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Developing, Implementing and Evaluating an Internet Curriculum for Egyptian Teachers

Ahmed Ali Hussein El-Gamal

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Abstract

This research aimed to develop, implement and evaluate an Internet curriculum for pre-service teachers in Egypt within a constructivist learning environment. Accordingly, this study included the development of the content and objectives of the Internet curriculum, the design of a web-based learning environment, the trialling with groups of pre-service teachers and the evaluation of the effectiveness of both the Internet curriculum and the Web-based learning environment.

The methodology used in this study is considered to be a case study and it was also influenced by an action research methodology involving cycles of development, design, implementation and evaluation of the Internet curriculum. A number of methods were used in order to collect research data including questionnaires, observations, interviews and a learning styles inventory (Kolb, 1981). Furthermore, a content analysis was carried out of Internet users' guides and teachers' guides and a Web-based questionnaire was used in order to develop the objectives of the Internet curriculum.

A Web-based learning environment namely 'Internet-Tutoring System' was designed in order to provide the students with cognitive tools, information resources and authentic activities.

The implementation of the study took place in two phases. The first phase was conducted with a group of students' teachers in Sheffield and the second phase was conducted with another group in Egypt. These phases aimed to identify the issues that emerge from using a Web-based learning environment based on the students' feedback on both the learning environment and the Internet curriculum.

This study led to significant results in relation to the content of the Internet curriculum, student learning within a Web-based learning environment, the roles of the teacher, the design of the web-based learning environment and the students' progress in the use of the Internet. The models of constructivist learning environments, particularly Jonassen's (1997a) model, influenced the development of the Internet curriculum and its structure. Accordingly, several content structures were developed in order to take into consideration the different needs and expectations of the students. These included well-structured content with teacher-centred learning, semi-structured content with teacher-student learning and ill-structured content with learner-centred learning. In addition, the Web-based learning environment was designed in order to provide the students with cognitive tools, information resources and authentic activities. As a consequence, a range of tools and resources were integrated in order to encourage the students to play an active role in knowledge construction. This integration is considered to be a key aspect of this study and it was developed in order to accommodate the preferred learning styles of the students. Moreover, a range of roles for the teacher were illuminated in this study such as those of mentor, facilitator and orchestrator. These roles developed due to the integration of a number of teaching methods alongside the use of the Web-based learning environment. They were also influenced by the different content structures of the Internet curriculum and the different types of control over the learning process.

The study concludes with a discussion of major implications for both policy and practice in Egyptian education. Furthermore, it highlights key characteristics and key design phases that should be taken into account in the future development of Web-based learning environments. Finally, further research questions are highlighted for the future development of integrated learning and teaching environments.

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Chapter one: Introduction

1.1. Introduction

At the present time we are witnessing an increasing use of information technology and the Internet in different domains in our lives. According to Williams (1995) and Cooper (1996), the Internet is defined as a large collection of networks that are tied together so that many users can share their vast resources. It is also defined by Pitter (1995) as the network of networks. The Internet began in 1960 when the US Defence Department launched the 'Advanced Research Projects Agency (ARPA)' in order to design a computer network to connect the different research centres and colleges (Wingate, 1997). In 1969, ARPANET was established by the Defence Department in order to begin research into computer networking. For several years after that, the development in this network was continued and the first email program was created and sent across the network in 1972. For about two decades after that, the development in using the network was mainly for research purposes across different academic institutions. The first school to connect to the Internet was a K-12 school in the United states in 1988 (McLain et al., 1998). Then in 1990 the network was opened up to everyone and it was officially named the Internet. One of the major advents of the Internet is the World Wide Web (WWW), which was created in 1992 at 'CERN' -an institute for particle physics in Switzerland- by a British scientist called Tim Berners-Lee. Since 1992 the Internet and the World Wide Web have become used widely across different disciplines. Subsequently, teachers and students have started to use the Internet e.g. they have used it as a 'virtual reference desk', as a way for students and faculty to communicate with peers worldwide and as a way to share lesson plans (Wiggins, 1995).

It is self evident that the use of the Internet has become widespread in recent years, and it has become essential for all teachers to know how to use the Internet. In fact, the Internet can make a real difference in teaching and learning in schools by using it to enhance and enrich the classroom experience according to Williams (1995).

However against this background of very rapid change in society, it has been found that there is a lack of computer knowledge and experience among teachers in developing countries according to a study by Al-Mohaissin (1997), which presents a serious difficulty for the introduction of computers into subject teaching. Moreover, Mohaiadin (1997) found that there is a lack of knowledge and skills in using the Internet, and this could be a consequence of the fact that the use of the Internet has been typically learned through friends rather than through formal curriculum or instruction. A study by Shezhang (1998) also found that 73% of a group of social studies' students learned how to use the Internet from friends. In most cases, there is no curriculum for the Internet that determines specific goals and contents. Therefore, this research focuses on developing an Internet curriculum for Egyptian teachers in order to enable them to use the Internet effectively in teaching and learning. Moreover, this research focuses on implementing this curriculum and evaluating both the Internet curriculum and the implementation processes. Subsequently, a Web-based learning environment namely 'Internet Tutoring System' was designed in order to represent the Internet curriculum. After designing the Web-based learning environment, the Internet curriculum was trialled with a group of ICT students in the School of Education at Sheffield Hallam University. Subsequently, it was trialled with a group of students in the Faculty of Specific Education at Menofia University in Egypt.

According to Cunningham (1991), the role of education from a constructivist perspective is to encourage students to construct knowledge and to promote collaboration with others in order to highlight the multiple perspectives that can be brought to bear on any particular problem. He also adds that learners must see the relevance of the knowledge and skill to their lives, and how such knowledge can help them do things that are embedded in the concerns that they have. Based on a constructivist perspective, Marx et al. (1998) identify four key features of the teacher knowledge which should inform professional development efforts. These features emphasise that teacher knowledge is constructed, situated, social and distributed. These key features are considered to be major assumptions of the constructivist theory of learning. Subsequently, a constructivist theory of learning is seen to best describe the theoretical basis for this research. Moreover, this research is particularly influenced by the constructivist pedagogical and epistemological models developed by Jonassen (1997a), Spiro et al. (1991), Mayer (1999) and Hannafin et al. (1999).

For example, these models influenced the development of the Internet curriculum and also the design and the implementation of the Web-based learning environment. The internet curriculum and its structure were developed within the framework of a constructivist theory of learning. Furthermore, this theory underpinned the pedagogical assumptions of both the design and the implementation of the Web-based learning environment by providing a range of cognitive tools and resources to enable the students to construct their own knowledge about the use of the Internet. The following parts in this chapter highlight an overview of the educational system and the use of the Internet in Egyptian schools; research aim and objectives; the action plan and programme of research.

1.2. An overview of the educational system and the technological development project in Egypt

Egypt is one of the largest countries in the Middle East and in Africa. It is the biggest country in the Middle East in terms of its population and it has the second biggest population in Africa after Nigeria. Egypt has over 65 million people who are living in less than 4% of its landscape, which is about 1 million square kilometres. Therefore, most inhabited areas in Egypt are considered to be highly residential. Egypt is also considered to be one of the developing countries of the world. Subsequently, the increased size of population and the small area that the people are living in has led to an increasing number of problems that the country faces such as economic problems, educational problems etc. For example, the Egyptian Ministry of Education is facing several key difficulties that jeopardise the quality of teaching and learning in Egyptian schools. These difficulties include the increasing number of students who require basic education, the need for increasing numbers of qualified teachers, a lack of resources, facilities and infrastructure etc. Table (1) shows a comparison between the total number of students in basic education (preschool, primary, prep-school and secondary), the total number of teachers and the total number of classrooms in schools.

