning resources still fail to involve the learner in the learning process due to a lack of interaction between learners and their peers on one side, and between learners and their educators on the other side (Sasikumar, 2008). As a consequence the course content is less useful (Welsh et al, 2003), students' motivation levels eventually decrease, and this results in high drop-out rates (Hamtini, 2008). Although Hamtini does not explain in detail the reason behind this, Smith (2006) suggests that student social interaction and successful integration into an institution's academic culture are features of the learner's experience that contribute significantly to a student's likely persistence in their studies. These features are very likely to be available in a traditional class-based learning, but for online learning they require better understanding of both the online pedagogy of e-teachers and of e-content, as will be explained later in this discussion. A final consequence of the lack of interaction in e-learning is students' feelings of isolation, together with a lack of self-direction and management (Hardman and Dunlap, 2003). Again, this results in a loss of intention to complete

a course of study. The success of an online learning course is doubtful, if the lack of student-teacher interaction (which results in the content being less useful), the students' lack of motivation and the high drop-out rates are not considered.

Sasikumar (2008) argues that students' feelings of isolation can be reduced by using better communication tools to enhance communication between the teacher and student in online learning, such as powerful simulations and multimedia capabilities. Lehmann (2008) similarly advises the use of more advanced tools to improve human interaction in online learning, such as live chat, phone calls and video conferences. These possibilities are for the most part an ignored or under-explored aspect of e-learning. When exploited effectively, e-learning enables a high degree of personalization and a wide range of instructional methods.

Section Summary

In spite of accounts and statistics which prove that the number of students enrolled in distance learning programs is rapidly rising in colleges and universities, e-learning has a number of weaknesses. With respect to the specific research topic of this thesis, the main drawbacks of e-learning as implemented today are:

- A lack of knowledge of its capabilities.
- A lack of encouragement by educational organizations to adopt e-learning, resulting in a lack of training for teaching staff.
- A lack of human interaction in OL which fails to engage learners to learn online.
- Identifying these drawbacks has allowed us to offer a number of suggestions on how to exploit e-learning efficiently, and to improve the quality student services designed to support online student learning.

2.2 What are the advantages and disadvantages of synchronous, asynchronous and blended learning?

Since the beginning of the 21st century, increasing importance has been given to considering the most effective methods of learning involving the use of impersonal technology and of direct human interaction in delivering information. Accordingly there are now a number of different modes of learning, such as synchronous, asynchronous and blended learning. Although face-to-face learning is a mode of considerable importance, it will not be discussed in this paper as it has no place in the selected case of OL. To decide which of these different modes is most appropriate for OL, the following section will explain each of these three modes in detail, and discuss their advantages and disadvantages.

2.2.1 Synchronous Learning

"Synchronous learning" is the term for real-time, instructor-led learning, called "synchronous" because it requires all participants (trainer and trainee) to be virtually present (as in, logged on) at the same time. Examples include audio conferencing with a shared whiteboard, VOIP (Voice Over Internet Protocol), video conferencing, and web casts (Paton, 2005). Specific integrated learning packages like Webex and Moodle also exist. Synchronous online learning is similar to traditional classroom learning through using the abovementioned technologies, although including physical separation of the participants. According to Mason (2003), synchronous tools are excellent for certain kinds of collaborative work, especially those requiring decisions about division of work between certain aspects of a given activity, or about the approach a group will take towards an activity. On the other hand, the main disadvantages of synchronous learning can be summarized as follows:

- Bandwidth may be a consideration. Online learning, especially when collaborative technologies are being used along with live video feeds, calls for reliable broadband connections. (Wright 2006)
- Lack of time flexibility, since all students must be in attendance at the same time.
- A certain level of confidence with technology is required (Business Software, 2011).
- It does not accommodate time zone differences between students dispersed all over the globe.

2.2.2 Asynchronous Learning

"Asynchronous learning" is more or less a self-paced learning event where the participants, trainer and trainee, are logged on at different times. It could be offered on CBT (Computer Based Training) or WBT (Web Based Training), available 24 hours per day and 7 days per week, so determined by the student's demand (Fallon and Brown, 2003). It is suggested to be the most flexible mode of learning. Explaining what "the student's demand" exactly means, Garrison (2003) notes that asynchronous learning supports virtual learning communities without diminishing the learner's independence of time and space. It also facilitates the transmission and assimilation of a large amount of information, as is the case with synchronous learning, a feature which can apparently help in the case of limited internet bandwidth. In accordance with the nature of a non-real time learning situation, there is a need to store the learning content, and to provide special tools to facilitate communication between learning participants - these may involve e-mail, discussion boards, chat rooms etc. According to Mason (2003), asynchronous learning is excellent when it involves students in using discussion forums as the focus for presenting their work on individual activities. In other words, it has the ability to provide a collaborative learning experience at the convenience of the individual - asynchronous learning offers both interaction and independence. According to Garrison (2003), one of the main advantages of asynchronous learning, which differentiates it from synchronous learning, is that it encourages the learner's reflection to interpret and construct knowledge by giving the learner time to reflect.

The main disadvantages of asynchronous learning can be summarized as follows:

- Limited interactivity and efficient collaborative learning between student and teacher. A student who does not feel connected with the class or instructor may lose motivation (Assesswave, 2002).
- No immediate feedback, so students are not provided with immediate explanations for possible areas of concern (Business Software, 2011).
- Teachers do not provide immediate feedback on a student's performance, leaving adjustments to training until after an evaluation is completed.(University of Adelaide, 2011).

After selecting the mode, the communication technology within the selected mode of learning should be considered. According to Anderson (2003) the relation between the student's time and place restrictions and the selected learning mode and technology of interactions is illustrated in the following diagram:

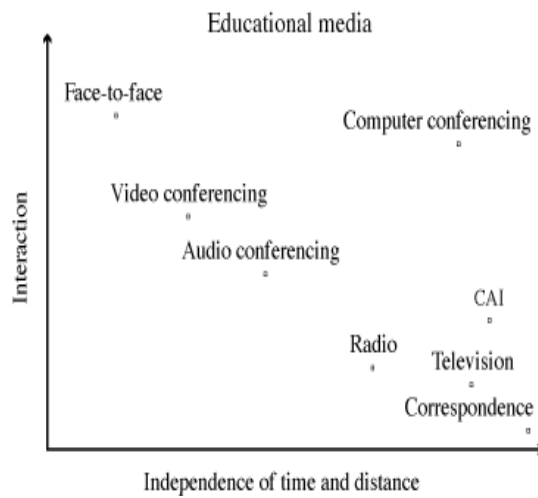


Figure 1: Relation between interaction and independence of time and distance(Garrison and Anderson, 2003)

The previous diagram illustrates that the selected technology of communication depends of the student time/place flexibility as explained in the following table:

Student time flexibility	Student place flexibility	Learning mode and used technology
flexible	flexible	face-to-face
flexible	restricted	synchronous (i.e. video conference)
restricted	restricted	Asynchronous (i.e. e-mail)

Table 1: Interaction and independence of time and distance

2.2.3 Blended Learning

Blended learning embraces all learning types in a blended approach (Wright, 2006), as it integrates distance learning with traditional learning techniques. The following diagram by Bates and Poole (2003) illustrates the contributing elements

in blended learning and the proportion of e-learning according to each element.

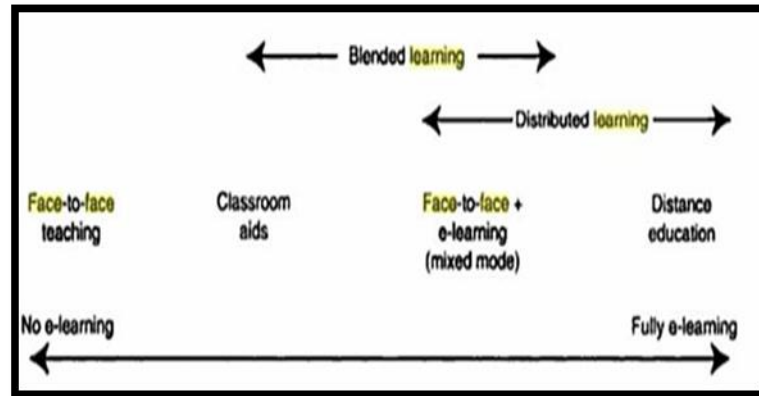


Figure 2: The continuum of technology-based learning (Bates and Poole, 2003)

Thorne (2003) lists a number of advantages of blended learning, which provides focused and targeted learning with appropriate timing. It achieves intercommunication between trainees and their trainers, and between the trainees and their peers, thus increasing learning effectiveness. It furthermore makes use of a variety of techniques and technologies, and thus offers a dimension of flexibility in learning. (Thorne, 2003). In addition, Fong, Kwan and Wang (2008) stress the importance of human interaction between learners and educators, and add this perspective to the definition of blended learning. They explain the importance of using a facilitator and also promote various types of interaction between trainer, trainee and course material (Fong, Kwan and Wang, 2008).

In summary, the blended learning model can combine different learning modes from face-to-face to distance learning, different learning resources from books to language labs to videos, different learning paces from self-pace to group-pace, and different learning timings from synchronous to asynchronous. These components can furthermore be combined by different degrees, so that for instance in one organization the proportion of face-to-face to distance learning could be 40% to 60%, while in another community it could be 30% to 70%. A given business can decide what ratio of face-to-face and distance-learning would fit their learning objectives best. The possible combinations between these different components that can be realized in blended learning are shown below:

Instructional strategy	Lab	Teacher-facilitated	Practicum	Self-study
Delivery mode	Online	Face-to-face	Face-to-face	Online
Pace	Self-paced	Group-paced	Group-paced	Self-paced
Time	Asynchronous	Synchronous	Synchronous	Asynchronous
Learning object	Simulation	Video	Video	Audio

Table 2: Different components in blended learning (Fong, Kwan and Wang, 2008)

Compared to other learning modes, there are not many disadvantages to blended learning. One of these concerns the learners' attitude towards non-traditional methods for delivering information, as their only experience may be face-to-face learning, and they may not show interest in or enthusiasm for any other method (Woodhouse, 2007). Pressure of time can also mean that time for discussions or the introduction of new topics can be limited. Extensive training for teachers is required, as blended learning involves the skills of both face-to-face and online teaching (Bray, 2006). Finally, in some cases learners may be in a situation where 100% of the course content has to be delivered online, since there are no facilities for the face-to-face part of the blended learning.

From the researchers' point of view the term "blended learning" is actually redundant, as there is no learning that is not blended. Even when reading a text on a screen, this is blended with the reader's experience when it is actually used. Aldrich (2004) explains that the main purpose of blended learning is as a support to the classroom's core learning course. In other words, in the current situation of blended learning the core course is face-to-face, while e-learning is just an added supportive part. However, if technological tools for user interaction and engagement such as multimedia and social networking programs were to be used successfully - more on this later - this situation would be reversed, since such tools use the classroom as an added supportive part for an e-learning core course. Also, in some cases blended learning cannot be applied because face-to-face mode is not affordable for OL students.

Section Summary

Obviously, each learning mode has its advantages and disadvantages. According to Clarke (2003), learning is most effective when individuals have choices in their different learning experiences and environments. However, Piscurich (2002) suggests that to provide a better online course with a good level of student engagement with the course content, a course should fluctuate between synchronous and asynchronous learning modes.

2.3. What does interactivity mean in the context of e-learning?

The following section is divided into two parts. The first part explains what is meant by the term "interaction", and discusses the degrees of interactivity between computer and computer user. The second part then focuses on the relationship between this computer interaction and e-learning in general as well as OL specifically.

2.3.1 Computer Interaction

According to Webster's Dictionary, "interaction" is "a mutual or reciprocal action or influence" (Webster, 2011). The word "mutual" implies a social dimension which makes interaction a process consisting of actions, reactions, and shared adaptation between two or more individuals. With regard to computer interaction specifically, Thing (1997) defines this as "a dialog [which] occurs between the user and the computer", and identifies three levels of interactivity:

Low Interactive programs like batches or background, middle Interactive programs like business application and high Interactive programs like games and simulations.

In 1998 Dix et al, describe both the Middle and High Interactive Programs as "direct interaction" and the Low Interactive Programs as "indirect interaction", but explain that in both cases (direct and indirect interaction) the user is in fact interacting with the computer in order to accomplish a certain task. The main components of this interaction are dialogue, feedback, and control throughout executing the required task. Both Thing and Dix et al's definitions explain interaction from the side of the computer, but Maron (1999) adds a part relating to the user to the definition of computer interaction – even in indirect interaction, it seems fairly clear to the user that interaction refers to what happens on the user's display when they click their mouse and type on their keyboard. In direct interaction, the user's part means envisioning and creating a certain task (for example a chart, map or image) and how this should be done in a specific application.

Shedroff (1999) analysed interaction in detail, explaining what happens to a user when they are interacting with the computer during and after a specified task, as illustrated in the diagram below:

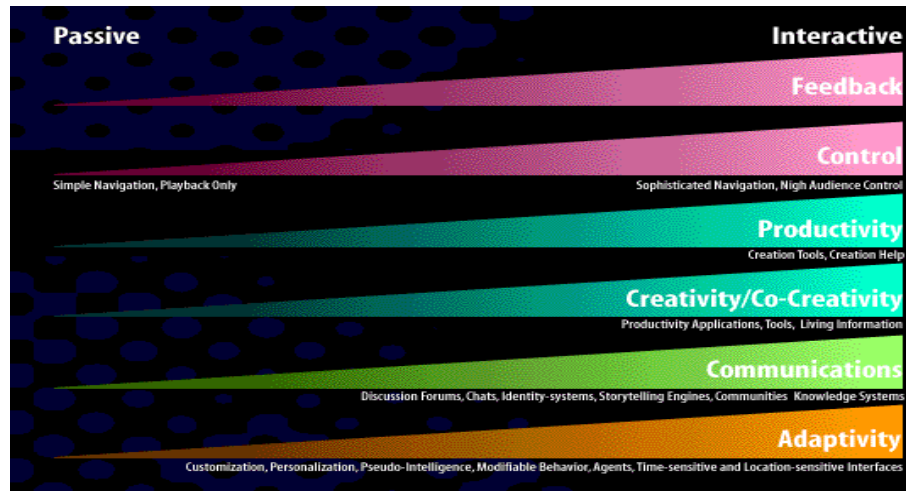


Figure 3: Components of interactivity (Shedroff, 1999)

It is obvious from this diagram that elements such as productivity, creativity, communication and adaptability confirm that interactivity is a user-centred approach more than a machine-centred one; in other words, if the computer program fails to provide the user with something to create his own experience, or with a means to communicate with another user to share experiences, it is not interactive, but passive.

Another recent perspective was added to the issue of interaction by Winograd et al (2011), who explain how the revolution of social media has affected the engagement between computer users, so that it is now not restricted to voice or text (Wadley et al, 2011), but goes far beyond this to all other media like video, live web meetings through web cameras, or social network such as Facebook, Wiki, blogs, or Twitter. Most programs like Facebook and Twitter provide the social community with a second, virtual life used in work, study and entertainment, because they enable users to interact both synchronously and asynchronously. With the new technologies available for mobile phones, users can furthermore integrate Facebook Chat, tags and notifications with their mobile phone to receive instant messages (Miller, 2011), so that they will not miss any messages or notification when away from their computers as they are keeping in touch with their social network via their smartphone's web browser. This option also enables users to multi-communicate – they can chat online, or send and receive messages while having a video conversation at the same time.

The above discussion shows that interaction and technology are related, and it may also give the impression that expensive and highly up-to-date technology is required for satisfying and successful interaction. However, although Maron (2003) discussed the correlation between technology and interaction components and considered them key elements for any online learning course, other research has shown that the key to success in online learning lies in strategies which facilitate communication and enhance social presence among online learners, not just the application of the newest technologies (Du Vall et al, 2007). Schone

(2007) also explained that these elements do not need to be expensive or complicated to develop an interactive learning course. Even for Marion (1999), interaction design may not be reduced to technological components, although it does entail their use. Consequently, there is no condition to use certain technologies at certain times to achieve an interactive learning course; instead it is a matter of understanding the learning objectives and the learners' needs, designing the instructional approach well, selecting the interaction level which achieves these objectives and designs, and selecting suitable tools which achieve the required interaction.

2.3.2 E-learning and Human Computer Interaction (HCI)

As a result of the close relationship between interaction and computer, and because e-learning is presented primarily by computers programs, as mentioned before, the following section will deal with interactive e-learning.

Online students are not like traditional students who attain knowledge from printed materials; they are involved in a certain endeavour, for example on-the-job training, and also exposed to related events such as contributing to discussion forums of their peers.

Horton (2006) defined interactive e-learning as the use of computer and technologies to create learning experiences, but Schone (2007) focuses on the process itself, explaining that a learner's experience should be the objective to achieve a certain task which considers and maintains the learner's goals and interests. Another point of interest is the sequence of this process. The Mac World San Francisco '98 Conference specified this experience be a dynamic experience, a term which implies understanding the difference between a static and a dynamic experience and their relation to e-learning. According to Fleming (1998), the course design approach (interface, visual effects etc.) and the pedagogical approach are both part of crafting a dynamic learner experience. Although Shedroff's explanation of a dynamic experience is somewhat dated (1994), it is quite simple and direct, comparing interactivity to storytelling. A good storyteller who captures their audience and engages their listeners creates a dynamic experience. More recently Lahanas (2010) discusses dynamic experience in more detail by considering it as a triangle with the three sides Learner-Centric, Content-Centric and Discovery-Centric.

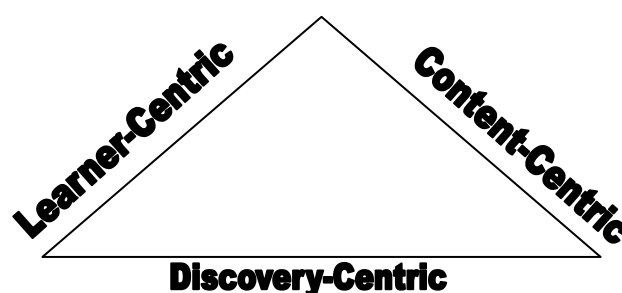


Figure 4: Dynamic experience as explained by Lahanas (2010)

Static learning is the traditional learning we are all familiar with, described by Chatti et al (2010) as the predefined presentation of knowledge. For easier understanding it can be compared with dynamic learning as follows:

Static Learning	Dynamic Learning
Designed more for assessments (Lahanas, 2010)	Designed more for knowledge assimilation
Knowledge is push only direction, top-down (educator-learner) (Chatti et al, 2010)	Knowledge is a fluid move in all directions (push/pull)
Fixed and limited discovery	Unlimited discovery
Content-centred approach, according to pre-packaged content and pre-defined rules (Chatti et al, 2010)	Learner- and content-centred approach (Lahanas, 2010)
Learner receives information only (Schone, 2007)	Learner sends and receives information

Table 3: Comparison between dynamic and static experience

Section Summary

Interaction is not simply the click of a mouse or a moving animation on the screen (Fleming, 1998), nor simply the application of the most expensive or most up-to-date communication technology. Instead, interactive e-learning should:

- Build and maintain the learner's identity (goals, interests, needs and abilities).
- Give the learner the ability to communicate with others and to share experiences.
- Give the learner the opportunity to generate the content themselves, make decisions, challenge and explore.

2.4 What are the different types of interaction in the process of e-learning?

The above definition of interactive e-learning as the process of creating the learner's dynamic experience involves many parties (catalysts) which contribute to forming this experience. As suggested by a number of researchers, these parties or catalysts are the learner (student), the educator (teacher), and the content (e.g. Moore, 1989, Anderson, 2003 and Sasikumar, 2008). The following section will discuss these parties and the direction of the relationship between them in detail.

2.4.1 Teacher-Student and Student-Student Interaction

According to Sasikumar (2008), communication and active engagement is restricted to the human factor only, namely interaction between the teacher and student and interaction between student and student. This type of interaction encourages students to feel that they are part of an online learning community, and reduces their feeling of isolation (Benaya and Zur, 2007).

However, while Sasikumar's main assumption is based on human interaction only, there are in fact other types of interaction which engage the OL student, and which are related to the content (to be discussed in the following section), and Sasikumar (2008) furthermore does not take teacher-teacher interaction into account. For an asynchronous and synchronous distance learning environment Sasikumar (2008) presents the available tool of the discussion board as a method of collaboration and engagement between learners and educators (Sasikumar, 2008), but Dawley (2007) adds more advanced applications to communicate with learners such as Wikis and blogs. Serwatka (2005) gives some hints about how teacher-student interaction can help to reduce the OL drop-out rate - it should be considered to respond to the student as swiftly as possible, and it is also important to explain to the student when a response within 24 hours can be expected, when not (e.g. at the weekend), a measure which will reduce the student's frustration and enhance their engagement with the course.