Table 1. The development in the total number of classrooms, students and teachers from 1992/1991 to 2001/2000

No./Year	1991/1992	2000/2001
Classrooms	291428	374481
Students	12101846	15179246
Teachers	568818	795195

Table (1) illustrates the fact that although there are a growing number of students in Egyptian schools, there is an increasing effort to increase the number of teachers and classrooms that are required for these students. However, according to the 2000/2001 statistics which are shown in table (1), it can be noticed that the average number of students per classroom is 40. This average number varies from school to school, e.g. while the average number of students in some schools is 35 students per classroom, some other schools have an average of over 55 students per classroom. The large numbers of students per classroom is considered to be one of the major problems facing education in Egypt.

In recent years, the Egyptian government -the Ministry of Education- has been seen to be providing an increasing effort to solve the educational problems. For example, the Ministry of Education in Egypt started to increase the number of schools by building new schools in order to solve the problem of the increasing numbers of students (see table 2). In addition, it increased the number of teachers year by year.

Table 2. The increase in the total number of schools' buildings in Egypt since 1995.

95/96	96/97	97/98	98/99	99/00	01/02
29753	30570	31179	32150	32985	33880

In line with the development in the infrastructure for education in Egypt, the Ministry of Education established the Technological Development Centre which launched a technological development project in 1995. This project aims to develop, integrate and use information and communication technologies in education in Egypt. According to the Ministry of Education (2000), the technological development project in Egypt aims to create a learning environment that enables the students to create their own learning experience by learning how to use information resources and technological devices to find the information by themselves.

Subsequently, the Ministry of Education (ibid) aims to use educational technology in order to improve the quality of instruction and increase its effectiveness through:

- *"Solving the problems related to the crowded classrooms.*
- *Facing the shortage of qualified teaching staff.*
- *Considering the individual differences between students.*
- *Training teachers in the fields of preparing instructional objectives and instructional materials and appropriate instruction methods."* (This quote is a translation of the Ministry of Education (2000) objectives)

The policy and the objectives of the Egyptian Ministry of Education influenced the teaching and learning process in Egyptian schools. Subsequently, the predominant approach to teaching and learning is considered to be the behaviourist approach. As a result, the main teaching method that is used in Egyptian schools is the 'lecture' approach. As a consequence, the teacher role is mainly seen to be as a dispenser of information while the learner role is mainly seen to be as a receiver of information. These roles do not give the learners the opportunity to actively engage in the learning process. Accordingly, the current pedagogical approaches in Egyptian schools do not support the students to develop higher cognitive abilities such as analysing, synthesising and integrating knowledge in new situations.

The current pedagogical practices in the Egyptian educational system were taken into account in this research. For example, different content structures of the Internet curriculum were designed in order to change the students' perception of the teaching and learning processes by transforming their learning experiences gradually from a teacher-centred approach to a student-centred approach where they take the responsibility and the control of their own learning.

Since the beginning of the Ministry of Education technological development project, a number of schools in Egypt have been provided with different facilities to enable the use of information and communication technologies. These schools were selected centrally by the Ministry of Education according to its own plan and the selection criteria included for example school size, school location (urban and/or rural), school facilities to accommodate the multimedia lab (available classroom, electricity) etc. According to Ministry of Education statistics in 2000, the total number of schools that were technologically developed is highlighted in table (3).

Table 3. The number of technologically developed schools in Egypt.

Type of school	Primary Schools	Prep Schools	Secondary Schools	Total
No. of schools	5500	4203	1100	10803

It can be concluded from table (3) and the total number of schools in table (2) that only one third of the schools in Egypt were provided with the information and communication technologies facilities. These schools were provided with a small computer lab to use multimedia and to connect to the Internet. Each school has one or two computers inside these labs and each school was provided with a television, video player, computer data projector, a screen and an overhead projector. A few schools around the country were provided with bigger labs that have around ten computers or more. Moreover, there are different types of Internet connections that are provided in these schools (see table 4).

Table 4. The actual and the target number of Egyptian schools connected to the Internet and the type of Internet connection.

Type of connection	Direct or leased connections		Dial-up connections	
	Current no.	Target no.	Current no.	Target no.
No. of schools	175	943	3200	6000

It can be noticed from table (4) that a few schools have 'direct or leased line' connections which are far faster than the 'dial-up' connections that can be found in the majority of schools. The slow type of connection is seen to create difficulties in using the Internet in teaching and learning in Egyptian schools.

Since these schools have been connected to the Internet, several issues have emerged such as the lack of in-service training for teachers on the use of the Internet. This issue is considered to be the main focus of this research. In this research, this issue is seen to be not only related to training in-service teachers, but also related to training pre-service teachers. For example, most teacher education institutions in Egypt such as the Faculty of Specific Education are lacking facilities for training pre-service teachers on the use of the Internet. Subsequently, those teachers start their careers in schools with a lack of ability in using the Internet effectively. As a result, the development of an Internet curriculum for these teachers is considered to be necessary. Accordingly, this research focuses on developing, implementing and evaluating an Internet curriculum for Egyptian teachers. The aim and the objectives of this research and the research programme are discussed in the following parts of this chapter.

1.3. Research aim and objectives

1.3.1. Research aim

This research aims to:

Develop, implement and evaluate an Internet curriculum for teachers in Egypt within a constructivist learning environment.

1.3.2. Research objectives

This research aims to attain several objectives:

- To investigate the development of an Internet curriculum for pre-service teachers in Egypt.

This development involves determining the main objectives for learning the basic knowledge and skills that are prerequisites for teachers to be able to use the Internet effectively.

- To investigate the impact of the constructivist learning environment on the development of an Internet curriculum.

An emphasis is given to the different structures of content in the constructivist learning environment and its impact on the structure of the Internet curriculum i.e. developing a structure for the Internet curriculum. Moreover, the stages for knowledge acquisition in constructivist learning environments are discussed. The procedures for developing the Internet curriculum are also presented.

- To design a constructivist learning environment to represent the Internet curriculum for pre-service teachers.

A Web-based learning environment namely the 'Internet Tutoring System' is developed in the light of the characteristics of the constructivist learning environments.

- To implement the new Internet curriculum with a group of pre-service teachers using the designed learning environment.
- To evaluate the different aspects that are related to the Internet curriculum.
- To evaluate the effectiveness of the use of the 'Internet Tutoring System' in teaching and learning the use of the Internet.

This evaluation will be conducted in the light of the evaluation criteria for constructivist learning environments as highlighted by Jonassen (1991).

1.4. Original contribution to knowledge

This research highlights the different issues that are related to the development, implementation and evaluation of an Internet curriculum for Egyptian pre-service teachers within the framework of constructivist theory of learning.

The Egyptian education system is considered to be a unique context for this study particularly in relation to the different settings for this system. The different settings in the Egyptian education system include for example the predominant underpinning theory of learning (i.e. behaviourist), the available facilities, resources, the limited access to learning resources for teachers etc.

As highlighted earlier in this chapter, the main perspective for teaching and learning that underpins the education system in Egypt is considered to be the behaviourist theory of learning. Subsequently, the introduction of the constructivist theory of learning through this research is considered to be a challenging task. This is seen to be as a result of the students' perceptions, ideas and expectations about the teaching and learning process which is more influenced by the behaviourist theory of learning. For example, the students predominantly expect the teacher to lead the teaching and learning process and they usually act as receivers of information which is dispensed by the teacher.

Within the Egyptian context, the different models of constructivist learning environments, especially those developed by Jonassen (1997a), Spiro et al. (1991), Mayer (1999) and Hannafin et al. (1999), influenced the development of the Internet curriculum and its structure. As a consequence, the pedagogical and epistemological assumptions of these models were critically analysed in order to develop the content structure of the Internet curriculum. Accordingly, several content structures were developed in order to take into consideration the different needs and expectations of the students. This included well-structured, semi-structured and ill-structured content. Well-structured content has well-defined and specific objectives; and the learning process is mainly teacher-centred. Semi-structured content has general objectives and both the teacher and the students share the control over the learning process. Ill-structured content has ill-defined objective and the learning process is mainly student-centred (see chapter five).

Furthermore, these models influenced the design and the implementation of a Web-based learning environment namely the 'Internet Tutoring System'. For example, the

Web-based learning environment was designed in order to provide the students with cognitive tools, information resources and authentic activities. As a consequence, a range of tools and resources were integrated along with different teaching methods in order to encourage the students to play an active role in their learning. This integration is considered to be a key aspect that emerged from this study and it was used in order to accommodate the different learning styles of the students.

Moreover, several roles for the teacher were illuminated in this study such as the roles of mentor, facilitator and orchestrator. These roles emerged due to the integration of a number of teaching methods alongside the use of the Web-based learning environment. These roles were also influenced by the different content structures of the Internet curriculum and the control over the learning process.

The different aspects that were highlighted in this study are seen to make an original contribution to knowledge. Moreover, the findings of this study are also seen to have major implications for policy and practice in Egyptian education.

1.5. Action plan

The action plan for this research was influenced by the approach of action research and in particular the cycle of planning, implementing and evaluating (Elliott, 1991). Therefore, it included three main phases: developing the Internet curriculum, implementing this curriculum, and evaluating both the curriculum and the implementation itself. These phases are explained in the following sections.

The first phase of this study was concerned with the development of the Internet curriculum. In order to develop this curriculum, a content analysis of Internet teachers' guides and users' guides was made. This content analysis was conducted according to a set of criteria which is discussed later in chapter four. After that a Web-based questionnaire was developed in order to inform the results of the content analysis. Based on the content analysis and questionnaire results, a list of objectives for the Internet curriculum was developed.

The second phase of this study followed the development of the Internet curriculum and aimed to design a constructivist Web-based learning environment called the

'Internet Tutoring System'. The main purpose for designing this learning environment was to implement the Internet curriculum and to present it for students within the framework of constructivist learning environments. After designing this learning environment, two trials took place in order to evaluate the impact of both the Internet curriculum and the Web-based learning environment on students. These two trials can be seen as two cycles of the process of action research as highlighted by Elliott (ibid). Each trial (cycle) included three key processes which are planning, implementing and evaluating. Accordingly, the second phase of this study (i.e. the implementation phase) led to the third phase which is the final evaluation.

The third phase included the evaluation of both the Internet curriculum and the teaching and learning process using the Web-based learning environment. In order to conduct the evaluation, a set of methods was used in order to collect data from different perspectives through the use of triangulation. Among these methods were the use of questionnaires, observations, and interviews. Finally, the data collected from this evaluation was interpreted and reported in this thesis.

This action plan was developed with the ongoing research, and although some parts of it were specified at the beginning of this research, they were under continuous revision and some were modified while other parts were deleted as the research developed. This action plan was extended in terms of actions to be taken and also in terms of extending the timetable of research.

1.6. Thesis structure

The structure of this thesis was influenced by the guidelines stated by both Bell (1999) and Sheffield Hallam University (2000). Accordingly, the thesis starts with the title page followed by an abstract and lists of contents, figures and tables.

Chapter one is the introduction chapter. This chapter gives a clear statement about the research rationale and its aim and objectives. Furthermore, the introduction chapter gives an overview of the education system and the technological development project in Egypt.

Chapter two is the background literature chapter. This chapter looks critically into the background literature relevant to this research. For example, it looks into the different models of constructivist learning which influenced this research. It also investigates the different studies that are related to the design of the Web-based learning environments.

Chapter three is the methodology chapter. This chapter highlights the methodology that was used in this research. This methodology involves an action research approach within a case study framework. In addition, the research techniques that were used in order to collect data are discussed such as questionnaires, interviews etc.

Chapter four is the Internet curriculum development chapter. This chapter focuses on the different processes that were used in order to develop the Internet curriculum in this research. These processes included the content analysis of the relevant Internet users' guides and teachers' guides. They also involved the development of a Web-based questionnaire in order to verify the results of the content analysis and in order to identify the objectives of the Internet curriculum.

Chapter five focuses on the impact of the constructivist learning environments on the development of the Internet curriculum. This chapter aims to highlight the different structures of the content within a constructivist learning environment and their impact on the structure of the Internet curriculum in this research. This chapter highlights the different stages for knowledge acquisition in this research.

Chapter six is the design of the Web-based learning environment chapter. This chapter focuses on the different phases that were involved in the design of the Web-based learning environment namely 'Internet Tutoring System'. These phases include designing a prototype, user interface, communication tools etc.

Chapter seven is the implementation of the Web-based learning environment chapter. This chapter highlights the two different trial phases that were involved in this research. Therefore, this chapter aims to highlight the main issues that emerged from the different trial phases.

Chapter eight is the discussion chapter. Consequently, this chapter includes a discussion of the main findings of this research. This chapter is divided into six sections which are student characteristics; objectives and content of the Internet curriculum; learning process within a Web-based learning environment; teacher's roles within Web-based learning environment; an evaluation of the Web-based learning environment 'Internet Tutoring System; and students' progress in using the Internet.

Chapter nine is the conclusions chapter. This chapter highlights the main conclusions of this study. Furthermore, it includes recommendations that were drawn upon the study conclusions.

At the end of the thesis, a comprehensive list of the references that were used in this study is provided. In addition, appendices of the materials that are related to this study are separately numbered. These appendices include research questionnaires, data summary sheets etc.

1.7. Programme of research

May 99 - August 99

The research proposal for this study was developed. Subsequently, the programme of research was developed in the light of the different objectives of this research.

September 99 - December 99

Conducting an intensive review of the relevant background literature and maintaining an ongoing review of the updated literature. The contents of the Internet users' guides, and teachers' guides were analysed. These included for example getting connected to the internet (Cooper, 1996), the wide use of the internet e.g. email, FTP (Wingate, 1997) and the use of the WWW e.g. the use of search engines (Kalbag, 1997).

January 99 – June 2000

A Web-based questionnaire was designed in order to verify the findings of the content analysis and in order to identify the main objectives of the Internet curriculum. In addition, the data that were obtained from the questionnaires were analysed. At the end of this phase of this research, a list of objectives for the Internet curriculum was developed.

July 2000 - December 2000

The content structure of the Internet curriculum was determined according to the different content structures within constructivist learning environment models. The initial prototype of the Web-based learning environment namely 'Internet Tutoring System' was started.

January 2001-September 2001

The Web-based learning environment was designed. This stage of the research included the different phases that were involved in the design. For example, it included designing the user interface, designing the communication tools etc. This stage also included a continuing development in the researchers' Web design skills.

October 2001- December 2001

During this time, the initial trial took place at the School of Education at Sheffield Hallam University. This phase of the research aimed to prepare and implement the first initial trial phase in order to feed into both the design of the learning environment and the implementation of the final phase. It also included the analysis of the findings of this trial.

January 2002 - March 2002

During this phase, the preparation for the final trial was made. This trial phase took place in Egypt and it was conducted with a group of students in the Instructional Technology Department in the Faculty of Specific Education at Menofia University in Egypt.

April 2002 - July 2002

During this stage, the data that were collected during the final trial were analysed. These data were obtained from different sources such as questionnaires, interviews, observations etc. The results of the final trial were attained.

August 2002 - July 2003

The final phase of this research is considered to be the writing-up of the thesis. The writing-up included determining the main structure of the thesis.

Chapter two: Background Literature

2.1. Introduction

This chapter aims to highlight the background literature that has underpinned this study. Therefore, it includes a critical review of the theoretical basis for this research. It focuses on constructivist learning theory as the underpinning theory for this research. Firstly, an overview of constructivist learning theory - as interpreted in this study - is made. Secondly, the main principles of constructivist learning are highlighted. Thirdly, the relevant models of constructivist learning are critically discussed. These models are discussed in order to highlight their influence on the model of constructivist learning used in this research. Moreover, a review of the literature related to teaching and learning, the use of the Internet and Web-based learning environments is made in order to reflect on the development of the Web-based learning environment developed in this research. Additionally, a review of literature relevant to the learning styles is made in order to use this framework later in identifying the different learning styles of the students who participated in this research.