2.4.2 Student-Content Interaction

According to Anderson (2003), although student-content interaction is a main component in traditional learning, a unique feature exists in online learning since the student can find a practically unlimited number of exercises in virtual labs or online computer-assisted tutorials. Serwatka (2005) drew attention to the fact that such unlimited resources can lead to time-consuming searches and students' frustration if the content is not provided with a proper search engine which enables students to find the appropriate material quickly.

There are other features that can engage the students with their course content such as pop-up windows and "mouse over events", events that occur when the mouse pointer rests on the control; such contents respond to student behaviour and attributes. The immediate access to a live chat with tutors through a "Help" button is yet another possible feature.

The important issue here is to achieve a balance between the interaction of student and content on the one hand, and providing the students with support and required skills to deal with this content on the other hand. If this balance is not achieved, this will lead to feelings of helplessness and frustration on the students' part. Describing learners in online learning, Knowles (1975) observed that "students entering these programs without having learned the skills of self-directed inquiry will experience anxiety, frustration, and often failure" (Knowles, 1975, p. 15). In other words, if these skills are not existent within the student, an e-learning course will not be effective. This highlights two main issues: one, in a distance learning environment, students need significant support through interaction with others (e.g. peers, instructors, learner support services personnel) (Hardman and Dunlap, 2003), and two, paying attention to the interaction between student and content is expected to reduce feelings of social isolation and thus the drop-out rate.

Accordingly, Jonson (2006) added one more type of interaction which is that of student-computer (software/interface). Shanks (2010) defined the role of computer software/interface in this type of interaction, which includes technologies used to deliver the content and tools for interacting with it and with others in the course. Johnson (2006) specifies this as the most challenging of all interaction types for several reasons. It is not existent in traditional learning, so both learners and educators are new at dealing with this technology, and it requires the learner to learn the technology necessary for online learning before they can begin learning the course content itself. According to Shank (2010), course design technology is rapidly changing and being updated, and accordingly even if the learner learns how to use a certain tool (for example a webcam for synchronous lessons) in one course, the tool will be most probably updated the next year for the same course.

Anderson (2003) added yet another characteristic to the student-interface interaction, namely the ability to be adapted according to the individual user for issues such as font colour, font size, or even exam time. On the other hand, Pike and Huddleston (2006) warn that interaction should not be mediated through interface elements like windows and buttons, but should directly involve the learning content.

2.4.3 Teacher -Content Interaction

The interaction between teacher and content is directly concerned with two main issues. The first is assessment; according to Sasikumar (2008) assessments testing the course and evaluating the students' progress reflect the overall quality of the e-learning course. Accordingly, assessment results provide the teacher with feedback and enable him to interact with the course content to modify or create learning activities that improve the learner's results. The second issue is related to the online course's updatability feature; according to Anderson (2008) this feature allows teachers to continuously monitor and update the content resources and activities which they create for student learning.

2.4.4 Content- Content Interaction

According to Anderson (2008), the content-content interaction is one of the new types of interaction, because it is based on the interaction between one content with another, automated content, so that it can refresh itself constantly and acquire new capabilities. However, it is based on advanced technology of communication. For example, a geographical tutorial course could be based on a weather forecasting server so that the course content is updated continuously. Accordingly, it is suggested that online courses should be provided with a RSS (Really Simple Syndication) tool as an advanced format for delivering regularly changing web content (King, 2003). Another feature of content-content interaction, according to Anderson (2004), is that when a student achieves a certain score in an online assessment or even an educational game, the teacher's application will be informed immediately of this result – the teacher is alerted immediately of any unusual activity (Moore, 2007). This definitely increases a student's engagement and interaction with an OL course.

2.4.5 Teacher - Teacher Interaction

According to Anderson (2008), this type of interaction is important because it enables teachers to exchange their experiences with each other, and thus it encourages teachers to develop their knowledge in their own subject and within the scholarly community of teachers. With regard to the learning process in general, Burden and Miller (2007) state that there is a surprising lack of descriptive research on the elements which actually occur during teacher-teacher collaboration. As evidence they quote Weiss and Brigham (2000, o. 243): "We do not know what teachers do in the co-taught class on a daily basis" and Austin (2001, p. 246):

"Because a collaborative model is both recommended and used in inclusive classrooms, one might infer that the interaction of co-teachers has been

examined extensively and that the criteria for an ideal model have been defined. However, this assumption is unsupported."

The lack of research on teacher-teacher interaction is a result of a lack of teacher–teacher interaction itself, and the suggested reasons behind this lie in three distinct phases. The first phase consists of the professional preparation of courses as teachers need specific training and practice to know "how to work, communicate, and collaborate with other adults" (McCormick, Noonan, Ogata, and Heck, 2001, p. 130). The second phase takes place within the working experience - Anderson (2004) mentions that teachers are used to work in relative isolation. The third phase is concerned with the educational organization for which the teacher works - school or college managers need to train, supervise and monitor teachers to practice this interaction with each other (Anderson, 2003).

In spite of the previous concerns about the lack of research on teacher-teacher interaction, Moore (2007) finds that online teaching gives a better chance for teachers to interact with each other, develop their skills, and enhance the quality of teaching as a whole. NEA (2003) adds another benefit - teachers can observe master teachers who work with effective strategies and through live chats with those master teachers reflect on the efficiency of their own teaching. As NEA (2003) points out, the pedagogical and technical experience a teacher can gain through online interaction is not restricted to teachers at the same institution, but can be accessed through emails and all kinds of networks like scholarly forums.

Section Summary

Interaction types between the three main elements in OL can thus be illustrated as follows:

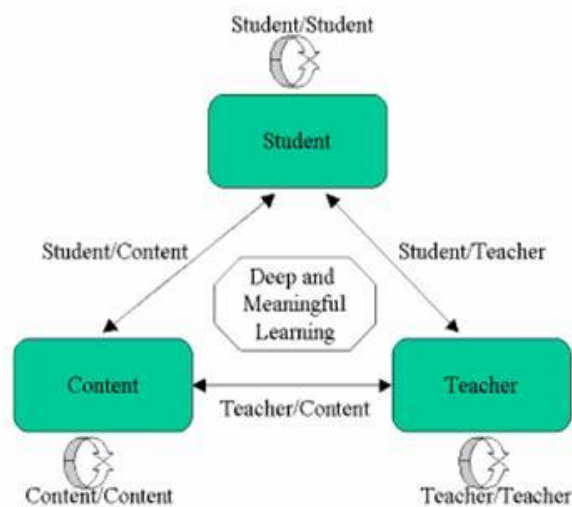


Figure 5: The interaction theory topology (Garrison and Anderson, 2003)

Both teacher and content are vital components in interactive distance e-learning. Accordingly, the interaction between both should be planned, designed, implemented, observed and evaluated efficiently and constantly.

2.5 Are there any barriers to using e-learning for all subject disciplines?

The following section discusses one of the most critical success factors for e-learning delivery, the ability of online learning to present any given subject matter. In his report Sloan (2010) states that almost all online enrolment growth takes place on existing programs, not as the result of the initiation of new programs or because of institutions beginning online instruction (Allen and Seaman, 2010). This means that the potential of e-learning to cover all subjects is limited or undiscoverable.

Codone (2001) suggests that not all content is suitable to be delivered via e-learning. If this suggestion is true, it would threaten some learning situations. In India, for example, science subjects are mostly taught as postgraduate courses in one or two years in a face-to-face learning mode. Because of the short duration of the course and because the quantity of knowledge and skills that need to be taught is continuously increasing, aspects of the course which cannot be delivered during regular face-to-face courses are taught through e-learning (Kumbhar, 2009). A more general problematic situation exists if a student does not have any access to learning except through e-learning because of his working situation or geographical obstacles. Codone (2001) cites two main reasons behind his suggestion that not all subjects are suitable for e-learning: either students need face-to-face contact with the teacher for further explanation; or the content itself needs real-life events to be explained such as field trips or science lab tests. Logan et al (2007) agree in stating that in fields like art, the available technologies have not yet proved their worth in replacing traditional materials and means such as, for example, clay for sculpture.

Another reason for the limitation of subjects is the shortage of professional teachers in e-learning in specific areas. Clarke (2003) lists subjects such as Science, Engineering, Mathematics, English as a Second Language, and Modern Foreign Languages as subjects which suffer a shortage of specialist in e-learning. This is because e-learning has not attracted sufficient teaching staff to supply the needs of the school curriculum. Obviously, if e-learning does not attract teachers' attention the potential of e-learning technologies to improve the quality of teaching (such as simulations, technologies to communicate with remote classrooms such as webcast master classes, video conferencing and online tutoring) remains unexploited. Noticeably, these issues require both direct funding from educational organizations to provide the resources and teachers' professional training in order to exploit the potential of e-learning to improve the quality of learning through interactive computers, online communication, and information systems in ways that other teaching methods cannot match.

OECD (2005) conducted a survey at a number of universities, questioning teachers, students, and administrators as to their views on whether certain

subjects might be suited to be delivered through e-learning. The results of the survey vary considerably between universities. The University of South Australia and University of British Columbia, for example, find that e-learning is appropriate to all subjects areas or programs, and even for subjects which require extensive practical work, as for these electronic simulations were both possible and desirable. Others disagreed - Zurich University argued that e-learning was beneficial in a mixed mode with a face-to-face class, but not on its own; Aoyama Gakuin University restricted the use of e-learning courses to introductory, but not advanced courses.; and Carnegie Mellon University regarded e-learning only suitable for foreign languages or problem-solving courses, but not for example historical or political analysis. The reason behind these negative answers is the fear that the absence of face-to face interaction between teacher and student may affect the pedagogical value of learning.

On the other hand, in the same study universities like the Open University Catalunya disagreed with the previous limitations and pointed to successful e-learning courses in Literature and Art. In their view, features such as remote connection and synchronous and asynchronous interaction are beyond the scope of face-to-face learning situations, and give online learning a competitive advantage.

Section summary

There are two main issues here. The main requirement to extend online learning suitability to all subjects is an extended knowledge about e-learning capabilities. In addition, the shortage of qualified OL teachers specialized in different subject is an issue related to two factors: the direct funding from educational organizations to provide resources, and professional training for teachers in order to exploit the potential of e-learning.

2.6 Are there notable differences for educators and learning content when designing e-learning activities?

2.6.1 Educators in online learning

In order to answer the question whether there are differences for educators when designing e-learning activities as opposed to traditional learning activities, it is essential to identify the job description of an e-tutor. The following section discusses duties that e-tutors share with face-to-face teachers both from the point of view of the learner and the educational organization, focusing on the challenges that are unique to e-tutors.

A survey by ELF (E-Learning Facilitator) in 2006 questioning 107 e-learners from different countries about the main duties of an e-facilitator had the following results:

Name given by the learner	Number of occurrences
Tutor	19
E-tutor	18
E-prof (or e-professor)	15
E-facilitator	8
Facilitator	5
Trainer	5
Instructor	4
Teacher	4
Professor	3
Adviser	1
Course leader	1
E-book, E-tutorial, How to, RFC	1
E-trainer	1
Helpdesk	1
Mentor	1

Table 4: What is the role of an e-learning facilitator from the learner's perspective? (ELF, 2006)

This figure shows the online educator's role from the learners' point of view, but according to ELF (2006) there are other roles for e-tutors which learners cannot see, starting from course designing and planning to implementation and course delivery. Fetaji (2006) explains in detail that instructors are normally expected to develop the content of e-learning or at least to select effective methods to present their content to users, and to achieve the OL interaction with learners. Obviously, novice instructors need additional support and training since this involves technical and new pedagogical knowledge. NEA (2003) highlights another issue in the nature of e-learning, namely the lack of a full array of visual and oral cues and use of body language which help listeners to interpret a speakers' message. In light of this it is important that e-teachers be sensitive to problems of

misunderstanding and demonstrate an appropriate use of both synchronous and asynchronous modes of communication to guide students.

Pierce (2008) explains that both traditional and online teachers may share tasks, for example communicating with students, but that online teachers face a number of challenges which traditional, face-to-face teachers do not have to contend with. E-learners and their instructors are, for example, unable to see the visual clues that often help us understand the meaning behind another person's words. Additionally, communicating primarily through text takes more time, and technology itself can create a barrier to learning, for example if there is a bandwidth or transmission speed limit.

As regards the first point, Lehmann (2008) argues that there is human interaction in online learning, and that other means like live chat, phone calls video conferences and even text-based communication can produce a high level of communication, which should however be with highly skilful instructors.

Although according to Pierce (2008) communication through texts is considered harsh and cold, Lehmann (2008) argues that communicating through texts can have a deeper effect in the recipient's memory than face-to-face communication - no reader can, for example, forget a book that made them laugh out loud. Again, this depends on the online tutor's proficiency in reinserting the human connectedness that may otherwise be missing.

Clarke (2003) confirms that teachers' access to technology is limited, which affects the quality of teaching. He explains there is too little training or reward for teachers and lecturers who wish to adopt or develop e-learning, and that consequently, in the absence of administrative support and access to technologies, teachers will be both unwilling and unprepared to face the challenge of online education (NEA, 2003). Obviously, this is not a decision to be taken by the teachers alone, but one which involves the leaders of colleges or universities as well.

Schekberg (2010) summarizes the problem and its solution in a sequential pattern as follows:

- Awareness of the technology-driven change and the potential of e-learning features and capabilities.
- Successful implementation and involvement of technology-driven innovation in education.
- Teachers will be motivated to acquire e-competence and to make use of learning technologies.

Section Summary

In summary, there are distinctive differences between e-teachers and face-to-face teachers. In order to further develop the potential for success as online teachers and learners, e-teachers need pre-course preparation for e-learning features and characteristics of the online environment, not only practicing or learning on the job (in service training). More incentives to teachers, such as qualifications, career promotion, and access to technology are required to encourage them to learn more about these new technologies.

2.6.2 Content in online learning

In order to maintain engagement throughout the learning process and ensure effective learning, relevant content and design is also important. According to Fetaji (2006), the quality of the virtual learning environment is mainly dependent on the quality of the presented e-learning content. Rhode (2007) points out the importance of content in e-learning because it contains the complete assortment of instructional materials, learning objects, assigned readings, resources, etc. Thus, content is the resource and reference for both the instructor and learner.

From the perspective of interactivity, Fetaji (2007) assigned the content importance as a key factor for communication and engagement between content and the other elements (teacher-student). Flexibility and storytelling are particularly important engagement features (Ahdell and Anderesen, 2001) – in online learning, interaction and communication with real people may or may not be involved, and consequently the importance of interaction and communication between the content and student and teacher is as important as the communication between student and teacher.

As regards the learner's benefit, Leuf and Conningham (2001) highlight the role of content in creating the dynamic knowledge bases of learners which are to be used for widely collaborative activities. When the learner interacts with the content and edits it (as, for example, in Wikis), it shifts to the construction of knowledge rather than the abstract presentation of information (Karasavvidis, 2009). The e-content here works to shift the student's role from that of a passive receptor to that of an active sender and receptor. In spite of this, as Leuf and Conningham (2001) observe, few researches focus on the importance of e-content.

The purpose of developing content for e-learning is different from that for traditional learning purposes, as Fetaji (2007) explains: e-content starts with planning, continues with writing the content and finishes with putting the material into an interactive format, which requires instructional designers, programmers and graphic designers respectively. Classic or traditional content, on

the other hand, only requires planning and then writing the content. Kollias (2005) describes e-content as a complex web of technological, economic, social, cultural and educational realities, and Assarahand Bedoukht (2010) added the words “careful mixture”, since e-content contains human resources, hardware and software applications, standards for interactivity and media, and design parameters based on user capabilities.

The previous suggestion implies the importance of identifying the traits of e-content. From the learner’s side, content should be student-centred (Pike and Huddleston, 2006). The reason behind this is that in the past teachers would control the pace, place, time and style of presentation and interaction. With e-learning, however, the control of these elements shifts to the student (Blassand Davis, 2003). Accordingly, e-content needs to hold the student’s engagement and attention, and to meet the students’ needs. Obviously, content irrelevant to a learner’s objectives can destroy his enthusiasm towards the course.

From a technical side Codone (2001), who is Manager of Interactive Multimedia at Raytheon Interactive in Florida, adds several other, technical traits such as interoperability (compatibility with multiple operating systems and internet browsers), the ability to be customized and adapted by user preference, and the flexibility to navigate, update, and access the sequence of the courseware - accordingly, content design should incorporate frequent updates and links to changing web content such as news websites. A bias-free e-content means in detail to create strategies, methodologies and technologies for the development and diffusion of inclusive e-learning contents to ensure that all learners regardless of their gender, race or ethnic origin, religion or beliefs, disability, age, social and economic condition or sexual orientation have access to high quality e-learning contents (Kollias, 2005).

From the instructional side, e-content should create and evaluate students' learning experience as well as their learning outcome (Fetaji, 2006). Pike and Huddleston (2006) list the components of instruction as learning objectives, material and assessment, and define the content in e-learning as the starting material which feeds the instructional design process. Allen (2003) adds the interaction prospective to the instructional content, and defines it as "the interaction which actively stimulates the learner's mind to do those things which improve ability and readiness to perform effectively". In other words, content should require the learner to think, make choices and reflect on the consequences and feedback from those choices – "interactive content" is not just navigation or browsing.

Section Summary

Most previous researchers deal with e-content from three perspectives, namely instruction, participation and access (Blass and Davis, 2003). More care with interaction is required, focusing on developing e-content which is capable of communication with student, teacher and other content. If multimedia and audio/video programs, social networks and other interactive tools in e-learning content support instructional strategies and design methods, this will lead to a higher level of learning and more engagement of the learner with the course.

Chapter 3 - Research Methodology

In this chapter the research methodology used in this thesis and the methods used for collecting data (questionnaire and experiment) are presented.

3.1 Rationale of Approach Adopted

The choice of appropriate research method is dependent upon the research problem and the best methodological fit, not on the researcher (Marshsall, 1996). However, the research for this thesis is exploratory descriptive depending on behaviours, experiences and attitudes of respondents; in other words, new ideas and concepts are generated in terms of the reasoning and overall structure of e-learning programmes in order to determine the extent of a particular phenomenon (interaction) within a specific population (distance learners). For these reasons, a quantitative approach is the best method, as it provides familiarity with the case and unlocks ambiguous information through numerical signification (Ryan (2006) and allows the summarization of vast sources of information and facilitate comparisons across categories and over time (Kruger, 2003). According to O'Neill (2008), one of the main advantages of the quantitative approach is generalization and accuracy of results. According to Abeyasekera (2002) accuracy means the reporting of summary results in numerical terms with a satisfactory degree of confidence.

For a research question such as "What are the advantages and disadvantages of synchronous, asynchronous and blended learning?", for each characteristic a scale rate from "excellent" via "very good", "good" and "fair" to "poor" is provided, and the number of respondents for each individual scale level can be converted into a numerical illustration of the advantages and disadvantages of each learning mode. The comparison and correlation of the final mark for each group (experiment group and control group) also yields quantitative data, so it is evident that there is a need for the collection of numerical data. This opens up a question: if there is a phenomenon which does not produce quantitative data (an issue very common in education research), does this mean it cannot be searched quantitatively? If the answer to this question is 'Yes', this will severely limit the use of quantitative approach. Muijs (2004) clarifies that the quantitative approach has its research instruments like questionnaires or tests which can convert data which does not produce quantitative information into quantitative data. For example, to identify teachers' attitudes towards a student-centred approach, the questionnaire might ask them to rate a statement as "strongly agree", "agree", "disagree", and "strongly disagree", and these responses can be interpreted as numbers from 1 to 4.

Accordingly, the selected research instruments are a semi-structured questionnaire as well as an experiment. For data analysis Microsoft Excel has proved very useful for generating graphs to illustrate results.

One of the main disadvantages of a quantitative approach is that its tendency towards generalization can lead to lack of in-depth study of human nature; however, it does not gain insight into particular events as well as a range of perspectives that may not have come to light without that analysis (Vine, 2008). Rather than the results of generalization, Beeftink (2003) focuses on the reason behind this generalization - in the quantity approach, the main focus is the quantity of the collected data, and it does not imply watching, listening, feeling, asking, recording, observing or examining participants' observations. The researcher is therefore detached from their research (Cohen et al, 2007). On the other hand, this has other benefits, as Learn Higher and MMU (2008) explain that when researchers keeping their distance from participating subjects means that personal bias can be avoided, and it furthermore allows for a broader study, involving a greater number of subjects. Using standards means that the research can be replicated, and then analyzed and compared with similar studies. The possibility of using research instruments to convert non-numerical data into numerical data (as mentioned earlier) makes this approach quite flexible (Muijs, 2004). Finally, defending the lack of accuracy in the quantitative approach, Cohen et al (2007) indicate that carefully controlled questions in questionnaires can make it more accurate and reliable.