The review of the relevant literature shows that there are two main groups of theories which have influenced instructional design in recent years, which are behaviourism and constructivism. According to Jonassen (1991), the most important metaphysical assumption of behaviourism is that the world is real, it is structured, and that structure can be modelled for the learner. Behaviourism also maintains that the purpose of the mind is to "mirror" that reality and its structure through thought processes that are analysable and decomposable. On the other hand, constructivism claims that reality is more in the mind of the knower and that the knower constructs a reality or at least interprets it based upon his/her experiences. Constructivism is also concerned with how we construct knowledge from our experiences, mental structures and beliefs that are used to interpret objects and events. Our personal world is created by the mind, so in the constructivist's view, no one world is any more real than any other. There is no single reality or any objective entity.

These two theories of learning yield different models for instructional design. The characteristics of these models are highlighted by Willis (1995) in table (5). It can be seen from table (5) below that he highlights the characteristics for both behaviourist instructional design models and constructivist instructional design models.

Table 5. The main characteristics of behaviourist and constructivist instructional models

Characteristics of behaviourist instructional design models	**Characteristics of constructivist instructional design models**
1- The process is sequential and linear. 2- Planning is top down and systematic. 3- Objectives guide development. 4- Experts, who have special knowledge, are critical to instructional design work. 5- Careful sequencing and the teaching of sub-skills are important. 6- The goal is delivery of pre-selected knowledge. 7- Summative evaluation is critical. 8- Objective data are critical.	1- The instructional design process is recursive, non-linear. 2- Planning is organic, developmental, reflective and collaborative. 3- Objectives emerge from design and development work. 4- General instructional design experts do not exist. 5- Instruction emphasises learning in meaningful contexts (the goal is personal understanding within meaningful contexts). 6- Formative evaluation is critical. 7- Subjective data may be the most valuable.

According to Jonassen (1991), behaviourism and constructivism are often described as polar extremes on a continuum in order to contrast their assumptions. However, most designers and theorists assume positions that fall somewhere between the extreme views (see figure 1). For instance, while programmed instruction (PI) and instructional design (ID) possess more behaviouristic assumptions, Piagetian and discovery learning tasks tend to be more constructivistic.

Behaviourism ←-----PI-----ID-----ITS-----Piagetian---→ Constructivism

Externally mediated reality internally mediated reality

Figure 1. The continuum between behaviourism and constructivism (Adopted from Jonassen, 1991).

According to a study made by Seels (1989), she investigates the instructional design movement and its influence on the field of instructional technology. In table (6), she also contrasts constructivism with two other traditional learning theories.

Table 6. A comparison between behaviourist, cognitivist and constructivist theories (Adopted from Seels, 1989)

	Behaviourist	Cognitivist	Constructivist
Learning is	Change in overt behaviour due to conditioning	Programming of a new rule for information processing	Personal discovery based on insight
Types of learning	Discrimination, generalisation, association, chaining	Short term sensory storage, short term memory, long term sensory storage, long term memory	Problem solving
Instructional strategies	Present and provide for practice and feedback	Plan for cognitive learning strategies	Provide for active, self-regulating, reflective learning
Media strategies	Variety of traditional media and CAI	Computer based instruction and human	Responsive environment
Key concept	Reinforcement	Elaboration	Intrinsic motivation

Williams and Burden (1997) state that in contrast to behaviourism, cognitive psychology is concerned with the way in which the human mind thinks and learns. Cognitive psychologists are therefore interested in the mental processes that are involved in learning. This includes such aspects as how people build up and draw upon their memories and the ways in which they become involved in the process of learning.

Constructivist theories of student learning, according to Wittle et al. (2000), are derived from cognitive psychology and, while varying in specifics, are grounded in three key assumptions about learning. Constructivism assumes that effective learning requires active engagement with subject content; collaborative learning environments and opportunities for problem solving.

2.2. Constructivism

Constructivism is a philosophy of learning based on the idea that knowledge is constructed by learners (Kirschner, 2001). Therefore, learners are active in seeking meaning. Consistent with this view, learning should be situated in a rich context and reflective of real world contexts for this constructive process to occur and for transfer to environments beyond the school to be possible.

According to Richardson (1997), constructivism is a learning or meaning-making theory. It suggests that individuals create their own new understandings, based upon the interaction of what they already know and believe, and the phenomena or ideas with which they come into contact. Constructivism is also seen by Richardson (ibid) as a descriptive theory of learning (this is the way people learn or develop), and it is not a prescriptive theory of learning (this is the way people should learn).

Honebein et al. (1993) state that constructivism proposes that knowledge or meaning is not fixed for an object, but is rather constructed by individuals through their experience of the object in a particular context. Moreover, constructivism affirms that in order to learn, learning needs to be situated in problem solving in real-life contexts (Brown et al., 1989) where the environment is rich in information. Cunningham (1991) also mentions that constructivism emphasises that learning is a process of building up structures of experience. Therefore, learners do not transfer knowledge from the external world into their memories; rather, they create interpretations of the world based upon their past experiences and their interactions in the world.

After defining the term constructivist, it is equally important to define learning and knowledge from a constructivist perspective. According to von Glasersfeld (1998), learning is the product of self-organisation. In contrast, knowledge is never acquired passively, because novelty cannot be handled except through assimilation to a cognitive structure the experiencing subject already has. Sutton et al. (1996) also state that learning, from a constructivist perspective, involves continuous, active construction and reconstruction of experiences. Because the nature of this construction depends on prior experiences and existing knowledge, learning is individual, i.e. no two students will leave one class with exactly the same understanding nor have an identical experience. In addition, Tobin et al. (1990) define learning, within a constructivist framework, as the construction of knowledge by individuals as sensory data are given meaning in terms of prior knowledge. Therefore, learning is an interpretive process, involving constructions of individuals and social collaboration. Based on their view of learning, knowledge is created through social interaction as individuals test the fit or usefulness of their conceptual understandings in interactions with others and in the contexts in which knowledge is applied.

The different views about constructivism have been categorised by Salomon (1997) into two main views, which can be summarised in the following:

1. Cognitivist Constructivism: This approach to learning is influenced by Piagetian cognitive development. Knowledge is believed to be actively constructed, tightly connected to the individual's cognitive repertoire and to the context within which this activity takes place and hence it is situated. Learning activities are designed to increase an individual's skill and knowledge and emphasise the solo effects of constructivist learning activities.
2. Sociocultultural Constructivism: This approach to learning is influenced by the Soviet school of thought (Vygotsky). Concern focuses on the social process of interaction and participation, the socially-based appropriation of meaning. How does the situative social system (not just the individual) interactively operate to construct shared knowledge? Learning activities are designed to enhance and explore the social process of participation and changes that take place while students are engaged in collaboration, problem solving and team-based activities.

Mathews (1998) also states that educational constructivism of the personal variety stresses the individual creation of knowledge and construction of concepts. Educational constructivism of the social variety stresses the importance of the group (be it the immediate of classroom or the wider culture) for the development and validation of ideas. This has its origins in Vygotsky's work in linguistics and language acquisition. Lerman (1994) also distinguishes between two views of constructivism. These are social constructivism (based on Vygotsky's work) and radical constructivism (based on von Glasersfeld's work). Although Lerman (ibid) sees these views as two extreme views of constructivism, the diverse views about constructivism tend to share two common beliefs according to Lefoe (1998), these are:

1. Learning is an active process of constructing rather than acquiring knowledge and

2. Instruction is a process of supporting that construction rather than communicating knowledge.

In this research, the different constructivism views are seen to be sharing common principles, which are highlighted in the next section. Moreover, the two main extreme views of constructivism can be illustrated as a continuum (see figure 2). Therefore, the different models of constructivism are seen to fall somewhere between these two diverse views.

Social constructivism ↔ Radical constructivism

Figure 2. The continuum of the different views of constructivism.

Subsequently, the different views of constructivism and the constructivist view of learning and knowledge have influenced the constructivist pedagogies in this research. Constructivist theory emphasises the individual's construction of knowledge as well as the social interaction. Constructivist pedagogies are seen by Holt-Reynolds (2000) to be emerging from an intellectual world where knowledge is seen as created rather than received, mediated by discourse rather than transferred by teacher talk, explored and transformed rather than remembered as a uniform set of positivistic ideas. Tenenbaum et al. (2001) identify four types of constructivist "strategies", which are: project-based learning environments, case-based learning environments, computer-based supports, and cognitive tools (mind tools). They also highlight the following seven components of constructivist teaching and learning: (1) arguments, discussions, debates, (2) conceptual conflicts and dilemmas, (3) sharing ideas with others, (4) materials and measures targeted toward solutions, (5) reflections and concept investigation, (6) meeting student needs, and (7) making meaning, real-life examples.

As discussed earlier, there are several models of instructional design which are based on the constructivist theory of learning. Although these models are different, they tend to share some common principles of constructivist teaching and learning, such as the individual's ability to construct knowledge and the role of social interaction in constructing shared knowledge.

In the following section, these principles are highlighted before the models of constructivist learning are discussed in order to identify the common background for these models of teaching and learning.

2.3. Constructivist teaching and learning principles

There are many studies that highlight the different principles for constructivist teaching and learning. This section aims to highlight the main principles for constructivist teaching and learning, which have underpinned the development of the Internet curriculum and the design of the constructivist learning environment in this research. These principles are interpreted further in chapter five in relation to the impact of constructivist learning on the development of the Internet curriculum and in chapter six which is related to the design of the constructivist learning environment.

The main principles of constructivist teaching and learning are seen to be interpreted in different ways in the literature. This is seen to be mainly because of the different views about constructivist theories of teaching and learning.

Merrill (1991) refers to collaborative learning and 'situated' learning as the main principles of constructivism. According to him, collaborative learning proposes that meaning is negotiated from multiple perspectives. Therefore, conceptual growth comes from the sharing of multiple perspectives and the simultaneous changing of our internal representations in response to those perspectives. Furthermore, the perspective of situated learning recognises that learning occurs in realistic settings. Accordingly, learning should be situated in a rich context, reflective of real world contexts. In this research the perspective of 'situated learning' is seen to have influenced instructional design since it was first proposed by Brown et al. (1989). Merrill (1991) also states that constructivists subscribe to the following basic assumptions that: learning is constructed, interpretation is personal, learning is active, learning is collaborative, learning is situated, and testing is integrated.

Moreover, Runlee and Daley (1998) highlight some principles of constructivist learning theory, which are: knowledge and beliefs are formed by the learner; learning activities should cause learners to gain access to their experiences, knowledge and beliefs; learning is a social activity that is enhanced by shared inquiry, reflection and metacognitition are essential aspects of constructing knowledge and meaning; learners play a critical role in assessing their own learning; the outcomes of the learning process are varied and often unpredictable.

Jonassen (1993) summarises the main principles of constructivist teaching and learning in the context of constructivist learning environments in the following:

- *"Engaging learners in authentic, context-sensitive learning tasks.*
- *Supporting collaborative learning activities and socially negotiated interpretations of domain knowledge.*
- *Facilitating problem identification, definition and solving.*
- *Emphasising knowledge construction, rather than reproduction.*
- *Using hypermedia as a delivery technology.*
- *Engaging learner control of activities.*
- *Presenting multiple perspectives.*
- *Providing alternative means for reflecting on personally constructed meaning.*
- *Offering experientially (situationally) indexed meaning (prior knowledge of* seminars)." p.36

Such principles for constructivist learning, especially those outlined by Jonassen (1993) have influenced this research. These principles have influenced the development and the design of both the Internet curriculum and the Web-based learning environment. Moreover, these principles alongside the constructivist learning environment models were used to inform the development of this study. In the following section a discussion of the main constructivist learning models that influenced this research is presented.

2.4. Models of constructivist teaching and learning

This section involves a discussion of the main models of constructivist teaching and learning. Four main models are seen to have influenced this research. These models are outlined by Spiro et al. (1991); Hannafin et al. (1999); Mayer (1999) and Jonassen (1999). Particular attention has been given to the model developed by Jonassen (1999) namely the 'constructivist learning environment' model, as it is seen to have been the major influence on the theoretical basis for this research. These models influenced this research in many aspects such as the development of the Internet curriculum and the structure of its content. Moreover, they affected the design of the Web-based learning environment.

There are several models for constructivist learning which have evolved from the field of instructional design as stated by Seels (1989). Instructional design, according to Willis (1995), is the process of designing instructional materials. The term instructional design model refers to a model or theory that can guide the instructional design process.
According to Hanley (1994), the variation of models for constructivist learning is seen to be a result of the different interpretations of the theory of constructivist learning itself. Although these models have different views about constructivist learning, they all share common principles of constructivist learning which were discussed earlier in this chapter. The differences between the constructivist learning models are described by Hanley (ibid) using the notion of multiplicity. According to her, multiplicity defines not only the epistemological and theoretical perspective but, as well, the many ways in which the theory of constructivist learning itself can be articulated. Therefore, researchers and theorists have developed variants of constructivism or have evolved the theory in different directions. This variation of constructivist models is also described by Wilson (1995) as the 'constructivist movement'. This movement, according to him, has helped to validate a more open-systems view of instruction that is less defined by pre-specified objectives and more open to the initiative of students and teachers. Therefore, the result is instruction that depends more on context-sensitive decisions and resources.

FitzPatrick (2001) also states that constructivist learning models reflect the diversity of their theoretical foundations. He categorises constructivist models of instruction into two main categories: general holistic instructional applications such as constructivist learning environments model (Jonassen, 1999) and specific theoretical/instructional models such as cognitive flexibility model (Spiro et al., 1991). Moulder (1998) also categorises learning models according to three types of learning objective:

1- Instructor-centred learning emphasises transferring information. It assumes that learning is about memorising information rather than interpreting or changing it, and that instructors should control the pace of learning and the material that is studied. Therefore, creating a curriculum is the key element.

2- Learner-centred learning emphasises acquiring skills. It assumes that learning is about individuals actively creating knowledge rather than passively receiving it, and that instructors should coach students and stimulate their curiosity. Therefore, creating learning experiences is the key element.

3- Team-centred learning emphasises changing mental models. It assumes that learning is about teams creating and sharing knowledge and that instructors should assist students in creating and sharing it. Therefore, giving and receiving feedback is the key element.

Constructivist learning models are seen to be influenced more by the learner-centred model of learning, while the sociocultural models of constructivist learning are seen to be influenced more by the team-centred model of learning. Consequently, most constructivist learning models stand in direct opposition with the instructor-centred model of learning. Since this research has considered learning from a constructivist perspective, both learner-centred and team-centred models of learning have been highly relevant. In addition, this research has considered the use of the instructor-centred model of learning in some situations, especially those at the beginning of the course when the students did not have the prerequisite knowledge and skills to deal with the Internet. Therefore, the students were seen to be in need of instructor assistance in order to make sure they had the prerequisite knowledge and skills.

In this research, four models of constructivist learning were seen to have a major influence. Therefore, they are discussed here in detail in order to highlight their influences.

These models of constructivist learning can be categorised into two main groups:

1- General-purpose constructivist learning models, which are not designed for a particular context and that guide the general design and development of the constructivist teaching and learning such as Jonassen's (1999) constructivist learning environment model and Mayer's (1999a) selection, organisation and integration (SOI) model.

2- Context-based constructivist learning models, which are designed in and for a particular context such as the context of hypermedia in the model of cognitive flexibility as proposed by Spiro et al. (1991) and the open learning environment model by Hannafin et al. (1999).

2.4.1. Constructivist learning environment model (Jonassen, 1999)

The theoretical and epistemological foundations of Jonassen's (1999) model of a constructivist learning environment have influenced this research in many aspects. First of all, since this model was seen to be a general-purpose instructional model, it affected the overall instructional design in this research such as the use of information resources, collaboration tools etc. Secondly, the different components of this model were carefully considered in this research and critically integrated into the design of the Web-based learning environment. Thirdly, this model alongside that of Spiro et al. (1991) emphasised the need to present ill-structured content for the students in this course to enable them to construct their own knowledge. Jonassen (1994b) states that a constructivist design process should be concerned with designing environments which support:

- The construction of knowledge, which is based on internal negotiation, social negotiation and facilitated by exploration of real-world environments and invention of new environments.
- It should also provide a meaningful, authentic context for learning and using the knowledge they construct, which should be supported by case-based problems.
- It should also support collaboration among learners and with the teacher, who is more of a coach or mentor. Moreover, it engages and facilitates social negotiation and provides an intellectual toolkit to facilitate an internal negotiation which is necessary for building mental models.