3.2 Further Considerations Relating to Research Method

3.2.1 Ethical Considerations

Before undertaking any research, advice and guidance from the Research Governance Office (RGO) at the University of Southampton was sought, and no research was conducted before approval from the RGO had been granted. All documentation relating to ethical requirements is included as Appendix 2.

3.2.2 Respondents' Background

Respondents were students and teachers from two different countries, the Kingdom of Saudi Arabia and the United Kingdom, studying or teaching different courses such as IT, business, and foreign languages in educational institutes or academic centres.

Study in these centres is non-compulsory further education, within a broad spectrum of learning activities and programs - students apply to these centres to

develop their skills. Courses are intended for both adult learners those beyond traditional undergraduate college or university age, as well as for undergraduates who would like to prepare for a successful future career. The students' age is between 20 and 50 years of age, from various backgrounds, experience, qualifications and spoken languages.

The data was collected face-to-face to clarify any problematic issues and to guarantee that the questionnaires were indeed delivered to the intended recipient. Because of the different languages used in the two countries the course and questionnaire were translated from English into Arabic. The total size of the sample was 56 respondents, including 36 students and 20 teachers. The purpose of the selection was to achieve a mixture of data or methods, so that diverse viewpoints would be highlighted upon a point “known as triangulation” (Olsen, 2004). Cohen et al(2007) stress the importance of triangulation in social science research, since it explains the richness and complexity of human behaviour.

3.2.3 Technical Considerations

Students were asked to study a short online course on "Network Fundamentals" with a simple assessment at the end. This course, in which all interactive elements from the researcher's point of view were functionalized, was designed by the researcher. The reason for delivering this course was to give students some experience of distance learning to enable them to better answer the questionnaire after finishing the course. Furthermore the course is the basis of the experiment as an instrument to collect data - students who studied this course with interactive elements were the experiment group, those who did not were the control group.

3.2.4 Limitations

The number of teachers in the selected sample (20 teachers) is less than the suggested number of 30 (Cohen et al, 2007), the reason behind this being that the sample was collected from educational centres where the average number of students is approximately 50, distributed over five to eight classes. This means an average number of seven teachers in each centre, plus a number of freelance teachers who work in the centres.

The time limitation of the research meant it was not possible to measure some factors over a longer period of time, for example the drop-out rate of e-learning - according to Smith (2006), this issue has been argued over at length, but there are not consistent conclusions about the degree of this problem. Additionally, also due to time constraints it was not possible to use some qualitative research

instruments such as interviews and observation to study the human experience in depth which would help to answer the research questions qualitatively.

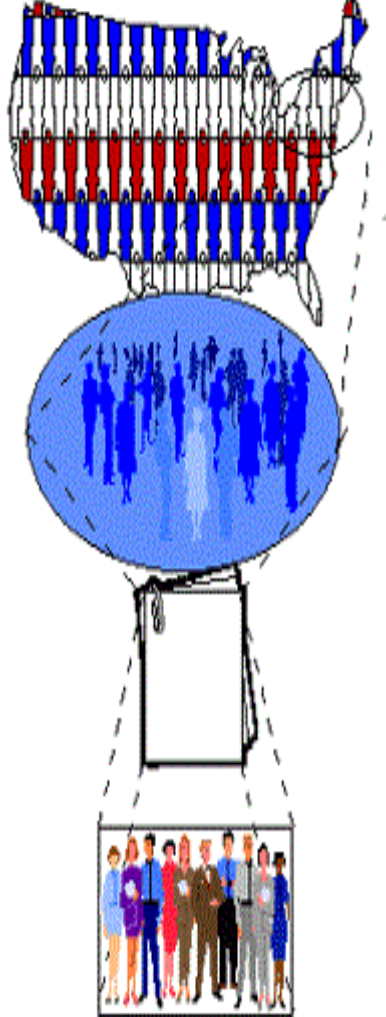
3.3 Sampling Strategy

The quality of a piece of research depends not only on an appropriate methodology and the selected instruments, but also on the selected sampling strategy (Cohen et al, 2007). Cohen et al (2007) stress the importance of appropriate sampling in reducing cost and resources such as time and trained staff, as compared with complete coverage of an entire population. Accordingly, an appropriate sampling strategy gives greater accuracy in collecting and analyzing data due to the possibility of more intense supervision of fieldwork. Mugo (2002) highlights how crucial sampling is, since it determines the populations' characteristics and enables the researcher to draw conclusions about the whole population through a set of respondents selected from a larger population for the purposes of a study. The best type of sampling, used in this study, is simple random sample, so that each unit of the population has an equal opportunity of inclusion in the research. This strategy has been adopted in order to avoid the main drawback of this method, the possibility of bias, owing to the fact that there may be difficulty in accessing other sites that represent the population (Muijs, 2004). In addition, random sampling is probably the strongest design with respect internal validity (Trochim, 2006). In this paper, the target audience is the group distance learners who are dispersed around the globe is the group this thesis is dedicated to; the external validity is also enforced by using the random sampling, a method where there is a high degree of probability that the conclusions of the study would be equally valid for other people in other places and at other times.

Trochim (2006) defines four main steps which prepare a well-organized main frame for sampling:

- Theoretical Population
- Accessible Population
- Sampling Frame
- Sampling

The following table illustrates these four steps for the present study in the form of four questions:

Question		Sampling
Who do you want to generalize to?		Distance learners
What population can you get access to?		Undergraduates, postgraduates, employees and non-employees who are willing to learn new skills or develop existing skills, aged between 18 and 50 with various backgrounds, experience, qualifications and spoken languages.
How can you get access to them?		Non-compulsory further education institutions, within a broad spectrum of learning activities and programs.
Who is in your study?		<p>Figure 6: Sampling Terminology, adapted from Trochim (2006)</p>

As illustrated in this table, with respect to this paper the specified population is distance learners. In order to expand the range of the research findings, the paper will attempt to consider a wide sample of three distinct areas: a literature review, opinions of subject matter experts (educators), and opinions of users (learners). Cohen et al (2007) consider a sample size of thirty individuals to be the minimum, though the main issue is that the sample should be representative of the population from which it is drawn. The total number of respondents is 56, the number is subdivided into 20 educators in one group and 36 learners in the other. The first group comprises e-learning experienced educators, who have direct experience in dealing with the specified technology in colleges, universities and IT

departments concerned with staff training programmes; the second is a group of learners including undergraduates, postgraduates, employees and non-employees, owing to the fact that the researcher believes that the requirements of an e-learning program vary according to many parameters such as age, education or work experience.

Dividing the respondents into two groups means that it is possible to compare learners' and educators' responses, which can have a positive effect on the communication between them and thereby influence the delivery of the course positively.

3.4 Approaches to Data Collection

Essentially, the main method utilized is the questionnaire, which provides an easy and straightforward way of comparing and analyzing collected data (Wilson and Mclen, 1994). Due to the questionnaire's limitation to study the phenomena in-depth and thus explore new ideas (Audience Dialogue, 2005) and because of the time limitation of the study which made it impractical to include a qualitative instrument such as interviews, in the hope of obtaining a general overview and to focus on the underlying reasons for the results generated an experiment is also used. This is then followed up by the questionnaire. All data has been collected face-to face for the reasons listed above (see section 3.2.2. Respondents' Background).

3.4.1 Semi-Structured Questionnaire

To collect empirical data a semi-structured questionnaire was distributed to all 56 respondents. The types of questions used in the questionnaires vary between rating scales (from 1-10), intensity-scaled questions (including categories such as 'excellent', 'very good', 'good', 'fair', and 'poor'), as well as a few open-ended questions. These latter were included to enable the respondents to write free responses in their own terms; although such questions take a considerable effort of time to analyze (Cohen et al, 2007), because the number of respondents is relatively manageable, this instrument is feasible in this case, and using open-ended questions can aid in gathering a combination of qualitative and quantitative data.

Owing to the different character of the two groups, there are two different questionnaires, a Teachers' Questionnaire and a Students' questionnaire. The Teachers' Questionnaire includes some questions regarding their experience in teaching in general and e-learning in specific (if it exists), while the Students' Questionnaire asks some questions related to the course they attended and the

experience they gained from it. Both questionnaires are included under Appendix 4.

3.4.2 Experiment

Experimental approaches are often described as the ‘gold standard’ of evaluation (Cambell and Stanley, 1966). The reasons behind using the Experimental Design are, for one, to give an explanation of a certain event based on many advantages such as data dependability, conformability and cogency. In addition, several researchers can participate in the same experiment as designers or observers, and at the same time a researcher can report a situation according to their observation (Cohen et al, 2007). For another, experiments can determine whether some program or treatment causes some outcome or outcomes to occur (if x then y) (Trochim, 2006).

Students in this experiment was randomly selected to participate in the experiment and distributed as follows:

Country	Group A(Experiment)	Group B(Control)	Missing
KSA	10	10	2 (from Group B)
UK	10	10	0

It is clear from table above that the initial number in this experiment was 40 students, randomly assigned to experiment group or control group. 2 students of the control group did not complete the experiment, so that in order to achieve an equal number of students in both groups the results of 2 students from the experiment group were not counted. Accordingly the net number of participants was 38 students.

Chapter 4 - Results and Findings

4.1 Introduction

This chapter provides the results and findings obtained from the collected quantitative data. The data was used to provide evidence in relation to each of the research questions listed above (see 1.4 Thesis Structure and Content and Chapter 2). Each research question will be addressed individually looking at the data collected from respondents through the questionnaires and from the final results of the experiment.

For the purpose of analyzing data in this thesis, the following functions are used:

- Range of Confidence Interval : to decide how many is enough of the collected data, it was important to find range of values around the statistic where the "true" (population) statistic can be expected to be located; accordingly, values below the minimum of this range are considered low and values above the maximum of this range are considered high.
- Correlation : to investigate the relationship between two sets of variables, for example the knowledge about social networks and its contribution to OL, a correlation is used to accept/reject the researcher's hypothesis.
- Spearman's Rank Correlation Coefficient : to discover the strength of a link between the correlated data and to check the level of significance. (StatSoft, 2011)
- T-Test : to evaluate the differences in means between the two groups in the experiment. (Trochim, 2006)

The explanation and definition of the previous statistical terms can be found in Appendix 5. In the bar charts, blue bars indicate student numbers and red bars indicate teacher numbers.

For data analysis Microsoft Excel was used - the reason for selecting it is explained in Appendix 5.

4.2 Demographics of Respondents

The students' age is between 20 and 50 years with various backgrounds, experience, qualifications and spoken languages. The spoken language was Arabic for Saudi students and English in the United Kingdom. The students' courses were randomly selected, as illustrated in the following diagram

1. Students

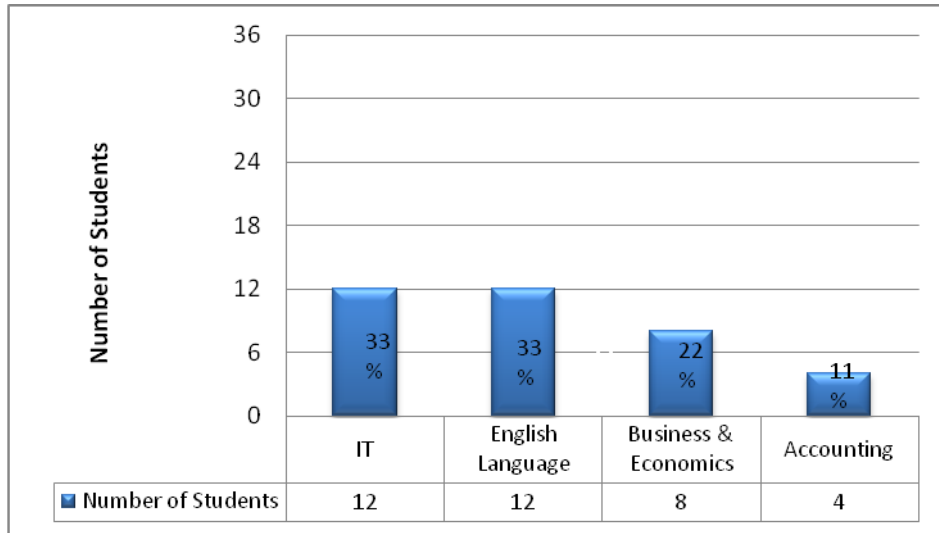


Figure 7: Graph highlighting the number of students in each course

2. Teachers

Teachers' courses were randomly selected as illustrated in the following chart

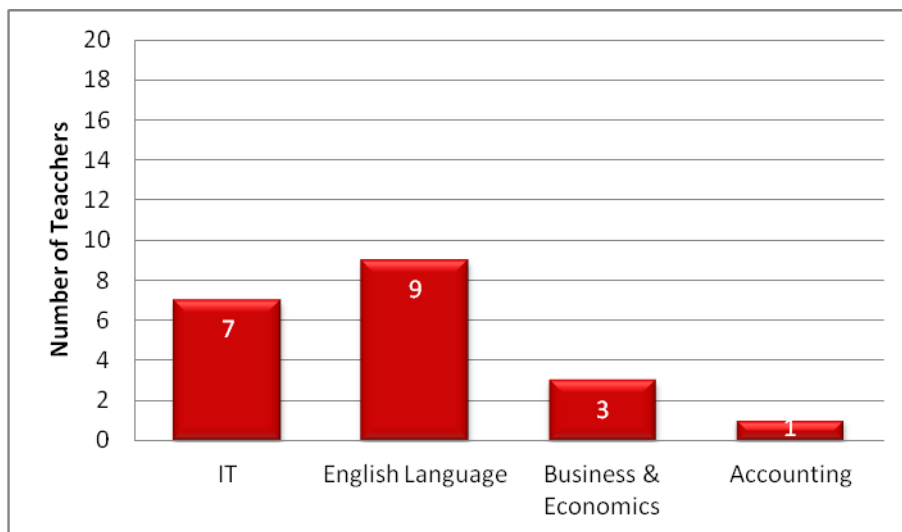


Figure 8: Graph highlighting the number of teachers in each course

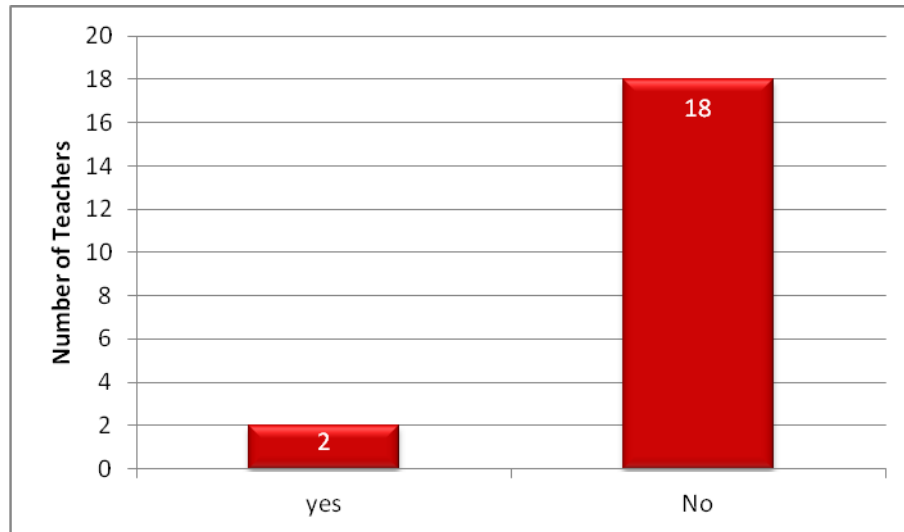


Figure 9: Graph highlighting if teachers have previous experience in online study

90% of teachers did not have any previous experience with online learning as teaching or studying.

4.2 Experiment Results

Group1 = Experiment Group (Interactive Course) =18

Group2 =Control Group (non Interactive Course) =20-2(missing) =18

4.2.1 Pre-Test Results

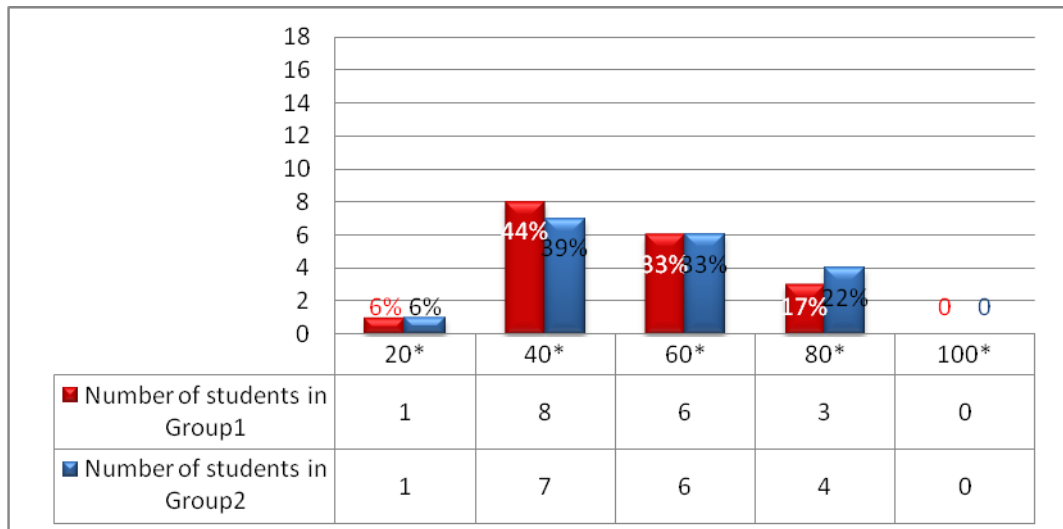


Figure 10: Graph highlighting Pre-Test grades for students in each group

The average mark for Group1 pre-test is 47, while the average mark for Group2 pre-test is 54. This indicates that both groups have approximately the same level of computer knowledge.

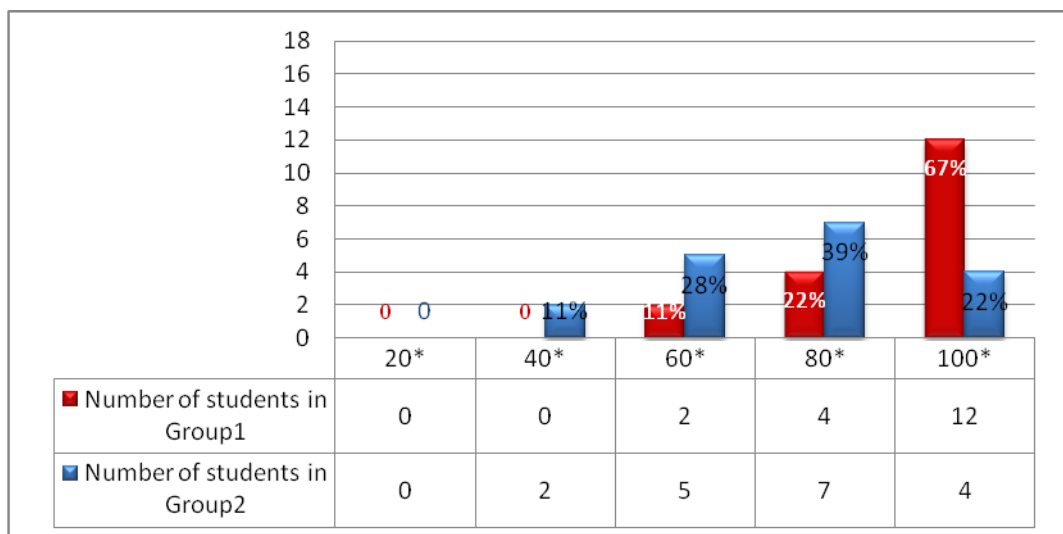


Figure 11: Graph highlighting Post-Test grades for students in each group

4.2.2 Post-Test Results

By using the t-test, the final result of students overall grade in experiment group is higher than that in the control group; this difference is considered to be statistically very significant with 95% confidence. The reason behind this difference will be discussed further in Chapter 4.

4.3 Research Question

4.3.1: What are the perceived drawbacks of e-learning?

In the following section, there are three groups of questions: questions for students only, questions for teachers only and questions for both groups.