These principles led Jonassen (1999) to the design of a constructivist learning environment model, which is illustrated in figure (3) and explained below:

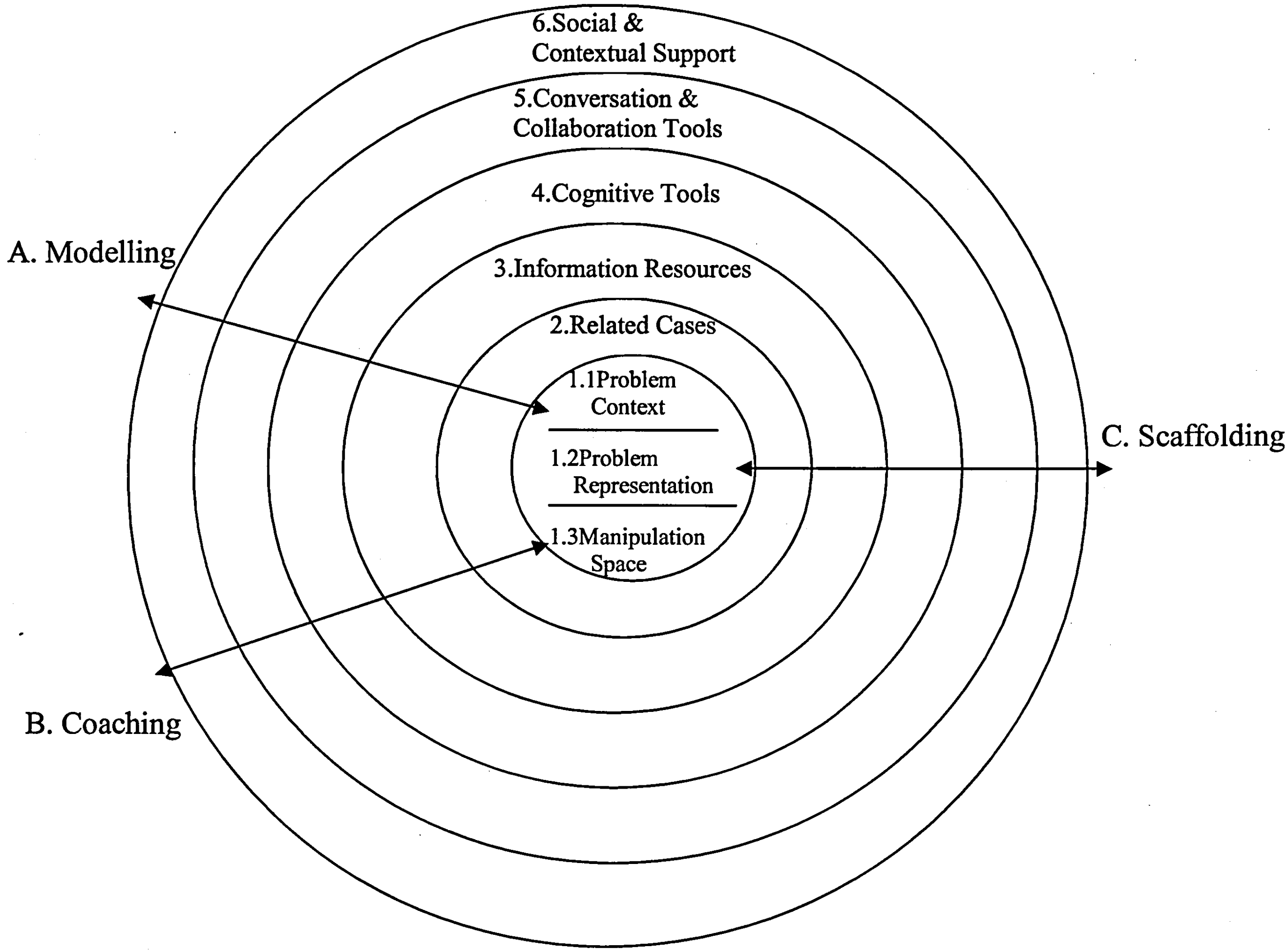

Figure 3. Jonassen's (1999) model for designing constructivist learning environment

This model consists of six essential components

1. Question/Case/Problem/Project

According to Jonassen (1999), the focus of any constructivist learning environment is the question/issue/case/problem/project that learners attempt to solve or resolve. It also constitutes the learning goal. Furthermore, a constructivist learning environment can be constructed to support many types of learning. The key to learning is the ownership of the problem/learning goal. Therefore, interesting, relevant and engaging problems must be provided for students to solve. Problems in a constructivist learning environment should address three components: problem context, problem representation and problem manipulation space.

2. Related Cases

Understanding any problem requires experiencing it and constructing mental models of it, as novice learners mostly lack experience. Therefore, related cases in a constructivist learning environment support learning in two ways: they scaffold student memory and enhance cognitive flexibility.

3. Information Resources

Learners need information to construct mental models and formulate hypotheses that drive the manipulation of the problem. Information may be included in the problem representation, information banks and repositories (text documents, graphics, sound resources, video and animations) Information should be relevant and readily accessible.

4. Cognitive (Construction) Tools

Cognitive tools are generalisable computer tools that are intended to engage and facilitate specific kinds of cognitive processing. Jonassen (ibid) identifies some types of cognitive tools such as problem/task representation tools and static & dynamic knowledge modelling tools.

5. Conversation & Collaboration Tools

Constructivist learning environments should provide access to shared information and shared knowledge building tools to help learners collaboratively construct socially shared knowledge, thus forming discourse communities. Constructivist learning environments can also support communities of learners. Therefore, when learners collaborate, they share the same goal, requiring shared decision-making, consensus building activities, etc.

6. Social/Contextual Support

Designers of constructivist learning environments should accommodate environmental and contextual factors affecting implementation e.g. physical, organisational, cultural aspects of the environment in which the innovation was being implemented. Moreover, support should be given in order to support and train students and teachers.

Supporting learning in constructivist learning environments:

Jonassen (1999) summarises the different instructional activities that support the different learning activities in constructivist learning environments. For example, he mentions that exploration can be supported by modelling, reflection can be supported by coaching etc. The different instructional activities, which are proposed by Jonassen (ibid) were also taken into account when developing the instructional activities in this research such as the use of scaffolding, coaching etc in order to support the different learning activities in this research.

2.4.2. Selection, organisation and integration (SOI) model (Mayer, 1999a)

According to Mayer's model (1999a) (see figure 4), constructivist learning depends on several cognitive processes in the learner during learning. These processes include selecting relevant information, organising incoming information, and integrating incoming information with existing knowledge. Therefore, according to his model, constructivist learning depends on activation of these three cognitive processes in the learner during learning:

S: Selecting relevant information from what is presented (words & pictures) for further processing

O: Organising incoming information. Selected auditory representations are organised into coherent verbal representation, and selected images are organised into pictorial representation.

I: Integrating relevant information. One-to-one connections are made between pictorial and verbal representations using prior knowledge and information is encoded.

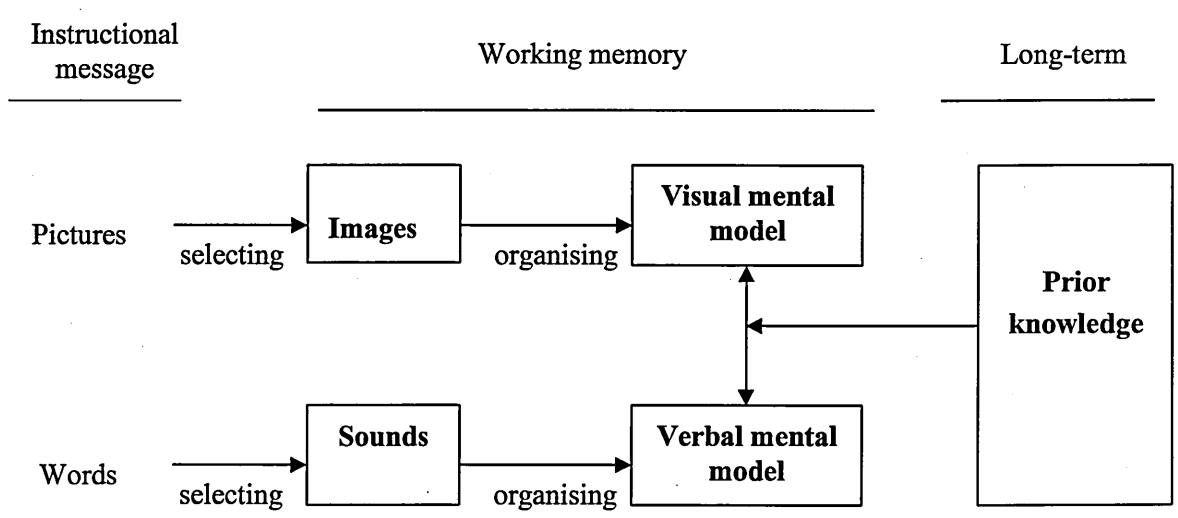

Figure 4. The SOI model of constructivist learning presented by Mayer (1999a)

In his model, Mayer (ibid) identifies the following values underlying the instructional goals of the knowledge construction approach to learning:

- Focusing on the process as well as the product
- Enabling transfer as well as retention
- Promoting how to learn as well as what is learned

He also highlights some instructional design implications of the SOI (selecting, organising and integrating information) model for improving textbook, lecture and multimedia messages. For example, when the goal is to encourage the learner to become cognitively involved in learning, instruction should be designed to help the reader identify useful information, understand how the material fits together and how the material relates to prior knowledge.

He concludes that there is a possibility of designing instruction that promotes constructivist learning, even when the learner is not engaged in a behaviourally active learning episode. In particular, constructivist learning can result from the seemingly passive task of reading a text if the text is designed to foster appropriate cognitive processing in the learner.

In this research, Mayer's model influenced the development of the content and the design of the learning environment in terms of considering the three cognitive processes that the learner is likely to have during the course. This was by presenting the knowledge through a range of integrated resources for the learner alongside the Web as a resource in order to foster different cognitive processes in the learner.

2.4.3. Cognitive flexibility model (Spiro et al., 1991)

Spiro and his colleagues (1991) describe their theory as "new constructivism" and they provide a persuasive argument that links learning problems in ill-defined knowledge domains to the need for cognitive flexibility which results from learning knowledge in a variety of ways and contexts. They also see cognitive flexibility theory as an integrated theory of learning, mental representation, and instruction.

They define cognitive flexibility as the ability to spontaneously restructure one's knowledge, in many ways, in adaptive response to radically changing situational demands. This is a function of both the way knowledge is represented (e.g. along multiple rather single conceptual dimensions) and the processes that operate on those mental representations (e.g., processes of schema assembly rather than intact schema retrieval).

According to Wilson et al. (1993), cognitive flexibility theory provides a number of heuristics for designing instruction, which can be summarised in the following:

1. Learning activities must provide multiple representations of content
2. Instructional materials should avoid oversimplifying the content domain and support context-dependent knowledge.
3. Instruction should be case-based and emphasise knowledge construction, not transmission of information.
4. Knowledge sources should be highly interconnected rather than compartmentalised.

Spiro et al. (1991) also add that any effective approach to instruction must simultaneously consider several highly intertwined topics, such as:

- the constructive nature of understanding;
- the complex and ill-structured features of many, if not most, knowledge domains;
- patterns of learning failure;
- a theory of learning that addresses known patterns of learning failure.

In this research, the model of cognitive flexibility has been taken into account by presenting knowledge in a variety of ways and contexts such as the use of well-structured, semi-structured and ill-structured content. The structures used in this research which influenced the development of the Internet curriculum are discussed in detail in chapter five.

2.4.4. Open learning environment model (Hannafin et al., 1999)

According to Hannafin (1996), open learning environments (OLEs) are systems designed to support the unique search and understanding needs of individuals. That is, they are not designed to teach particular content, to particular levels, for particular purposes; they are designed to support learners' attempts to understand for their own purposes. In effect, open learning environments impose no particular pedagogical strategy or instructional sequence, but guide learners in invoking their own strategies and generating their own learning sequences.

Open learning environments tend to be valued for exploring ill-defined and ill-structured problems. They promote the discovery and manipulation of underlying beliefs and structures rather than impose particular beliefs (Hannafin et al., 1999).

Open learning environments also assume that understanding (continuous and dynamic process) evolves as a result of observation, reflection and experimentation (Land & Hannafin, 1996).

The goal of an open learning environment according to Hannafin et al. (1994) is to support the individual's efforts to achieve that which he/she determines to be important. They also highlight the different principles for designing open learning environments, which are:

- Enabling contexts facilitate articulation of the learning need or goal.
- Resources (ranging from electronic to print to humans) are available.
- Tools provide the means for engaging and manipulating resources and ideas.
- Scaffolds support learning efforts while engaging in an open learning environment.

These principles or components, according to Hannafin et al. (1999), are explained in the following:

1- Enabling contexts orient the individual to a need or problem. They guide students in recognising or generating problems to be addressed and framing their own learning needs.

This component influenced the development of the semi-structured content in this research, since this structure was developed in the light of the different contexts according to the open learning environment model. This is discussed in more detail in chapter five.

2- Resources

Resources, ranging from electronic (e.g. databases, computer tutorials, video), to print (e.g. textbooks, original source documents, journal articles), to human (e.g. experts, parents, teachers, peers), are source materials that support learning. The World Wide Web, for example, enables access but the potential relevance of the available resources is often difficult for individuals to ascertain. According to this model, open learning environments make extensive use of available resources that provide an extraordinary reserve of source materials across a wide range of open learning environment applications.

3- Tools

Tools are the overt means through which individuals interact with resources and act upon their own thinking. Tool functions vary according to the open learning environment's enabling contexts as well as the intents of their users. Therefore, the same technological tool can support different functions.

4- Scaffolds

Scaffolding supports learning efforts within an OLE. Mechanisms emphasise the methods through which scaffolding is provided, while functions emphasise the purposes served. Scaffolding complexity varies according to the locus of the problem(s) posed and the demands posed in the enabling context. Scaffolding mechanisms include conceptual scaffolds, metacognitive scaffolds, procedural scaffolds and strategic scaffolds.

Based on the open learning environment model, this research was influenced by the different components of this model. For example, it was seen as essential to use a range of resources and tools that the students can use in different contexts within the course such as the use of the different materials alongside the use of the Web. In addition, a number of communication tools such as email and videoconferencing were integrated into the course. These resources and tools were integrated in order to give the students the opportunity to use them in constructing their own knowledge.

2.5. Teaching and learning the use of the Internet

According to Stefanov et al. (1998), the history of information and communication technology shows a movement of the main attention of researchers and technologists gradually from hardware to software, then to the human-computer interface, and most recently to social issues related to global communication and collaboration. This movement is also highlighted by Passerini and Granger (2000), as they identify four main evolutionary stages of distance education, which can be summarised in the following:

- The first generation of distance education was correspondence learning.
- The second generation started with the British Open University using radio, television, recorded audio-tapes and correspondence tutoring to deliver instruction.
- The third generation benefited from satellite technologies and the emergence of communication networks facilitating the delivery of analogue and digital content to computer workstations.
- The fourth generation was considered to be the Internet, which shifted distance education to a completely new instructional approach. Therefore, the Internet, according to them, led to a substantial shift from an instructor-led approach, in which the instructor, the videotape producer, or the multimedia developer exclusively created the content of instruction, to a real learner-centred approach.