4.3.1.1 Students' questions

Potential problems in e-learning

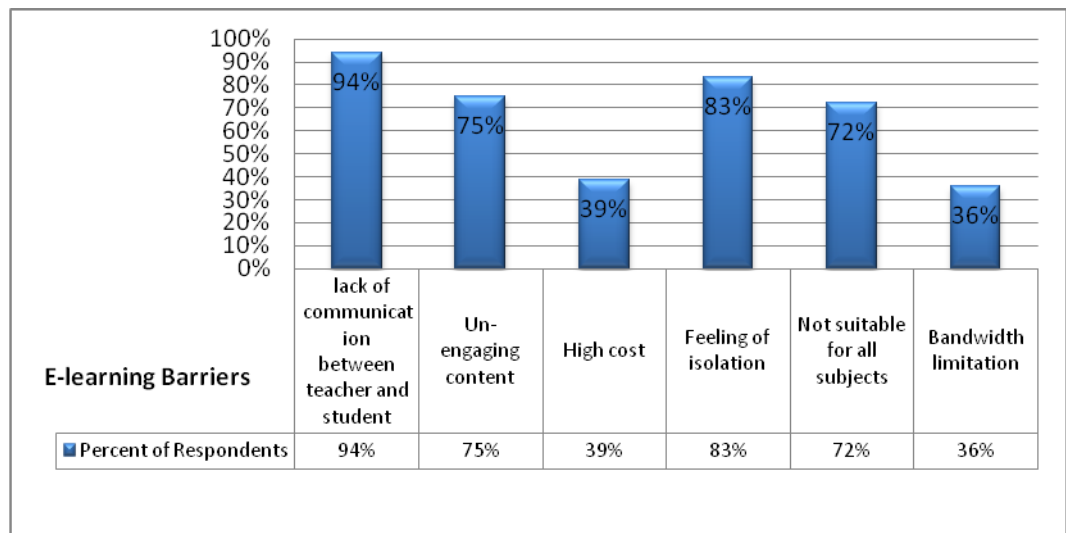


Figure 12: Graph highlighting the potential problems in e-learning from the students' perspectives

The range of confidence is between 74% and 59%. However, it is statistically significant that a feeling of isolation, lack of communication between students and teachers (94%) and the un-engaging content (75%) are considered to be the main barriers of e-learning.

After attending the course, correlation was established between the students' understanding and satisfaction about the course and 2 different variables- explained below- by using Spearman's rank correlation coefficient to measure of statistical dependence between two variables (McDonald, 2009). The results are as follows:

Dependant variable: **the student's understanding and satisfaction about the course**

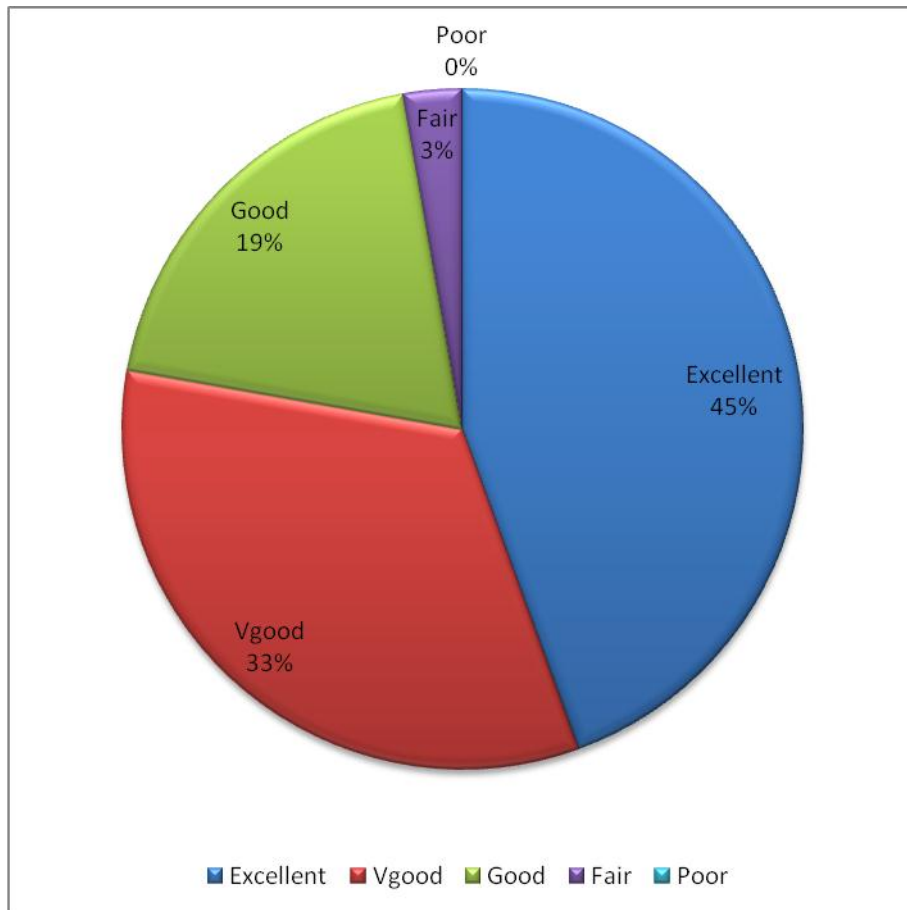


Figure 13: Graph highlighting the students understanding and satisfaction about the studied course

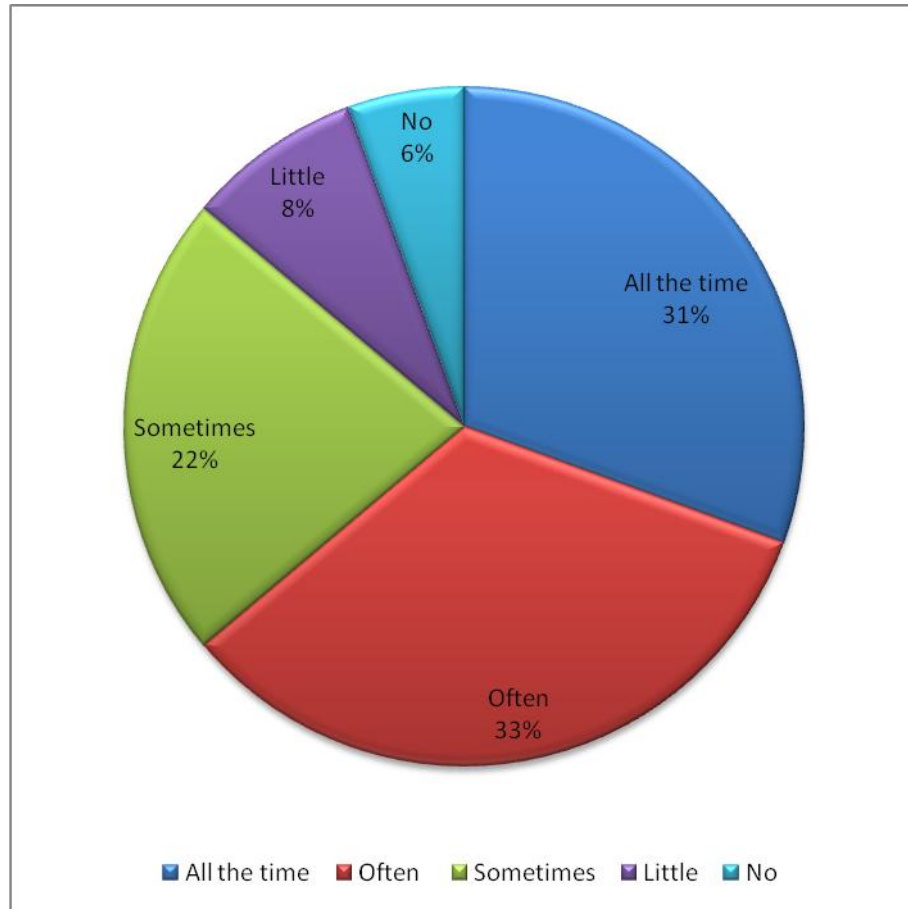
First independent variable: **The students' need for face-to-face tutoring**

Figure 14: Graph highlighting the students needs to face-to-face tutoring in the studied course

The correlation has a strong negative value (-0.8), which means that the higher the social isolation the student felt, the less understanding of the course and students' satisfaction, and vice versa.

Second independent variable: **the students' feeling of social isolation**

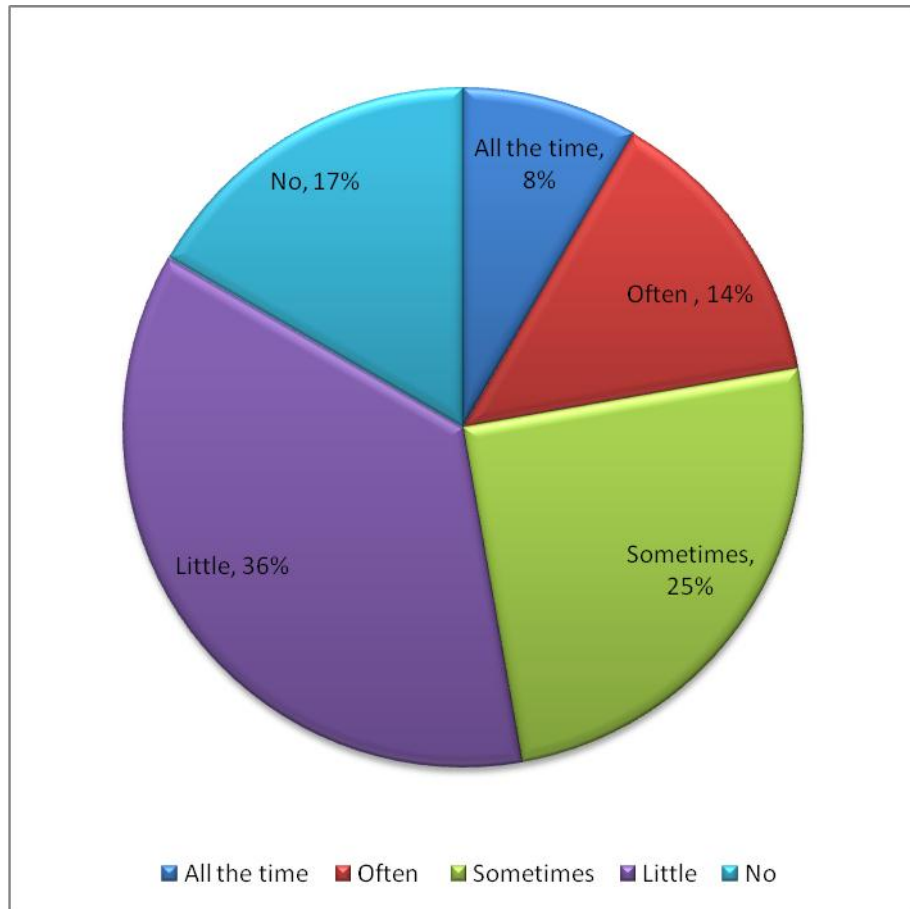


Figure 15: Graph highlighting the students feeling of isolation in the studied course

The correlation has a moderate negative value (-0.4), which means that the higher the social isolation the student felt, the less understanding of the course and students' satisfaction, and vice versa.

4.3.1.2 Teachers' questions

E-learning benefits

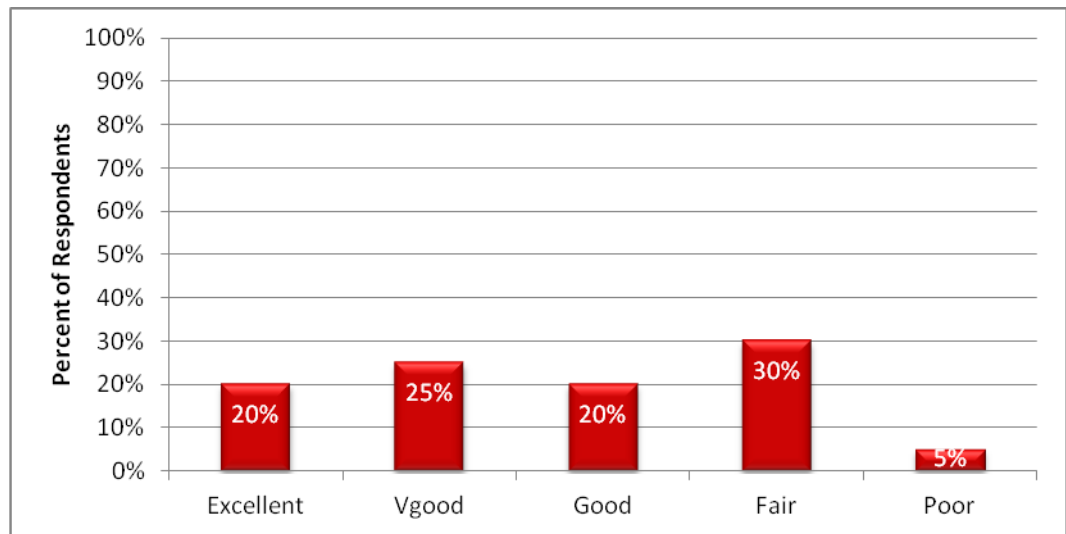


Figure 16: Graph highlighting the teachers' rating of e-learning benefits

Qualitative thematic analysis of free text response questions about e-learning problems

The qualitative thematic analysis of free-text response questions from the teachers' perspective also identifies certain areas which deserve to be acknowledged in relation to e-learning barriers:

40% of teachers identify the lack of direct personal contact between teachers and students as one of the main barriers of e-learning. A further 15% argued that a lack of students' self-discipline and time management is another main barrier, and 10% mentioned that there are courses which require field trips and lab practice which e-learning is not able to provide.

10% of teachers pointed out obstacles of s-learning synchronous sessions such as a difficulty to ask questions and getting an immediate response, or limited time for these sessions; a few teachers argued that using body language in teaching is a main prerequisite for a teacher to deliver information and to realize the students' response. Added perceived disadvantages of e-learning are a lack of security and the possibility of cheating on assessments with the help of online resources during exams, or the possibility of a completely different student completing the exam instead of the one actually enrolled on the course.

4.3.1.3 Teachers' and students' questions

The level of required IT skills to study an online course

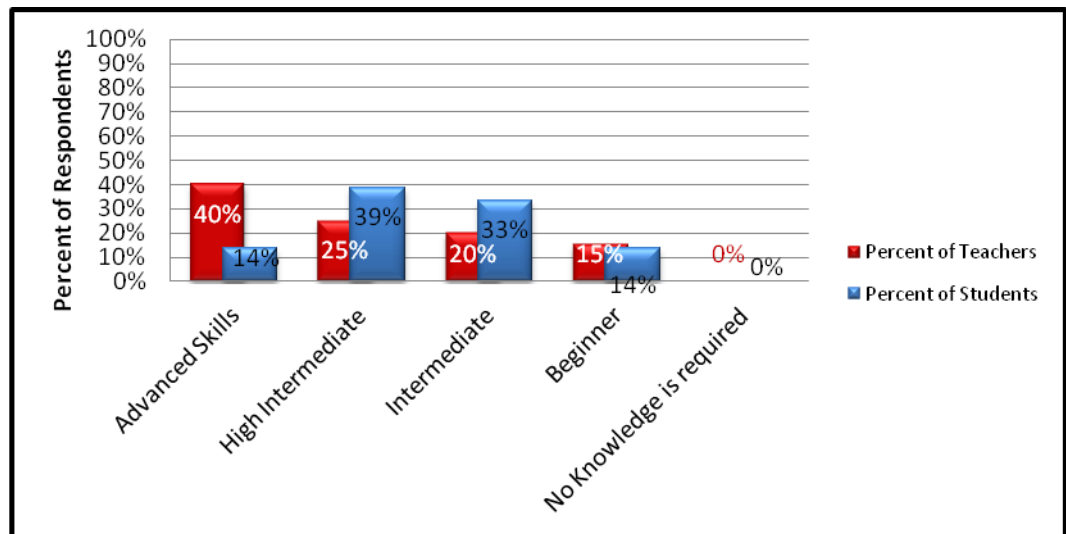


Figure 17: Graph highlighting the required level of IT skills for online study

It is statistically significant that 40% of the teachers selected advanced skills to study online, while 39% and 33% of students respectively selected high Intermediate and Intermediate level.

4.3.2 What does interactivity mean in the context of e-learning?

In the following section, there are two groups of questions: questions for teachers only and questions for both groups.

4.3.2.1 Teachers

Teachers' acceptance for the student-centred approach

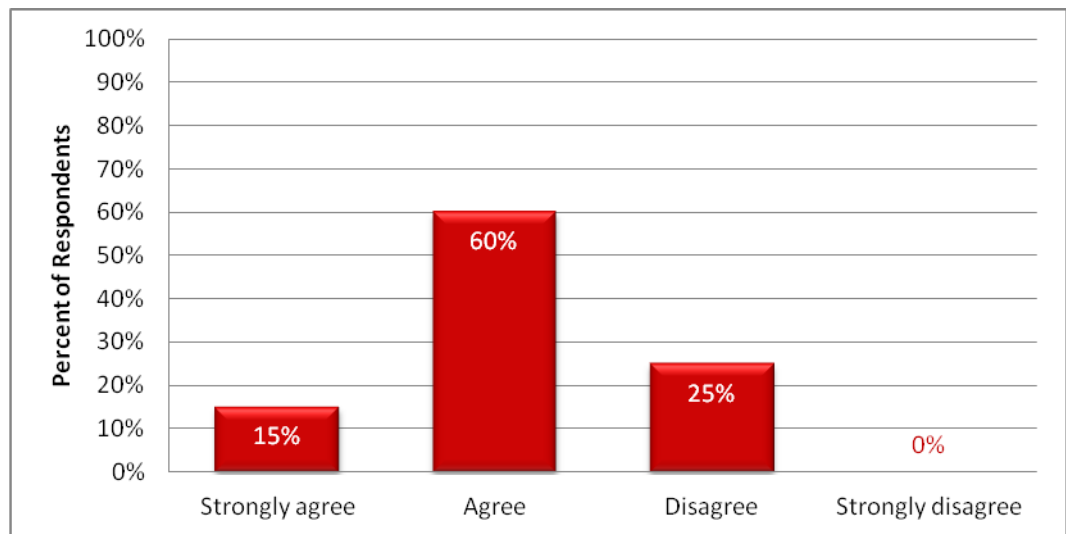


Figure 18: Graph highlighting teachers' acceptance for the student-centred approach

The general teachers' acceptance of a student-centred approach in OL is above the maximum range of confidence. Notably, a quarter of the teachers disagree with this – see the discussion in Chapter 5.

4.3.2.2 Students and Teachers

Efficient tools embedded in online courses

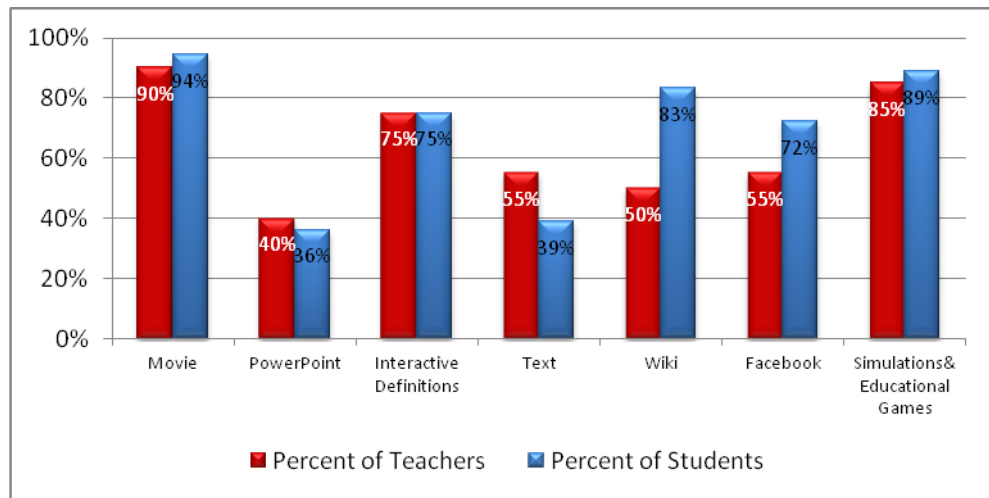


Figure 19: Graph highlighting the efficient tools embedded in online courses

It is observed that students' acceptance of the social networks within e-learning is higher than that of teachers, as illustrated in the following table:

Respondents	Wiki	Facebook
Students	83%	72%
Teachers	50%	55%

On the other hand, the teachers' acceptance of more traditional methods such as texts and PowerPoint is higher than that of students as illustrated in the following table:

Respondents	PowerPoint	Text
Students	40%	55%
Teachers	36%	39%

Notably, movie is highly selected by both groups 90% teachers and 94% students

-Respondents' use of social network such as wiki and facebook

-Respondents' perspectives about the benefit of social network in the learning process

The data of the previous two questions is analyzed from two different perspectives:

Firstly: Comparing between students and teachers use of social network (e.g. MySpace, Facebook, Wiki)

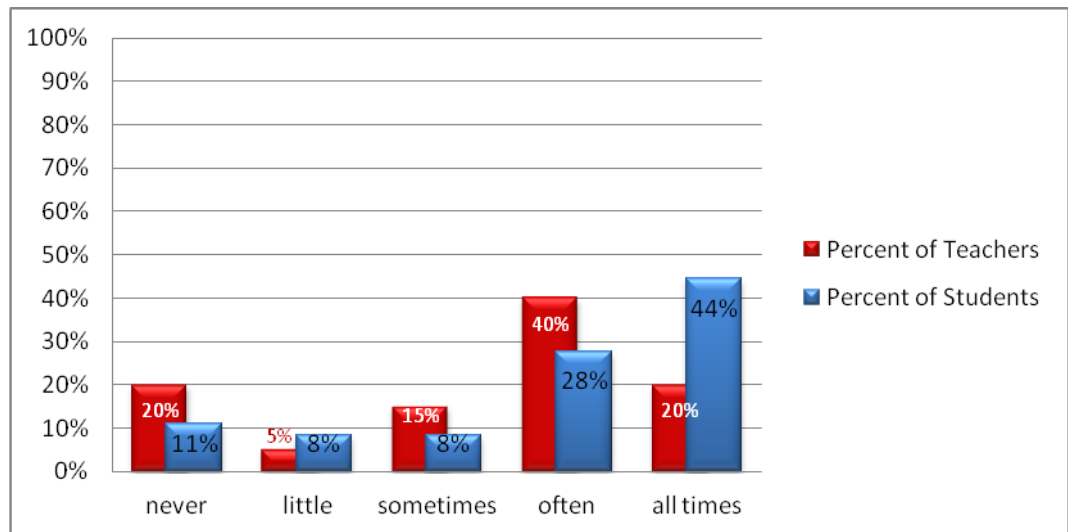


Figure 20: Graph highlighting the respondents' use of social network

By comparing between teachers' and students' use of social networks, it is evident that the students' use of social networks is far above the maximum range of confidence (44%) at all times, while 20% of teachers never use social networks, which is slightly above the maximum range of confidence. However, it is statistically significant that students have more use and knowledge about social networks than teachers.

Secondly: Correlating between respondents' use of social network and their perspectives about its benefit in the learning process. The correlation is strongly positive (0.4) with a high level of significance (95%).

4.3.3 What are the advantages and disadvantages of synchronous, asynchronous and blended learning?

In the following section, all questions were the same for both groups.

4.3.3.1 The best method of learning in online courses: synchronous, asynchronous, both, blended learning.

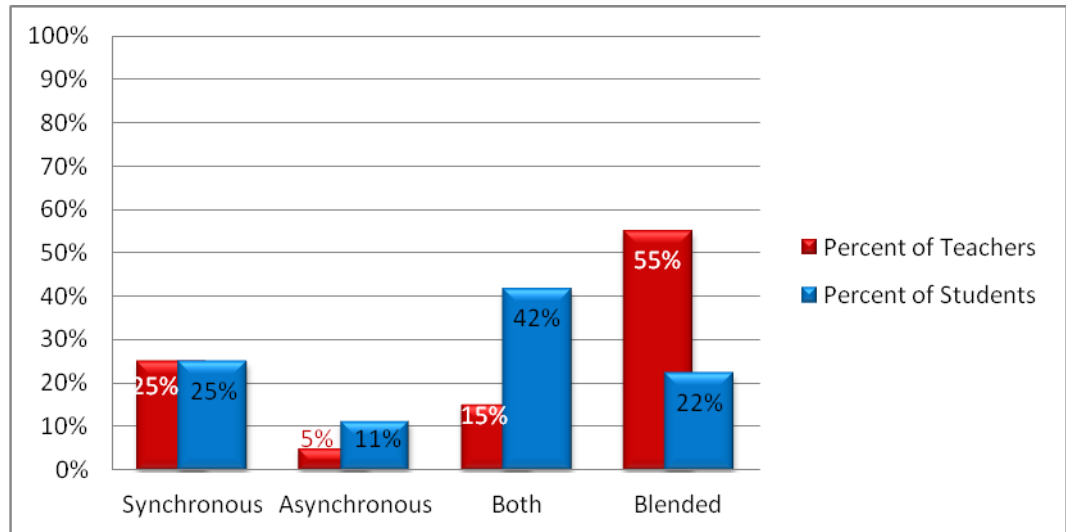


Figure 21: Graph highlighting the the best method of learning in online courses

55% of teachers recommended blended learning, while 43% of students recommended both (synchronous and asynchronous) learning modes.

4.3.3.2 Qualitative Thematic analysis of free text response questions about the selection of the best mode on online learning.

60% of teachers recommend blended learning because it ensures social interaction in which the students will need guidance for learning. Students, on the other hand, argue against blended learning because it is not possible for some cases in online learning to have a face-to-face session with a teacher. The main disadvantage of synchronous and asynchronous learning is seen to be that it requires a high level of IT skills and reliable bandwidth. Both students and teachers agree that the main advantages of asynchronous learning are that it offers the maximum amount of flexibility and convenience.

4.3.3.3 The main characteristics of synchronous learning

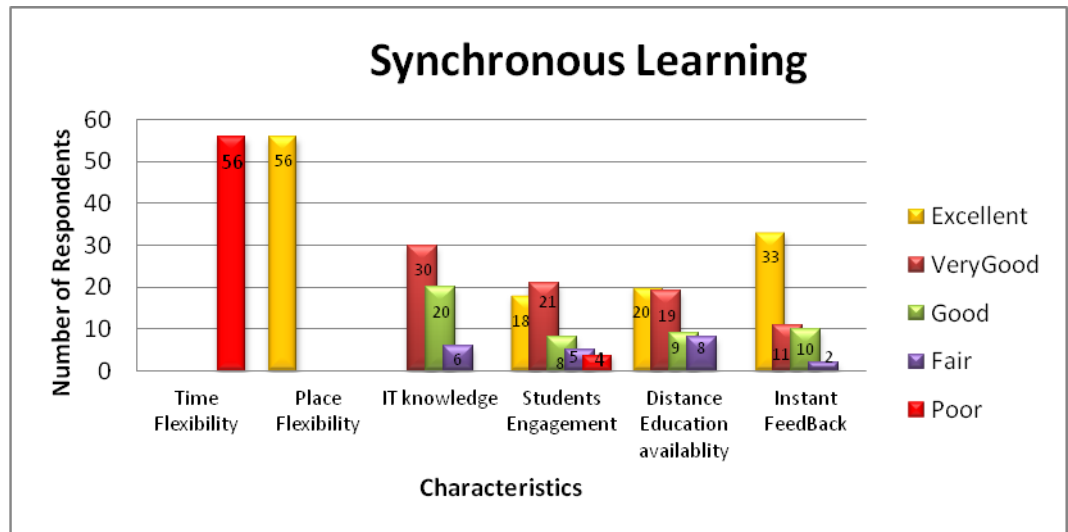


Figure 22: Graph highlighting The main characteristics of synchronous learning

4.3.3.4 The main characteristics of asynchronous learning

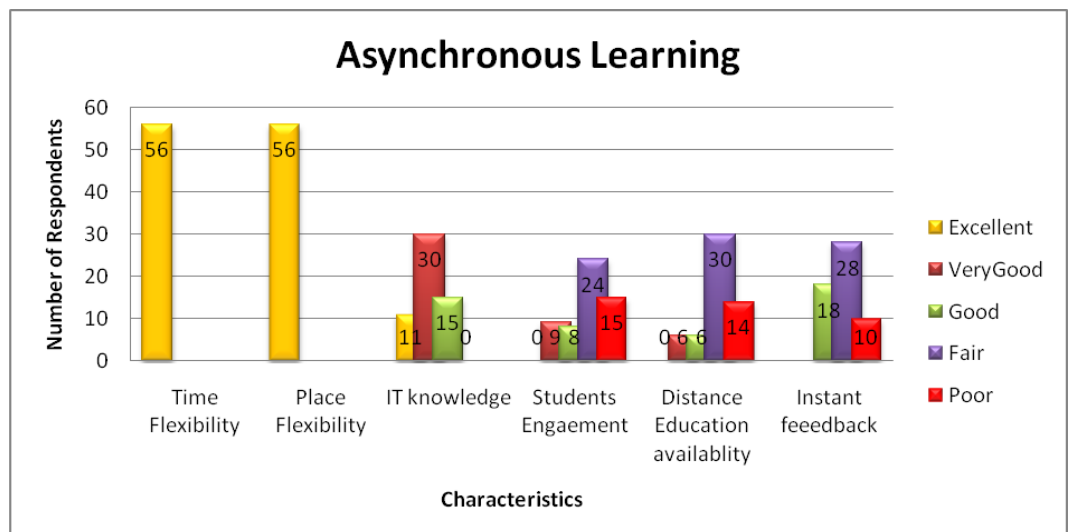


Figure 23: Graph highlighting the main characteristics of asynchronous learning

4.3.3.5 The main characteristics of blended learning

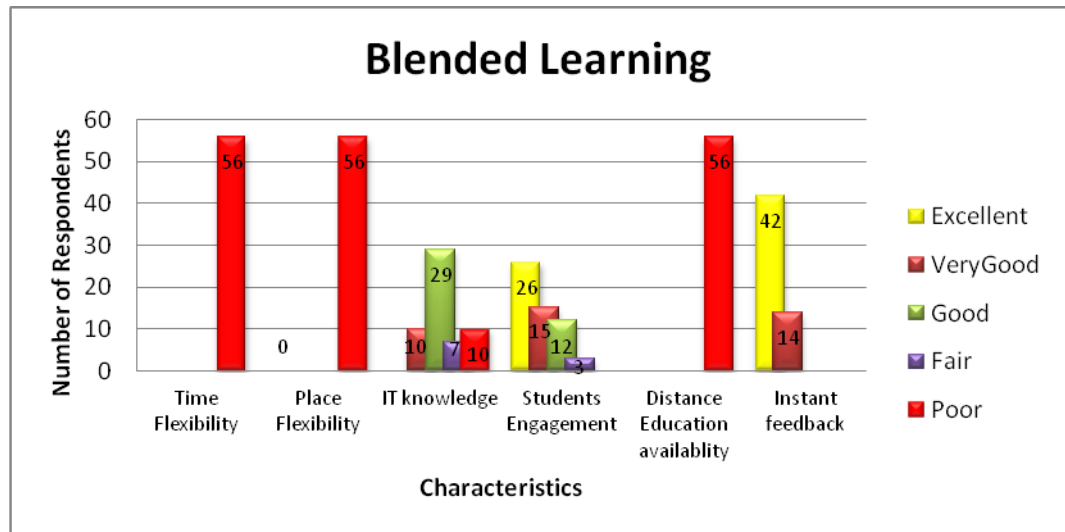


Figure 24: Graph highlighting the main characteristics of blended learning

Focusing on students' engagement, a comparison of synchronous and asynchronous with blended learning has the following result:

Learning Mode	Excellent	Very good	Good	Fair	Poor
Blended	26	15	12	3	0
synchronous	18	21	8	5	4
A synchronous	0	9	8	24	15

Table 5: Comparison between the respondents' acceptance to synchronous, asynchronous and blended learning

4.3.4 What are the different types of interaction in the process of e-learning?

In the following section, there are two groups of questions: questions for teachers only and questions for both groups.

4.3.4.1 Teachers

The importance of assessments/feedback as a form of student-content interaction

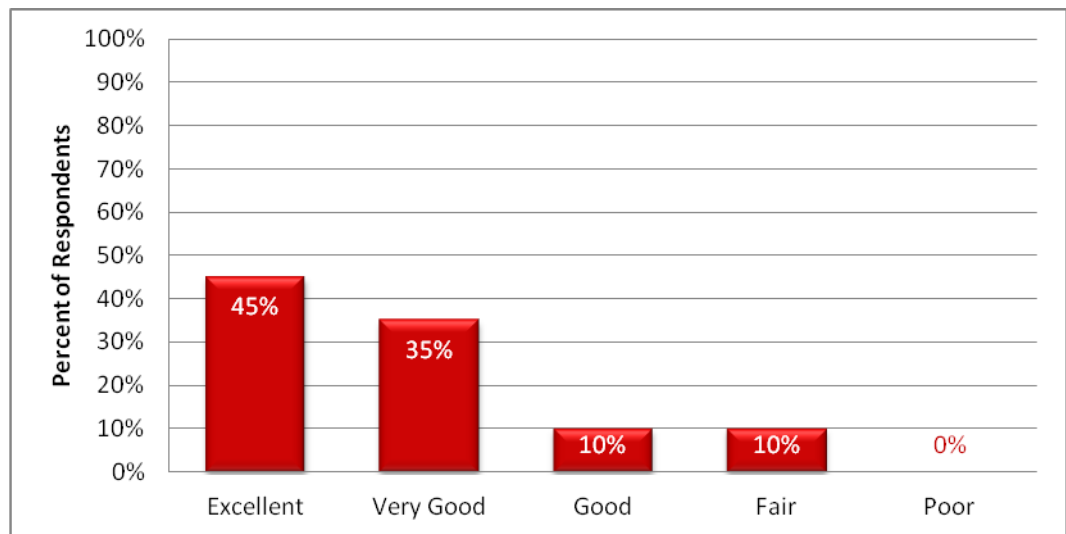


Figure 25: Graph highlighting teachers' acceptance to assessments in e-learning

It is statistically significant that teachers consider assessments and instant feedback as important in e-learning as a form of interaction between student and the content.

4.3.4.2. Students and teachers

Respondents rating for the importance of the different types of interaction

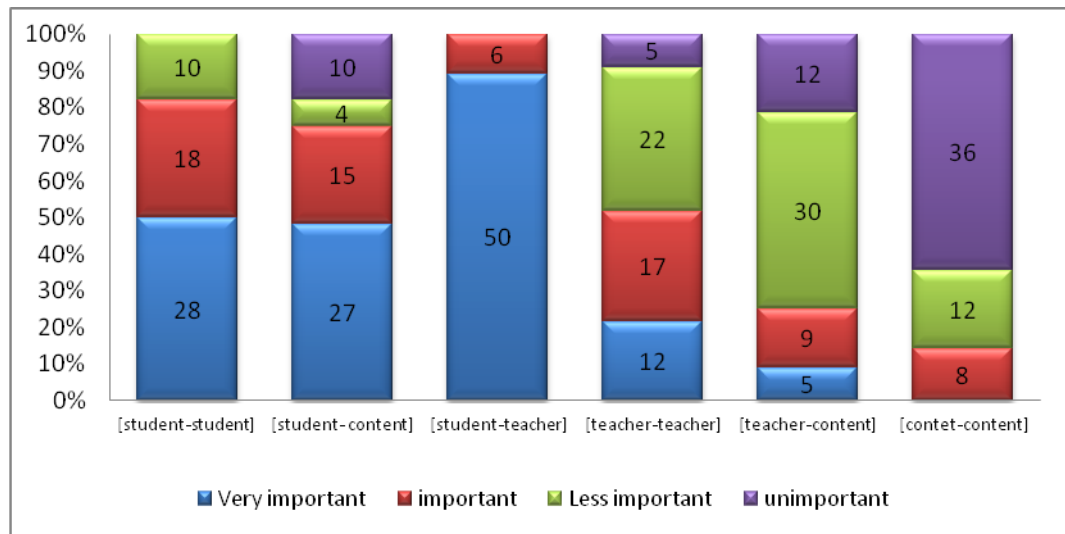


Figure 26: Graph highlighting the respondents rating for the importance of the different types of interaction

It is statistically significant that the highest number of respondents is for the student-teacher interaction while the lowest number of respondents is for content-content interaction

4.3.5. Are there any barriers to using e-learning for all subject disciplines?

In the following section, there are two groups of questions: questions for both groups and questions for teachers only.

4.3.5.1. Students and teachers

Recommended subjects for online courses

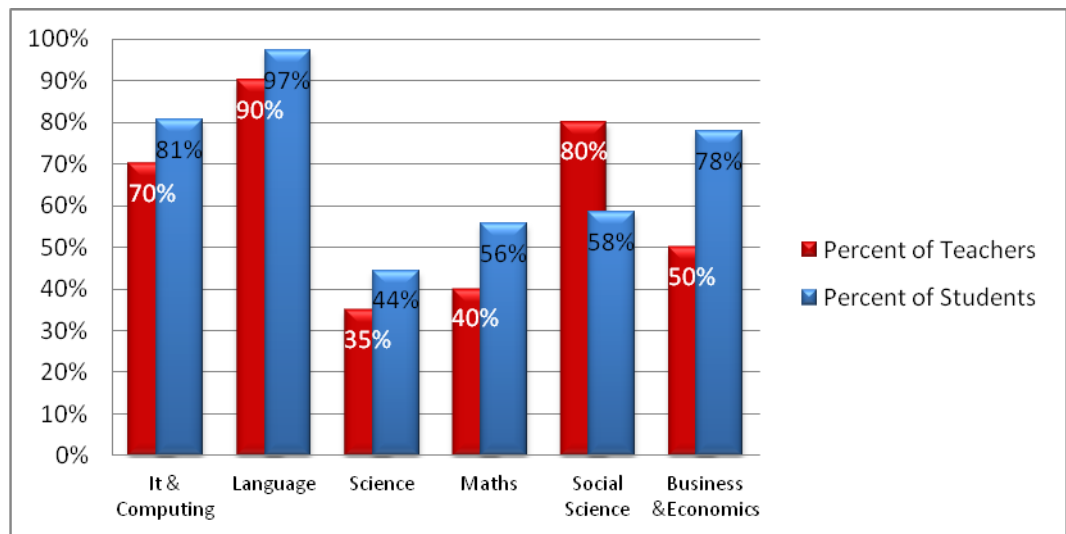


Figure 27: Graph highlighting the recommended subjects for online courses

It is statistically significant that language, business and IT are highly recommended while maths and science are the least recommended for OL courses.

Obstacles that prevent e-learning to cover all subjects from teachers and students perspectives

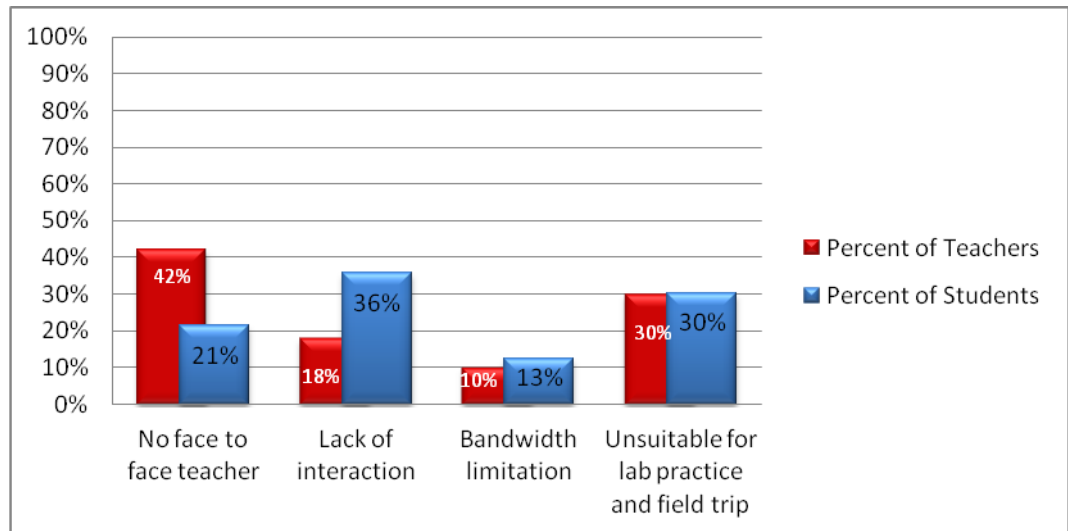


Figure 28: Graph highlighting the obstacles that prevent e-learning to cover all subjects from teachers and students perspectives

The highest obstacle for teachers is the lack of face-to-face interaction between student and teacher (42%), but for students the highest obstacle is the lack of all types of interaction (with peers, teachers and content) (36%).

Respondents’ acceptance to teach/study Maths and Science online

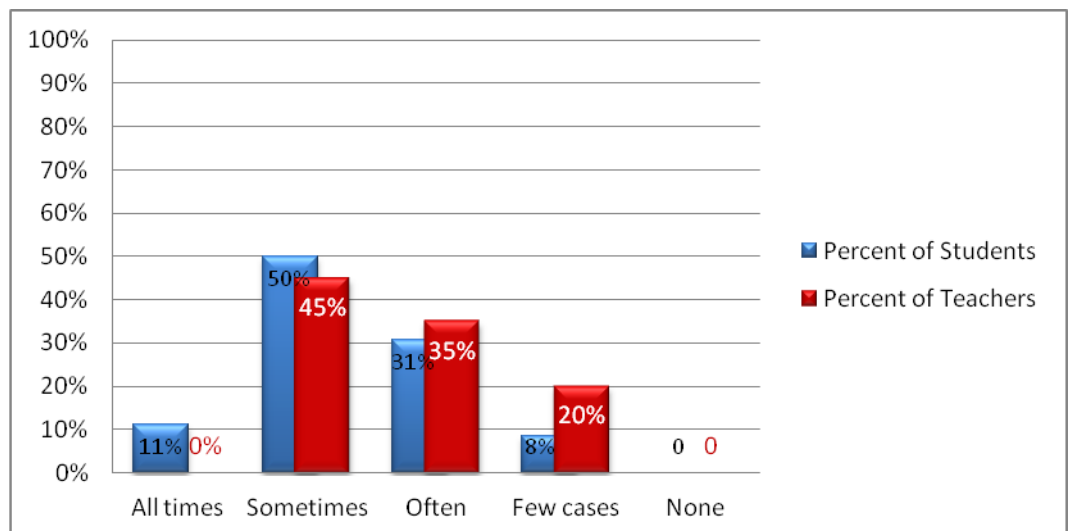


Figure 29: Graph highlighting the respondents’ acceptance to teach/study Maths and Science online

It is statistically significant that the majority of both groups accepted sometimes to study Maths and Science online. While 11% of students accepted

all the time and” 20% of teachers accepted “few cases”, in general both ratios is below the minimum range of confidence.

4.3.6. Are there notable differences for educators and learning content when designing e-learning activities?

4.3.6.1. Educators (teachers only)

Teachers’ previous experience to teach online

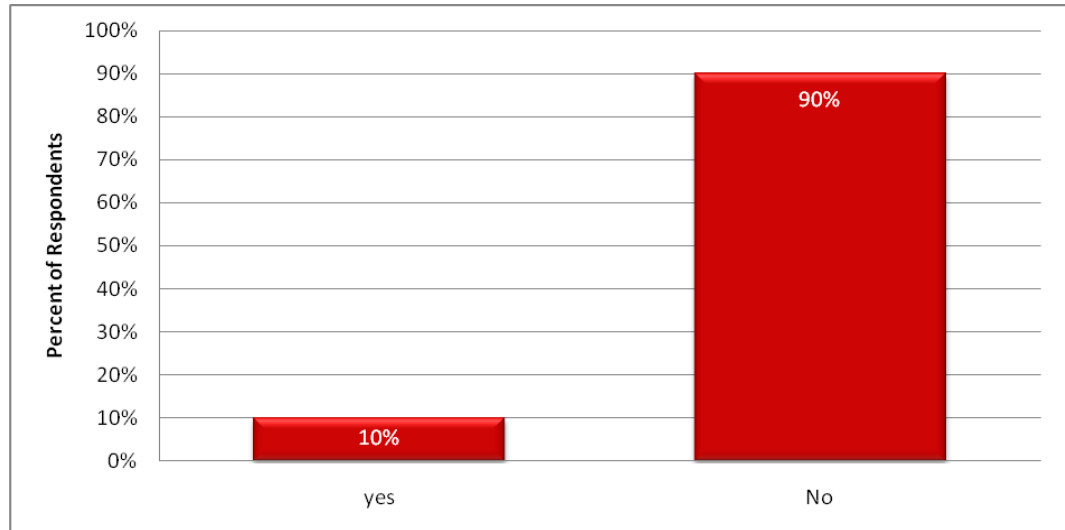


Figure 30: Graph highlighting teachers’ previous experience to teach online

The reason behind the low percent of experience in teaching online

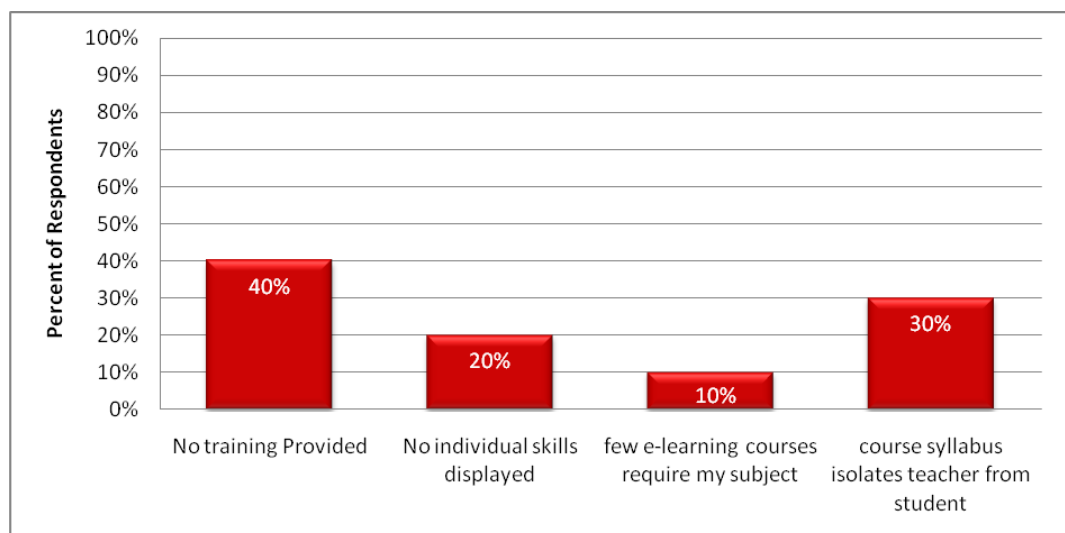


Figure 31: Graph highlighting The reason behind the low percent of experience in teaching online

From the previous graphs, It is statistically significant that the majority of teachers (90%) in the sample did not have any training for online teaching; the reasons

behind this vary, but the highest number of respondents stated this was because of a lack of training (40%) and the isolation between teacher and student (30%).

Teachers' acceptance that any face-to face teacher can be an online teacher

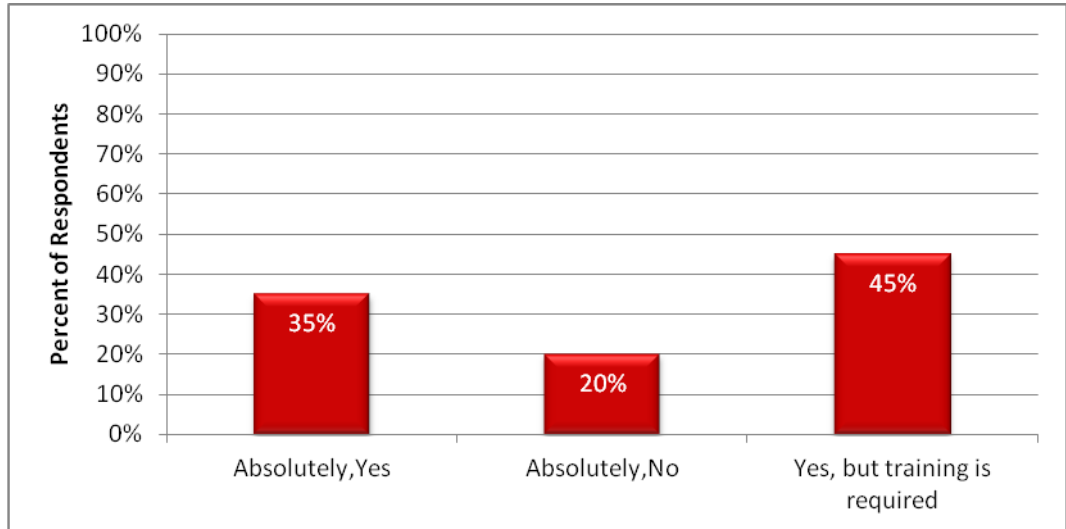


Figure 32: Graph highlighting teachers' acceptance that any face-to face teacher can be an online teacher

Although the need for training is essential for an e-teacher as statistically indicated (45%), 35% of teachers stated that any qualified teacher can be an e-teacher without further training.

Provided training for online teaching

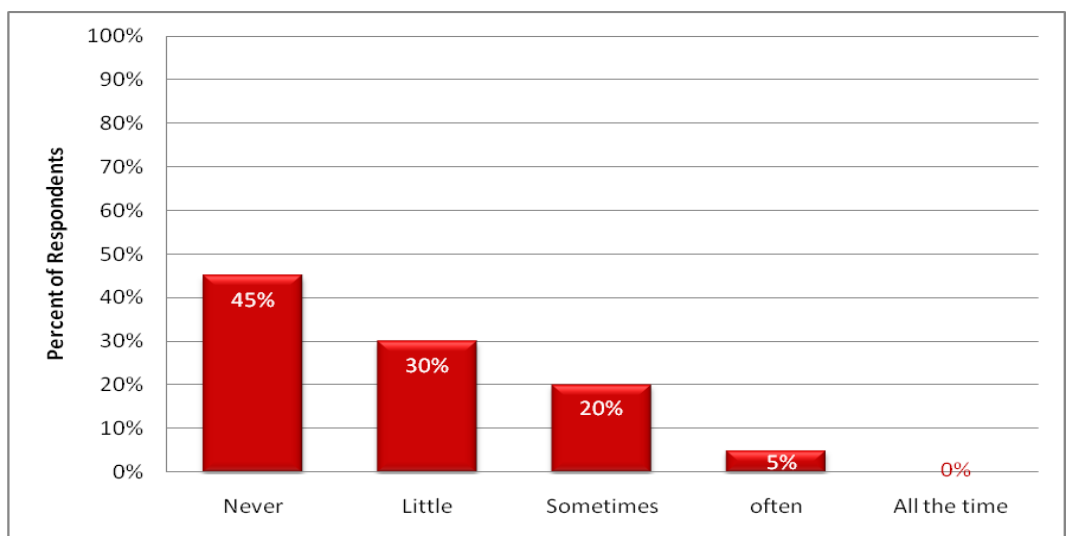


Figure 33: Graph highlighting the provided training for online teaching

45% of teachers did not have any training in delivering online courses before and 30% had little; notably both these figures are above the maximum range of confidence which is (28%).

4.3.6.2 Content

The main characteristics of the e-learning content from teachers' perspectives

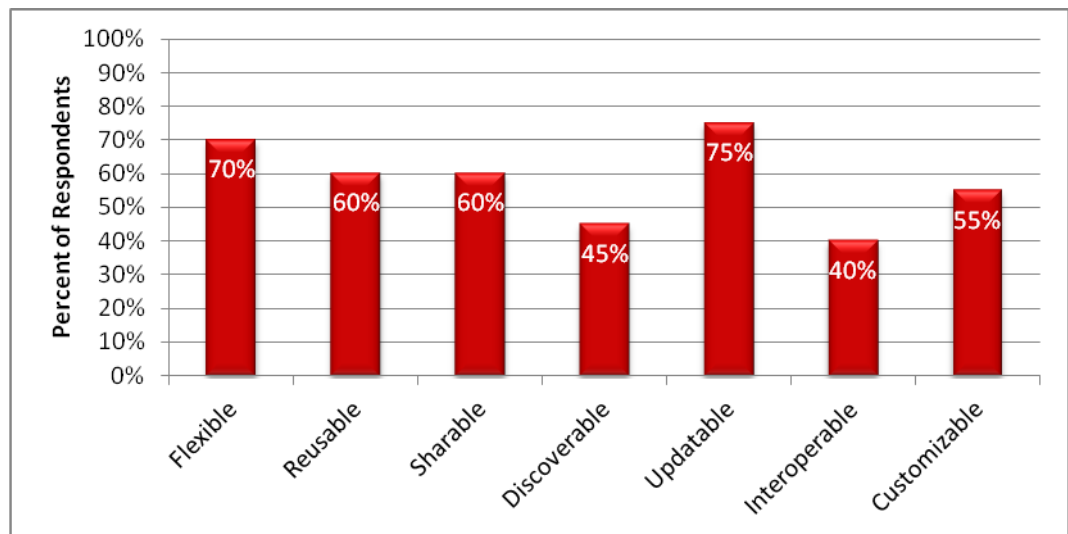


Figure 34: Graph highlighting the main characteristics of the e-learning content from teachers' perspectives

According to the teachers' feedback the main characteristics of e-learning content are updatable (75%) and flexible (70%), and the least selected by respondents are discoverable (45%) and interoperable (40%).

E-learning course’s main features compared with the traditional courses

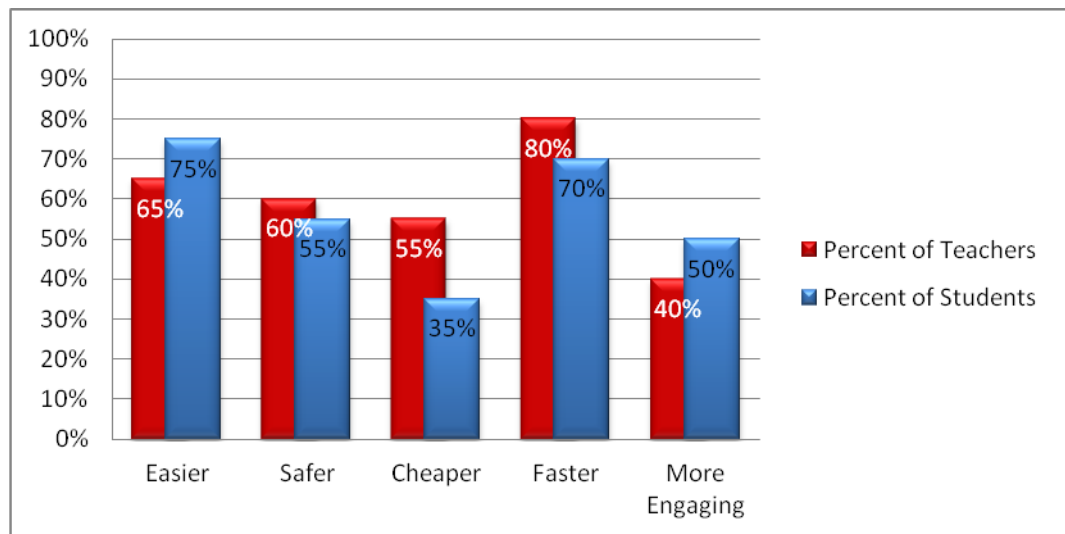


Figure 35: Graph highlighting e-learning course’s main features compared with the traditional courses

It is statistically significant that e-content is more engaging than traditional or classic content (50% students). It is also considered to be both faster and easier by both groups.

Online course contribution in self discipline and time management during the learning process

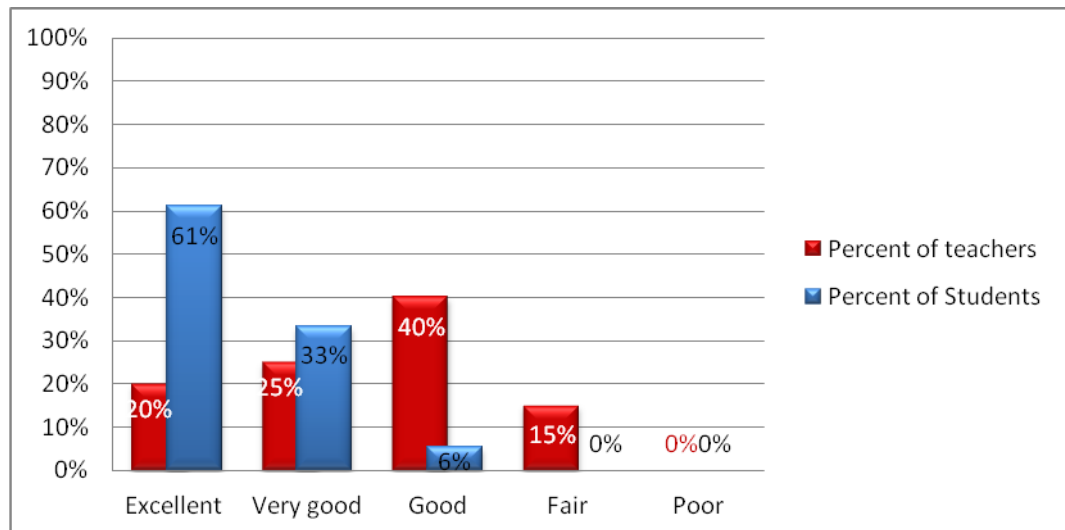


Figure 36: Graph highlighting online course contribution in self discipline and time management during the learning process

Regarding the content contribution in self-discipline and time management, students rated it excellent (61%) and very good (33%), while the majority of teachers rated it good (40%) and very good (25%).

Chapter 5 - Discussion of Results and Findings

The following section explains the discussion of the results and findings obtained from both the questionnaires and the experiment. The data was used to provide evidence in relation to each of the research questions.

5.1 What are the main barriers of e-learning?

The following part is divided into two sections; the first explains some barriers to be considered in e-learning giving the evidence in the collected data and literature; the second explains the relation between interactive e-learning as a dependant variable and other independent variables considered barriers of e-learning.

5.1.1 Barriers in e-learning

The collected data shows that the main barriers for e-learning - above the maximum range of confidence in order from highest importance to the lowest- are as follows:

- Lack of communication between teacher and student
- Feelings of isolation
- Un-engaging content
- Not suitable for all subjects
- Required IT skills

In the following section each reason will be explained in details

Lack of communication between teacher and student and feelings of isolation

It is statistically significant that 94% respondents had chosen miscommunication between teachers and students as one of the main barriers in e-learning, which agrees with Sasikumar (2008). Hamtini (2008) indicated that this barrier would result in the eventual decrease of students' motivation levels and high drop-out rates. In addition, Hardman and Dunlap (2003) consider the same barrier as a

reason for students' feelings of isolation, lack of self-direction and management. In this study, 83% of respondents had chosen feelings of isolation and decreased motivation as main barriers of e-learning. However, the relation between the two is cause and effect, so treating the cause would prevent the effect.

Un-engaging content

75% of respondents gave un-engaging content as one of the main barriers in e-learning. The implied engagement here includes lack of tools that achieve interaction between the student and the content such as instant feedback for assessments, simulations, and educational games. Although Sasikumar (2008) and Lenham (2008) recommend some advanced tools to improve the missing interaction between student and content and even student and teacher, Schneckenberg (2010) declares that the reason behind this perceived barrier is that many universities have neither fully recognized nor systematically exploited the innovative potential of learning technologies. In other words, the solution exists but has not been implemented yet. This point is statistically clear - although there are various tools such as live chats and video conferences in synchronous mode that enable a high degree of online communication between teachers and students (Lenham, 2008), still 14% of teachers stated that in teaching online there were difficulties to ask questions and getting the immediate responses from students.

Not suitable for all subjects

Respondents' feedback about this barrier was high (72%), however because of its importance it will be discussed further in the section on Research Question 5 below (see 5.5).

Required IT skills

In general the respondents felt that the required IT skills were high to advanced (teachers) and high to upper intermediate (students). This highlights two main issues:

Many researchers confirm that young learners and employees are more comfortable in OL because of their familiarity with computers (Eiseberg and Johnson, 2004). However, based on the statistical results, this is not in fact the case - most respondents were young learners and employees and they considered the required IT skills to be advanced or upper intermediate. Therefore, OL courses should be provided with efficient help and technical support to consider all levels of students' computer literacy.

When comparing the responses of teachers and students, the choice of advanced skill among the teachers was 40%, which is relatively high compared to the

students of which only 14% chose advanced skill. This gives a statistical significance that we are in an era where learners are more knowledgeable than teachers when it comes to technology and the internet (Dawley, 2007).

5.1.2 Students' understanding and satisfaction in an interactive OL course

In this section the relation between the students' understanding and satisfaction in an interactive OL course will be discussed with respect to three independent variables:

- Feeling of social isolation
- Need for face-to-face tutoring
- Drop-out rate

Correlating the students' understanding and satisfaction of the course and the need for face-to-face tutoring and feelings of isolation resulted in a strong negative relation for both. However, the more socially isolated students feel, the less they show understanding and satisfaction of the course and vice versa. Similarly, the more need of face-to-face teaching they feel, the less understanding and satisfaction of the course they show and vice versa. This result agrees with the findings of Access Technologies Group (2007), that if employees find the software engaging and interactive, they inevitably profit more from it and the content will be more useful (Welsh et al, 2003).

Regarding to the experiment's results, according to Punch (2005) any difference between the two groups after the experiment is due to the treatment (interactive elements in the experiment group); however by comparing the final results of the two groups, it is suggested that the lack of interactivity in the traditional course is the reason for the decrease in students' motivation and loss of enthusiasm to complete the course, which in turn lead to the drop-out of the two students of the control group. This is confirmed by Moore (1996) and Hamitinin (2008) .

The concluded results and findings obtained from the questionnaires giving evidence to its related research question is illustrated in the following constructed diagram:

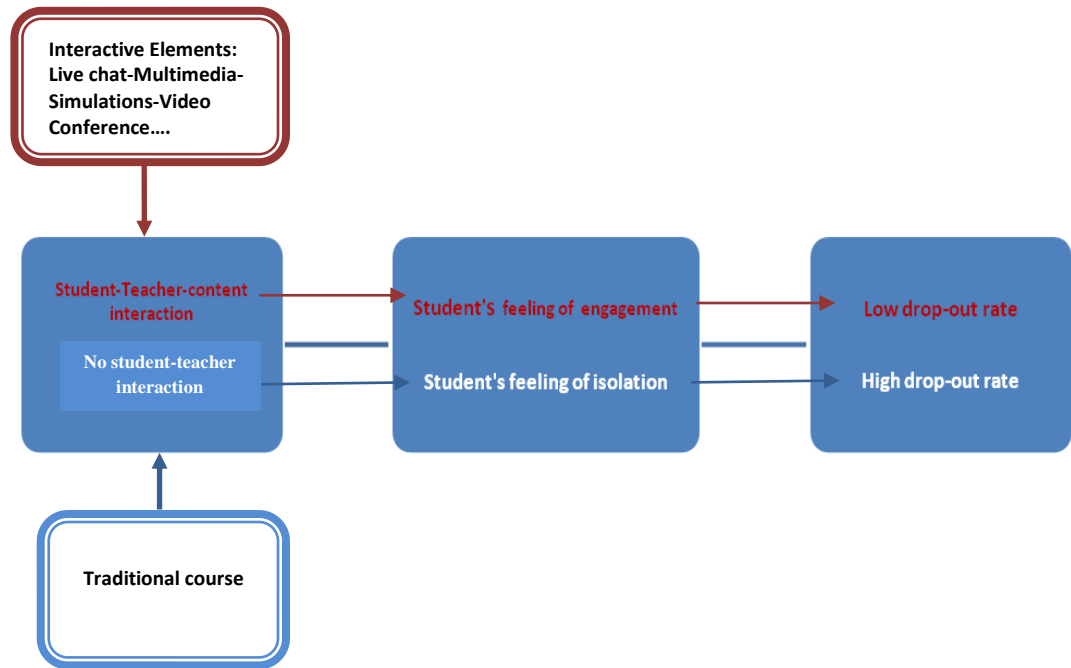


Figure 37: The relation between interactive elements and drop-out rate in OL study

5.2 What does interactivity mean in the context of e-learning?

Shedroff (1999) identified interactivity as giving the user something to create from their own dynamic experience and also providing the user with a means to communicate with others to share this experience. The following part is divided into three sections: Section One discusses the respondents' feedback on some suggested tools to create their dynamic experience. Because of the importance of social networks as a means of communication and sharing this experience in OL (Winograd, 2011), Section Two measures respondents' general use and knowledge about social networks and correlates it with their perception of its use in e-learning. Apparently, these interactive elements give the students the control of pace, place, time and style of presentation and interaction. The teachers' perception of an acceptance of a student-centred approach will be discussed in Section Three.

5.2.1 Interactive elements to create learner's dynamic experience

Text and PowerPoint

It is worth mentioning that teachers still have a commitment towards traditional methods in teaching like text and PowerPoint. Although using text in learning is highly supported by the literature (Wadley et al, 2009 and Du Vall et al, 2007), others like Bliss and Davis (2002) warn that it reduces e-learning efficiency and changes it from a learning to a reading experience. However, Lehmann (2008) claims that the use of text by highly skilled instructors achieves the required communication. Accordingly, using text as way to develop students' dynamic experience is worth further research on the condition that it is understood how to make it effective and interactive in OL.

Simulation and Educational Games

Simulations and educational games were highly selected by students (90%) and teachers (98%) both. They are not discussed in depth in the literature, according to Ahdell and Anderesen (2001), but they have a significant effect on forming a learner's dynamic experience, ingraining learning and motivating learners.

Movies

Although movies do not comply with the core meaning of the dynamic experience where the student is given something to create to form his own

experience or a means to communicate with another user to share others experience, but movies were highly selected by both groups, the reason behind that is suggested because movies give the student the real life atmosphere specially for labs and field trips to see a real place in front of them.

5.2.2 Social network use in e-learning

The correlation between the frequent use of social network in daily life and its benefit (if embedded in a course) for the learning process is strongly positive for both groups. The more knowledge about these technologies is obtained the better their functionalization and operationalization in learning will be. To achieve this, some concerns mentioned in the literature should be addressed. For one, as long as learners are more knowledgeable than teachers when it comes to technology and the internet, a lack of students' motivations towards online learning is likely the consequence (Dawley, 2007). For another, Assareh and Bidokht (2011) highlight that it is not only the need to acquire technical competencies but also the readiness for a transformation of 'traditional competencies' and for the acquisition and development of those competencies. It is necessary to first know about a technology, which is then followed by the perception and preparation for its application.

5.3.3 Teachers' perception to student-centred approach

While Blass and Davis (2003) explain that in the past teachers would control the pace, place, time and style of presentation and interaction in e-learning, now the control of these elements shifts to the student. It is statistically significant that 25% of teachers disagree with the student-centred approach. However, the word "past" here is arguable as this is still the case at present. Teachers' approval or disapproval of the student-centred approach is therefore suggested to be considered in further research.

5.3 What are the advantages and disadvantages of synchronous, asynchronous and blended learning?

In this section, the discussion will be divided between the feedback from teachers and that from students, as each group has its own choice which is different from the other based on preference and motivation.

Teachers' perspectives

It is statistically significant that the teachers' preferred mode of e-learning is blended learning (55%). This is supported by Thorne (2003), who reasons this is because it achieves the intercommunication between teachers and students, and between the students and their peers, thus increasing learning effectiveness. In addition blended learning makes use of a variety of techniques and technologies, so offers a dimension of flexibility in learning. This highlights the important issue that teachers judge blended learning to have the highest number of advantages and the least number of disadvantages in learning.

Students' perspectives

42% of student respondents in selected 'both synchronous and asynchronous' learning for this question. The reason behind this is that a use of both modes means getting the maximum benefits from and eliminating the disadvantages of both. As with synchronous learning, this gives the flexibility of geographical place (Paton, 2005) combined with instant feedback, as it has suitable tools for collaborative work (Mason, 2003).

In the qualitative feedback students explain drawbacks of blended learning as limited time during face-to-face session, unsuitability in some cases for face-to-face tutoring, and also mention the nature of some students who avoiding face-to-face interaction with others and prefer the interaction with others to be synchronous or asynchronous, in which case they are less apprehensive about comments or criticism, and have more time to think before responding to comments.

It is statistically significant that there is no learning mode which is considered the best mode of learning - each one has its advantages and disadvantages, and in the case of distance e-learning, the main issue is the lack of face-to-face tutoring which directly affects the students' engagement with teachers and peers.

5.4 What are the different types of interaction in the process of e-learning?

The focus in this part will be on the highest and the lowest selected type of interaction according to the collected data, and discuss the justification of this result.

Most important type

All the types of interaction were common choices among student respondents, confirming that e-learning is a student-centred approach as advocated by Lahanas (2010). Even the content should be student-centred (Pike and Huddleston, 2006) since with e-learning the control of these elements shifts to the student (Blass and Davis, 2003).

The importance of teacher-student interaction is iteratively confirmed in the literature by many researchers such as Fong, Kwan and Wang (2008) and Sasikumar (2008).

Least important type

The least important types of interactions chosen by the respondents are, in order from the lowest to the highest importance:

Teacher-Content

Teacher-Teacher

Content-Content

The reason that Content-Content is not highly selected by respondents suggested in the literature as it being one of the new types of interaction which are based on technological innovations (Anderson 2004), and that the existence of these multi-terms that describe the learning object is a result of the lack of clear definition and misconception of the term (Moore and Micheal 2007). Further research on this type of interaction is therefore to be considered - it is based on technology and coding but at the same time it needs to be integrated in the pedagogical and instructional approach for the benefit of the learning process.

In spite of the importance of Teacher-Content interaction as advocated by Anderson (2004), as it helps teachers to continuously monitor and update the content resources and activities that they create for student learning, statistically,

according to the respondents' point of view, it is one of the least important type of interaction. The reason behind this is suggested in the literature as little training or reward for teachers and lecturers who wish to adopt or develop e-learning (Clarke 2003), which that results in their lack of knowledge about e-content and its interaction with the teacher. The same considerations about the content in the previous section also apply.

Finally, much of the literature gives evidence of the lack of collaboration and engagement between teachers in learning (Weiss and Brigham, 2000 and Austin, 2001). Burden and Miller (2007) also state that there is a surprising lack of descriptive research describing this type of interaction. Accordingly, it is suggested for further research to focus on how online learning can contribute in developing the interaction between teachers.

5.5 Are there any barriers to using e-learning for all subject disciplines?

Potential subjects for e-learning

It is statistically significant by the respondents' feedback that Foreign Languages, Business Administration and Information Technology are the most suitable subjects to be covered in OL. The same is advocated by Eiseberg and Johnson (2003), OECD (2005) and Sloan (2010). On the other hand, Maths and Science are the least selected subjects, as is also suggested by Eiseberg and Johnson (2004), and assigned two different reasons in the literature: the shortage of qualified e-teachers in these specialties (Clerke, 2003) and the difficulties in replacing the traditional materials (Logo et al, 2007).

Reasons behind this limitation

With regard to the limited effectiveness of e-learning for all types of courses, it is statistically significant that the main reasons are perceived to be a lack of face-to-face tutoring (students 21%, and teachers 30%), which affects the pedagogical value of learning (OECD, 2005). 30% of both students and teachers stated that the content itself needs real-life application in a lab or field trips, and although the lack of interaction is not mentioned in the literature, both students (36%) and teachers (30%) considered it an important reason.

Although the relationship between interactivity and the suitability of e-learning to cover all subjects is not directly and in-depth investigated in research, according to the respondents' feedback, a full investigation of the obstacle, and an understanding of the interactivity perspective, it is concluded that using e-learning capabilities such as simulations, dissemination and some technologies to communicate with remote classrooms (webcast master classes, video conferencing and online tutoring) can compensate the absence of face-to-face tutoring to a great deal, and can thus enrich the course content itself with capabilities to simulate for the students the real life events of some subjects.

This can contribute to solving the problem highlighted by Sloan (2010) that almost all online enrolment growth is taking place on existing programs and there is no initiation of new programs (Allen and Seaman, 2010). In addition, it can play a role in enhancing the current delivered courses so that they are not just limited to introduction-level or foreign language courses or solving problems (Slone, 2005) or short courses (Eiseberg and Johnson, 2004).

5.6 Are there notable differences for educators and learning content when designing e-learning activities?

5.6.1 Educator

It is statistically significant that 90% of all teacher respondents did not have any experience in teaching online, a number is above the maximum range of confidence. NEA (2003) gives the lack of provided training or reward for teachers who wish to adopt or develop e-learning. As a reason for this, Clarke (2003) cites teachers' limited access to technology which results in the lack of adequate knowledge about the e-teaching environment (Assareh and Bidokht, 2011).

The respondents' feedback added yet another perspective: 30% of teachers stated the reason as the lack of interaction between the teacher and the student which did not encourage them to try this form of teaching, and 20% of teachers said that OL does not assist the teacher in displaying their individual teaching skills. This issue may need further research to clarify.

Another point of interest is the need for teachers' training to implement OL. 45% of respondents found that training is a main requirement for teachers to be e-teachers, while 35% stated that this is not a prerequisite. Although this number is just below the minimum range of confidence (39%), it is relatively high, and highlights two main issues: the skills required by online teachers are not fully recognized by some teachers, as the literature confirms (NEA(2003), Fetaji (2006)and Pierce (2008)), and the fact that e-teachers play a different role from that of traditional instructors (Pierce, 2008) is not recognized by some teachers.

5.6.2 Content

It is statistically significant that some features should exist in the e-content according to their beneficial contribution in the learning process. Content contribution in self-discipline and time management is high according to the student respondents (excellent 63%, very good 31%), while for the majority of teachers it is good (40%) and very good (25%). Blass and Davis (2003) conducted a case study with some online courses in Glasgow and Lancaster Universities where time boundaries were added to the course content to improve learner's self management. It is suggested that further research is conducted into the elements in the e-content that overcome specifically the lack of self discipline and time management in e-learning.

Teachers' feedback about the main characteristics of e-content such as accessibility, durability and adaptability was in general above the maximum range of confidence, a result confirmed by the interrelated characteristics presented by

ADL (2004) and Cadone (2001). Notably, interoperability was relatively low, a reason for which could be that it is a rather technical term difficult to understand for non-technical personnel. Discoverability was selected only by 45%, which is related to the teachers' limited access to internet technology in general and to the e-learning community specifically (see Clarke, 2003 and Assareh and Bidokht, 2010). With regards to comparing e-content with traditional content, students' feedback shows that e-content is more engaging with students to build up their dynamic experience than classic content (50%), a result supported by Fetaji (2007) and Kollias (2007). This is not the case with teachers, whose response on this issue was not very high (40%), possibly reflecting their view about the lack of engagement in e-content as a part of a lack of engagement in e-learning as a whole. 75% of students and 65% of teachers consider e-content to be easier than traditional learning content one, a result not supported in the literature, where Assarahand Bedoukht (2010) and Kollias (2005) describe e-learning as complex mix of human, software and hardware components.

Chapter 6 - Conclusion and Recommendations

6.1 Conclusion

The findings from literature have been mostly supported and confirmed by the quantitative research conducted in this study. Answers to each research question have been provided. A benchmark of the current situation of interactive e-learning has been established and it has been demonstrated that recognizing and exploiting the innovative potential of learning technologies in e-learning would help to ensure that an appropriate mix of student, teacher, and content interaction is designed for each learning outcome, which will enhance the learning process directly and indirectly. Directly it can enhance but not completely replace the missing human interaction in OL, but indirectly: more engagement between the student and the course can be achieved, and educational organizations can be encouraged to provide their staff with the required training and rewards to compete in this technology and acquire high quality OL instructors.

The main research question in this study was whether interactive e-learning can contribute in minimizing the students' drop-out rate and maximizing its potentiality to cover all contents. A good understanding of interactive e-learning is suggested to engage learners and increase their understanding and satisfaction of an OL course, and the potential to reduce the drop-out rate of OL is great. With regards to expanding the possibility of e-learning to cover more online subjects, it is sensible to accept that the potential to achieve this is limited because of a number of factors, such as:

- lack of research about the web2 application in online courses.
- lack of staff training regarding online courses.
- teachers' limited access to technology.
- limited bandwidth in some geographical areas.

However, interactive online study is not expected to cover all subjects without first overcoming these obstacles.

There are two areas of disagreement between the literature and the findings from this study. The first issue is related to the teachers' acceptance of the student-centred approach. As Blass and Davis (2003) claim, in the past teachers would control the pace, place, time and style of presentation and interaction in e-

learning, while now the control of these elements shifts to the student. It is statistically significant that a quarter of teachers disagree with the student-centred approach. However, the word 'past' here is arguable as this is still the case at present.

The second issue is related to the required IT skills in OL. It is suggested in the literature that young learners and employees are more comfortable in OL because of their familiarity with computers (Eiseberg and Johnson, 2004). However, based on the statistical results in this study, this is not the case - most respondents were young learners and employees and they considered the required IT skills to be of either advanced or upper intermediate level.

6.2 Recommendations

6.2.1 Recommendations from this study

- More efficient interactive elements in OL (leads to)→ less feeling of isolation among students (leads to)→ less need for face-to-face teaching (leads to)→ more understanding and students' satisfaction about the course (leads to)→ lower drop-out rate.
- There is a high potential to extend the possibility of e-learning to cover the given subjects more efficiently and to add more subjects to the list which were not added before to online study.
- OL courses need to be provided with efficient help and technical support considering all levels of students' computer literacy.
- Teachers can be encouraged to engage in online teaching by making a blended learning mode compulsory, not optional for e-learning, and by offering additional points for their qualifications when they study the use of learning technologies within their courses.

6.2.2 Recommendations for further researches

- Further empirical research on how to use both text and PowerPoint effectively to communicate with OL students and the provided training is recommended.
- Further empirical research on how can movie give the student the real lab atmosphere in science courses

- Further empirical research is suggested on teachers' approval/disapproval of a student-centred approach.
- Further empirical research is suggested on the direct relationship between interactivity and the suitability of e-learning to cover all subjects.
- Further empirical research is suggested on developing elements for e-content which overcome specifically the lack of self-discipline and time management issues in e-learning.
- Further empirical research is suggested on online-learning benefits in developing and enhancing teacher- teacher interaction.
- Further empirical research is suggested on content-content interaction, combining technology and computer intelligence with pedagogical and instructional approaches.

6.2.3 Obstacles

The following issues are some of the obstacles and limitations encountered throughout this thesis in collecting data.

- Limited time of research to measure some factors like the high drop-out rate of e-learning; finding the proper number of teachers as a selected sample; and using more instruments to investigate the phenomenon qualitatively.
- Although Web2 applications (web applications which facilitates sharing of information, user-centred design, and collaboration on the web, O'Reilly, 2006) such as Wikis and blogs, can contribute to successful interaction (Schone, 2007), and although interaction was a point of research on the micro level, the research highlighted a concern about a neglected area of research about Web2 applications and their operationalization in the instructional design of distance learning (Zawik, 2010).

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Appendix 1- Definitions and Abbreviations

1.1 Definitions

Simulation: is a reproduction of an item or event through computer games, role-plays, or building models so that we can explore it, perform experiments on it, and understand it before implementing it in the real world.(Access Technology Group, 2006)

Wiki is a website that allows the creation and editing, removing, adding of any number of interlinked web pages via a web browser using a simplified mark up language or a text editor.(Oxford Dictionaries, 2011)

Blog a personal website or web page on which an individual records opinions, links to other sites, etc. on a regular basis.(Oxford Dictionaries, 2011)

Podcast a digital recording of a radio broadcast or similar program, made available on the internet for downloading to a personal audio player. (Oxford Dictionaries, 2011)

Twitter: is an online social networking and micro blogging service that enables its users to send and read text-based posts of up to 140 characters, informally known as "tweets". (Sagolla, 2009)

VOIP is a family of technologies, methodologies, communication protocols, and transmission techniques for the delivery of voice communications and multimedia sessions over Internet Protocol (IP) networks, such as the Internet. (FCC, 2010)

WBT: Web Based Training – The training platform is the WWW and the training resides within the browser. This tends to be synchronous, as the instructor is sitting at a terminal with a web cam and presentation. The learners are able to ask questions via chat like features. Replaying the live presentation is a form of asynchronous delivery, though the replay is static and no questions can be asked. (Hildebrandt, 2007)

CBT: Computer Based Training – The course is packaged to run off a CD or DVD with no instructor present. If questions need to be asked they are normally e-mailed to the teach team. This is an asynchronous delivery, though it is a self-taught approach and learner motivation easily fails (Hildebrandt, 2007)

Content is a part of another bigger object known as “Learning Object” LO . As illustrated in the following diagram which shows components of LO

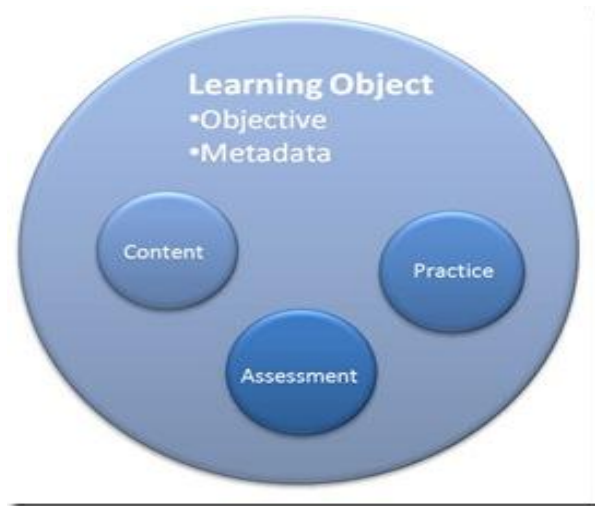


Figure 38:Atomic level view of a learning object (Cisco,2010)

Learning Object: is a digital entity (reusable-interoperable-durable-accessible) can be used and reused using technology and it must have a specific learning objective (Mason, 2003)

1.2 Abbreviations

E Electronic (Learning, Content, Tutor....)

CBT Computer Based Training

DL Distance Learning

HCI Human Computer Interface

IT Information Technology

MS Microsoft

OL Online Learning

RSS Really Simple Syndication

UKeU United Kingdom E-University

VOIP Voice Over Internet Protocol

WBT Web Based Training

Appendix 2 – Ethical Considerations

2.1 Introduction

Before undertaking any research, the Research Governance Office (RGO) at the University of Southampton has provided advice and guidance. Some documents and forms should be provided to get the RGO approval. These documents are:

- Consent Form
- Ethics Review Checklist
- Protocol
- Risk Assessment Form
- Participant Information Sheet
- Insurance and Resource Governor Application

However, no research was proceeding before approval from the RGO was granted.

2.2 Copy of Research Governance Office (RGO) Approval Letter



Mrs Nashwa Ismail
School of Education
University of Southampton
University Road
Highfield
Southampton
SO17 1BJ

RGO Ref: 7974

05 April 2011

Dear Mrs Ismail

Project Title Is Interactivity a Major Promise for E-Learning?

This is to confirm the University of Southampton is prepared to act as Research Sponsor for this study, and the work detailed in the protocol/study outline will be covered by the University of Southampton insurance programme.

As the sponsor's representative for the University this office is tasked with:

1. Ensuring the researcher has obtained the necessary approvals for the study
2. Monitoring the conduct of the study
3. Registering and resolving any complaints arising from the study

As the researcher you are responsible for the conduct of the study and you are expected to:

1. Ensure the study is conducted as described in the protocol/study outline approved by this office
2. Advise this office of any change to the protocol, methodology, study documents, research team, participant numbers or start/end date of the study
3. Report to this office as soon as possible any concern, complaint or adverse event arising from the study

Failure to do any of the above may invalidate the insurance agreement and/or affect sponsorship of your study i.e. suspension or even withdrawal.

On receipt of this letter you may commence your research but please be aware other approvals may be required by the host organisation if your research takes place outside the University. It is your responsibility to check with the host organisation and obtain the appropriate approvals before recruitment is underway in that location.

May I take this opportunity to wish you every success for your research.

Yours sincerely

Dr Martina Prude
Head of Research Governance

Tel: 023 8059 5058
email: rgoinfo@soton.ac.uk

Appendix 3 – Questionnaire Design and Piloting

3.1 Introduction

This information is being collected as part of Master's thesis with the School of Education at the University of Southampton. To fulfill the research requirements, information is to be collected from both teachers and students through questionnaires; however, there are two different questionnaires for teachers and students respectively. There are two reasons for this:

As part of the research, the students took part in a short online course, and were asked to answer some questions in the students' questionnaire regarding this course.

On the other hand, teachers were asked to answer some questions in the teachers' questionnaire regarding their teaching experience.

The Student's Questionnaire consists of 20 questions; the Teacher's Questionnaire consists of 23 questions. Both questionnaires are between 7-8 pages long and should take no more than 15 minutes to complete. The first two questions in each questionnaire concern the course that the respondent is studying or teaching in their institution, the third question concerns their previous knowledge about e-learning. The rest of the questions deal with a number of issues in e-learning including advantages and disadvantages, learning modes, e-content and e-educator, but are not divided into specific sections.

3.2 Piloting questionnaire

In the following section some issues have been highlighted to the researcher after piloting the questionnaire:

There were 17 questions to be answered in 30 minutes, with a considerable number of open end questions which were unsuitable specially for students who had limited experience and practice with e-learning. Also, there was one unwanted question ("Rate the aesthetic appearance of the course"), as it had no relationship with the specified research question. Furthermore, it had not been considered to add footnotes to explain some of the terminology in e-learning especially for students such as "synchronous" and "asynchronous", or the difference between radio button and check box.

And finally, the time dedicated to answer the questionnaire's questions should be reduced for the following reasons:

Data was collected from respondents face to face and each institution specified limited time for collecting data.

Explaining the course itself and giving students enough time to study and answer the final assessment took more than half of the specified time .

The previous concerns have been considered in the final questionnaire.

3.2.1 Example of pilot questionnaire for students

(1)What course are you studying?

- English
- Information Technology
- Business & Economics
- Accounting

(2)After studying the course, rank your understanding and satisfaction about it.

- | | | | | |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Excellent | Very good | Good | Fair | Poor |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

(3) What are the main obstacles in online learning?

(4) Did you find any need to have face to face tutoring?

- Never

- Little
- Sometimes
- Often
- All the time

(5) Did you have any feeling of social isolation?

- Never
- Little
- Sometimes
- Often
- All the time

(6) What is the required level of IT skills before studying an online course?

- No knowledge is required
- Beginner
- Intermediate
- Upper Intermediate
- Advanced

(7) Which embedded tool/tools helped you the most while studying the course?

- Movie
- PowerPoint

Interactive definitions in the page footer

Text Files

Wiki

Facebook

None

(8) Are you a social butterfly and a social network user (E.g. MySpace, Flickr, Facebook, Wiki)?

All the time

Often

Sometimes

Little

Never

(9) Rate the aesthetic appearance of the course.

Excellent

Very good

Good

Fair

Poor

(10) What is the best method of learning in online courses?

Synchronous

Asynchronous

Both (Synchronous & Asynchronous)

Blended learning

(11) Rate the main types of interaction in E-learning.

Student-Content

Student-Teacher

Student-Student

Teacher-Content

Content-Content

Teacher-Teacher

(12) Do you recommend e-learning for all subjects?

All the time

Often

Sometimes

Little

Never

(13) What are the obstacles that prevent e-learning to cover all subjects?

(14) What subject/subjects do you recommend for online courses?

IT & Computing

Science

Maths

Social Science

Business & Economics

Foreign languages

None

(15) Rank your overall course contribution in self discipline and time management during the learning process.

Excellent

Very Good

Good

Fair

Poor

(16) What are the main characteristics that differentiate online course from any traditional course?

(17) Any other comments

**Thank you for the taking the time to complete this
questionnaire**

3.3 How do the questions in the questionnaires relate to the research questions of the thesis?

Research Question	Questionnaire Question
1. What are the perceived drawbacks of e-learning?	SQ 2,3,4,5,6 TQ 3,4,5
2. What does interactivity mean in the context of e-learning?	SQ 7,8,9 TQ 6,7,8,9
3. What are the pros and cons of synchronous, asynchronous and blended learning?	SQ 10,11,12,13 TQ 10,11,12,13
4. What are the different types of interaction in the process of e-learning?	SQ 14 TQ 14,15,16
5. Are there any barriers to using e-learning for all subject disciplines?	SQ 15,16,17 TQ 17,18,19,20
6. Are there notable differences for educators and learning content when designing e-learning activities?	SQ 18,19 TQ 2,16,21,22,23,24,25,26

SQ: Student questionnaire

TQ: Teacher questionnaire

3.4 Example of Final Questionnaires

3.4.1 Teachers' Questionnaire

(1) What course are you teaching?

- English ¹
- Information Technology
- Business & Economics
- Accounting

(2) Did you study/teach on line before?

- Yes
- No

(3) What are the main obstacles in online learning?

If others, specify below.

- Miscommunication between student and teacher ²
- Miscommunication between student and content
- Unclear Content
- Feeling of isolation
- Not suitable for all subjects
- No time management or self discipline

¹ Specify one option only

² Specify more than one option

(4) Rate the level of IT skills that are required for the learner to have before studying an online course.

- No knowledge is required
- Beginner
- Intermediate
- Upper Intermediate
- Advanced

(5) What are the best tools that help the student in learning online?

- Movie
- PowerPoint
- Interactive definitions in the page footer
- Text Files
- Wiki
- Facebook
- None

(6) Are you a social butterfly and a social network user (E.g. MySpace, Flickr, Face book, Wiki)?

- All the time
- Often
- Sometimes

Little

Never

(7) Rank the benefit of social networking (Face book, Wiki) embedded in the course regarding the learning process.

1 2 3 4 5 6 7 8 9 10

1=Lowest rate 10=Highest rate

(8) What is the best method of learning in online courses?

Synchronous ³

Asynchronous ⁴

Both (Synchronous & Asynchronous)

Blended learning

(9) Rate the main characteristics of **Synchronous**

Learning:

	Excellent	Very Good	Good	Fair	Poor
Place Flexibility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Time Flexibility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
IT knowledge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Students Engagement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

³ Synchronous learning mode: requires the presences of all participants: teacher and student simultaneously.

⁴ Asynchronous learning mode: takes place for different students at different paces (time and place).

Distance Education Availability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Instant Feedback	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(10) Rate the main characteristics of **Asynchronous Learning**:

	Excellent	Very Good	Good	Fair	Poor
Place Flexibility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Time Flexibility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
IT knowledge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Students Engagement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Distance Education Availability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Instant feedback	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(11) Rate the main characteristics of **Blended Learning**⁵:

	Excellent	Very Good	Good	Fair	Poor
Place Flexibility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Time Flexibility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
IT knowledge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Students Engagement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Distance Education Availability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Instant Feedback	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

⁵ Blended learning mode: combines traditional face to face classroom methods with more modern computer-mediated activities.

(12) Rate the main types of interaction in E-learning.

- Student-Content
- Student-Teacher
- Student-Student
- Teacher-Content
- Content-Content
- Teacher-Teacher

(13) Do you accept the Student-Centred Approach?

- Strongly agree
- Agree
- Disagree
- Strongly disagree

(14)Rate the importance of assessments and instant feedback as form of interaction between the student and the content?

- 1 2 3 4 5 6 7 8 9 10

1=Lowest rate 10=Highest rate

(15) Do you recommend e-learning for all subjects?

- All the time
- Often
- Sometimes
- Little

Never

(16) *What are the obstacles that prevent e-learning to cover all subjects?*

- No face-to-face teacher
- Lack of students engagement
- Bandwidth limitation
- Lab practice & field trips can not taught through e-learning

(17) *Rate e-learning contribution in the learning process for subjects that requires science lab and math exercises.*

1 2 3 4 5 6 7 8 9 10

1=Lowest rate 10=Highest rate

(18) *What are the subjects do you recommend for online courses?*

- IT & Computing
- Science
- Maths
- Social Science
- Business & Economics
- Foreign languages
- None

(19) *If your answer to question 2 is “No”, what is the reason behind the low number of online teachers?*

- No training is provided
- No individual skills
- Few e-learning courses require my subject
- Course syllabus isolates teacher from student

(20) Do you think that any face-to face teacher can be an online teacher?

- Absolutely, yes
- Absolutely, no
- Yes, but training is required

(21) Did you have any training for online learning before?

- All the time
- Often
- Sometimes
- Little
- Never

(22) What are main characteristics in the e-learning content?

- Flexible
- Reusable
- Sharable
- Discoverable

- Updatable
- Interoperable
- Customizable
- None

(23) What are the main characteristics that differentiate e-learning from any traditional course?

- Faster
- Easier
- Cheaper
- Safer
- More Engaging

(24) Any other comments

**Thank you for the taking the time to complete this
questionnaire**

3.4.2 Students' Questionnaire

(1)What course are you studying?

- English ₁
- Information Technology
- Business & Economics
- Accounting

(2)After studying the course, rank your understanding and satisfaction about it.

- | | | | | |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Excellent | Very good | Good | Fair | Poor |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

(3) What are the main obstacles in online learning?

- Miscommunication between student and teacher ₂
- Miscommunication between student and content
- Unclear Content
- feeling of isolation

₁ Specify one option only Specify one option only

₂ Specify more than one option Specify more than one option

- Not suitable for all subjects
- lack of time management and self discipline

(4) Did you find any need to have face to face tutoring?

- Never
- Little
- Sometimes
- Often
- All the time

(5) Did you have any feeling of social isolation?

- Never
- Little
- Sometimes
- Often
- All the time

(6) What is the required level of IT skills before studying an online course?

- No knowledge is required
- Beginner
- Intermediate
- Upper Intermediate
- Advanced

(7) Which embedded tool helped you the most while studying the course?

- Movie
- PowerPoint
- Interactive definitions in the page footer
- Text Files
- Wiki
- Facebook
- None

(8) Are you a social butterfly and a social network user (E.g. MySpace, Flickr, Face book, Wiki)?

- All the time
- Often
- Sometimes
- Little
- Never

(9) Rank your overall satisfaction with the benefit of social networking (Face book, Wiki) embedded in the course regarding the learning process.

- | Excellent | Very good | Good | Fair | Poor |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

(10) What is the best method of learning in online courses?

- Synchronous
- Asynchronous
- Both (Synchronous & Asynchronous)
- Blended learning

(11) Rate your overall satisfaction with the main characteristics of **Synchronous Learning**:³

	Excellent	Very Good	Good	Fair	Poor
Place Flexibility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Time Flexibility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
IT knowledge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Students Engagement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Distance Education Availability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Instant feedback	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(12) Rate your overall satisfaction with the main characteristics of **Asynchronous Learning**:⁴

Excellent Very Good Fair Poor

³ Synchronous learning: requires the presences of all participants: teacher and student simultaneously.

⁴ Asynchronous learning: takes place for different students at different paces (time and place).

	Good				
Place Flexibility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Time Flexibility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
IT knowledge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Students Engagement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Distance Education Availability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Instant feedback	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(13) Rate your overall satisfaction with the main characteristics of **Blended Learning**.⁵

	Excellent	Very Good	Good	Fair	Poor
Place Flexibility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Time Flexibility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
IT knowledge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Students Engagement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Distance Education Availability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Instant Feedback	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Place Flexibility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(14) What are the most important type/types of interaction in E-learning?

⁵ Blended learning: combines traditional face to face classroom methods with more modern computer-mediated activities.

- Student-Content
- Student-Teacher
- Student-Student
- Teacher-Content
- Content-Content
- Teacher-Teacher

(15) Do you recommend e-learning for all subjects?

- All the time
- Often
- Sometimes
- Little
- Never

(16) *What are the obstacles that prevent e-learning to cover all subjects?*

- No face-to-face teacher
- Lack of students engagement
- Bandwidth limitation
- Lab practice & field trips can not taught through e-learning

(17) What are the subjects do you recommend for online courses?

- IT & Computing
- Science

- Maths
- Social Science
- Business & Economics
- Foreign languages
- None

(18) Rank your overall satisfaction with the course contribution in self discipline and time management during the learning process.

Excellent	Very Good	Good	Fair	Poor
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(19) What are the main characteristics that differentiate the e-learning from any traditional course?

- Easier
- Cheaper
- Faster
- More Engaging
- Flexible

(20) Any other comments:

**Thank you for the taking the time to complete this
questionnaire**

Appendix 4 – Experiment Design and Procedures

4.1 Experiment design

A two-day course on the “Network Fundamentals” was created, and students from the specified centers were enrolled to attend the course and accepted to participate in the experiment. They were divided into two groups: the experiment group learned the program with interactive elements, whereas the control group got the traditional PDF course. Before starting the main course, a pre-test was held for both groups to ensure the similarity between the initial levels of experience between the two groups. After attending the course, both groups were tested on the content of the module. Then, the researcher compared their scores using statistical functions as explained in chapter 4. The experiment elements design is as follows:

Factor	Explanation	Example
Research Question	The experiment results support/ reject the research question	Interactivity effect on enhancing distance learning regarding to: <ul style="list-style-type: none"> • Suitability to cover all subject • Reducing drop-out rate
Variable	Something that changes	Interactive application
Independent	Something that you control	interactive elements in an e-learning course
Dependant	Something that changes based on your control of the independent variable	<ul style="list-style-type: none"> • Student perception • Success rate • Drop-out rate • E-learning suitability to all subjects
Experiment group	Group that is subject to your changing variable	Attendants of interactive course
Control group	Group that is treated exactly like your experimental group except for the variable you are testing	Attendants of non-interactive course

Table 6: Experiment Design

4.2 Course Design

The researcher designed an online course about “Network Fundamentals” in which all interactive elements from the researcher’s point of view are functionalized, such as:

- Pre- test and post-test that give the student immediate results.
- A questionnaire at the end of the course that was sent to the teachers immediately via e-mail to evaluate the students' feedback about the course.
- Tools for time- and self-management such as a clock to remind the learner of both the current time and the time spent since he/she logged in.
- Translation into two different languages (Arabic & English in this course).
- Educational games.
- Interactive definitions as glossary.
- Audio/Video tutorial lessons.
- Facebook and Wiki pages for synchronous and asynchronous interaction between teacher and students and between the students and their peers.
- Extra tools that give the student a feel of class atmosphere such as a notepad to write notes and a break with mental maths games.
- The overall course appearance aesthetically acceptable.
- Programs used in designing and developing the course were:

(Dreamweaver CS3 - Visual dot Not 2005 - Macromedia Flash MX -

Photoshop CS)

Appendix 5 – Data Analysis

5.1 Microsoft Excel in Data Analysis

Before analyzing the data, a comparison was made between the Statistical Package for Social Science (SPSS) 17.0 and Microsoft Excel, since it is the researcher's task to determine which statistical package is more efficient to analyze the collected data.

According to Clark (2009), SPSS's default graphics are poor and not easily customizable, while Excel graphics are easy and fully controlled (Learn Higher and MMU, 2008). According to Goldwater (2007), if there are 10 or 12 columns in a data source, or a complicated statistical correlation is needed, then SPSS is to be used.

In spite of the inability of MS Excel to support a large database, its complicated statistical functions, and its lack of tractability and audit ability (Insighful, 2005), it was found to be a suitable data analysis package for quantitative data for the following reasons:

- All required statistical functions to analyze the data are existed in MS Excel.
- Excel is ideal for transforming relatively small data sets into attractive tables and presentations.
- Charts are extremely flexible, providing the ability to include multiple data plots in a worksheet and easily link cells and formulas (Learn Higher and MMU, 2008).
- Sorting, grouping and some functions can work with non-numerical data (text), which is not the case in SPSS, which deals with numbers only.
- The data source is relatively small.

5.2 Statistics Data Analysis Reference

For the purpose of analyzing data in this thesis, the following statistical functions and tools have been used:

-Range of Confidence Interval: to decide how many enough of the collected data is, it was important to find range of values around the statistic where the "true" (population) statistic can be expected to be located. Accordingly, values below the minimum of this range are considered low and values are above the maximum of this range are considered high. To calculate the range of confidence, the following formula was used:

The CONFIDENCE () function [CONFIDENCE (alpha, STDEV, n)](Microsoft, 2007)

- Alpha is the significance level used to compute the confidence level, e.g. an alpha of 0.05 indicates a 95 percent confidence level (Trochim, 2006).
- STDEV is the the population standard deviation for the dataset.
- N is the number of respondents.

-Hypothesis: the hypothesis describes what the researcher expects to happen in the research. Regarding the experiment results in this case, there are two hypotheses:

The null hypothesis H_0 : there is no change between the two groups after the course.

The alternative hypothesis H_1 : there will be a significant increase in the experiment group results. Because the specified direction is "one-tailed-hypothesis".

-Correlation: To investigate the relationship between two sets of variables, for example the general use of social network and the learner's perception to use it in OL, a correlation is used to accept/reject the researcher's hypothesis. Generally, correlation coefficients between 0.00 and 0.30 are considered weak, those between 0.30 and 0.70 are moderate and coefficients between 0.70 and 1.00 are considered high (Ridings, 2008). However, this rule should be always qualified by the circumstances. After correlating the two sets of data, it is essential to check the strength of the correlation, the selected method to check this is explained in the following section.

-Spearman's Rank Correlation Coefficient: to discover the strength of a link between the correlated data and check the level of significance, Spearman's Rank Correlation Coefficient was used (StatSoft, 2011).

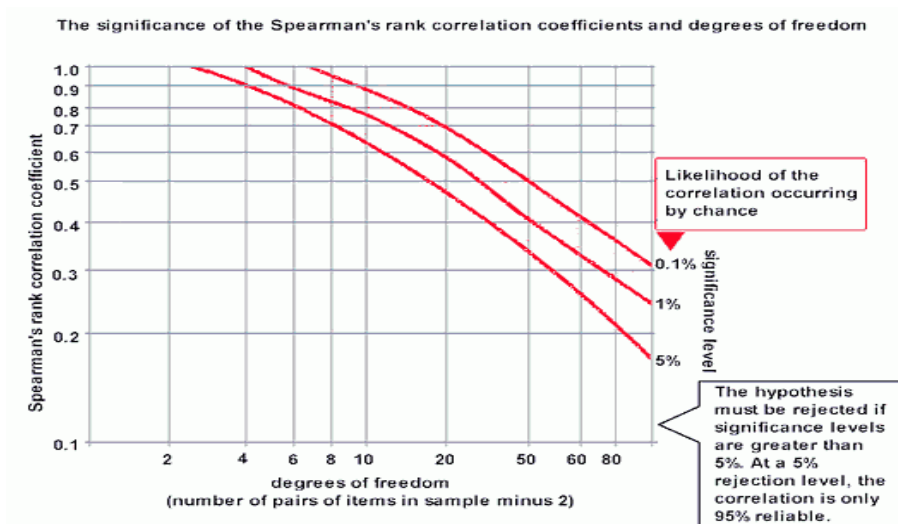


Figure 39: Blank copy of Spearman's significance graph (Barcelona Field Studies Centre S.L., 2011)

With regard to the above diagram, if R (correlation)=0.6 and the degree of freedom (Number of respondents-2)=10, this gives a significance level of slightly less than 5%. That means that the probability of the relationship is being a chance event is about 5 in 100. In other words, it is 95% certain that the hypothesis is correct. The reliability of a sample can be stated in terms of how many researchers completing the same study would obtain the same results, namely 95 out of 100.

-T-Test: to evaluate the differences in means between the two groups in the experiment (Trochim, 2006). It compares the actual difference between two means in relation to the variation in the data. In this thesis, the Paired T-Test is used to evaluate a difference in test scores between the experiment group who studied the interactive course, and a control group who studied the traditional course. The result would confirm or reject the null hypothesis as explained above.

To calculate a value of T:

- State the research hypothesis: the experiment's group result is higher than the control group result.
- State the null hypothesis: there is no difference between the results of both groups.
- Select the level of alpha: $p=0.05$.
- Decide whether it will be a one-tailed test or a two-tailed test for significance

In general, a T-score must fall far from the mean in order to achieve statistical significance. That is, it must be quite different from the value of the mean of the distribution.