Since the beginning of the Internet, its usage has been seen to be growing day by day. According to the Internet Software Consortium survey in July 1999, there were over 56 million host computers on the Internet with an approximate 80% compounded annual growth rate for hosts since 1991. A more recent survey in July 2002 shows that there are now over 162 million host computers on the Internet, which means that the number has nearly tripled since the last survey in July 1999.

Despite the increasing use of the Internet, teaching and learning about the use of the Internet is still seen to be immature. Many studies conclude that the majority of people rely on friends or trial and error to learn about the use of the Internet. For example, a recent study by Foster (2000) concludes that 71% of academic users rely on trial and error to learn about the Internet. Therefore, teaching and learning about the use of the Internet is seen to be in its early stages and still needs further research and development in order to face the fast growing development and changes on the Internet itself.

It is seen to be important to highlight the advantages and disadvantages of using information and communications technology, especially the Internet, in teaching and learning in order to highlight its importance in preparing future teachers which is the focus of this research.

According to Schrum (1995), there are a number of advantages in using information technologies in teaching and learning e.g. students in rural and urban regions can benefit from their teachers' enhanced professional development and access to teaching resources. Anandarajan, M. et al. (2000) also conclude that Internet usage could have positive results in terms of enhanced job characteristics, overall job satisfaction and productivity.

Doherty (1998) summarises the key features of the Internet (see figure 5) that characterise its usage and usefulness. He highlights three key features which are presentation, communication and dynamic interaction.

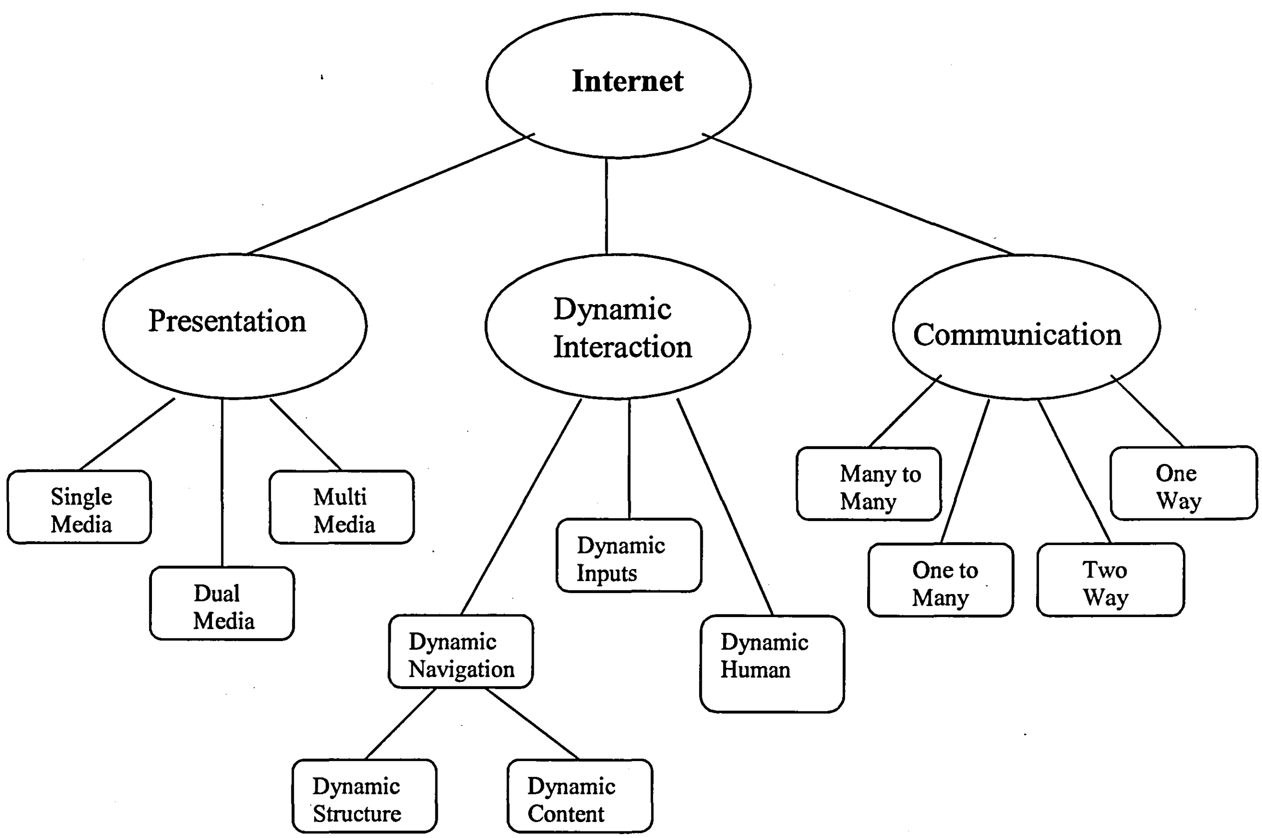

Figure 5. The key features of the Internet (summarised by Doherty, 1998).

On the other hand, Montelpare and Williams (2000) highlight some disadvantages of including the Internet in the curriculum. For example, the effective use of the Internet requires prerequisite computer skills for the student and some students may feel frustration and have a sense of being left behind. Blatt et al. (1998) also state that one of the disadvantages of using the Internet in teaching and learning is that it may lead to silent and isolated learning. According to them, this should be avoided when designing to teach and learn via the Internet in order to make the best use of teacher/learner cooperation. Therefore, in order to avoid silent and isolated learning, the students should work together in teams. This provides a source of motivation and gives them the opportunity to discuss problems; to share learning strategies and knowledge and thus to learn from each other. Furthermore, teamwork also helps to overcome people's fear of experimenting with digital information and communication technologies.

In this research, an effective way to avoid the disadvantages of integrating the Internet is seen to be training teachers in the effective use of the different tools available on the Internet. Foster (2000) identifies these tools based on the Internet such as e-mail, which allows personal communication on a one-on-one basis; bulletin boards and newsgroups, which enable multiple users to communicate together; search engines that perform keyword searches and scan the Internet to retrieve documents; and Internet protocols such as File Transfer Protocol (FTP) that locate and retrieve files from known locations. Accordingly, all these tools were seen to be an essential part of the Internet curriculum which was developed in this research.

Henze and Nejdl (1997) state that while it is relatively easy to use the Internet to transport conventional types of lectures and course notes, it is more difficult to utilise the full power of Internet-based techniques to advance teaching and learning conceptually. Therefore, it is important to highlight the recommendations outlined by Montelpare and Williams (2000) in order to use and integrate the Internet effectively into the curriculum. These recommendations are:

> *"1. uphold prerequisites for student enrolment to maintain a similar competency with course material and skills;*
>
> *2. maintain a level of flexibility in course material to better meet all learning abilities, experience, and knowledge; work towards finding a medium between assignments and expectations being too difficult and too easy to be sure all students are challenged;*

3. accept that technical problems, from lab accessibility to software upgrades, will be ongoing; work to prevent problems before they occur by having back-up plans in place;

4. incorporating electronic curriculum into the classroom is much like presenting the course for the first time; be sure that all members of the course delivery team are involved, including technical support staff, teaching assistants, and peer counsellors.

5. instructors should be well organised, prepared, and ready to deal with the unexpected." p100.

Based on Montelpare and Williams' (ibid) recommendations, teachers need to be trained well in the use of the Internet in order to prepare them to integrate Internet use into curriculum. The training of teachers is seen by Krajka (2002) as a challenge for using online learning. This challenge comes from the fact that pre-service institutions are seen to provide neither sufficient facilities nor training, while in-service training may be less effective and more exhausting for trainees.

The review of the relevant literature showed that there are a few studies that looked into teaching and learning the use of the Internet. Among these studies was a study made by Collier and LeBaron (1995) to design a course entitled "Exploring the Internet". It is a project-based course and it is designed to introduce students to the large array of resources available through Internet, to develop competence with Internet tools, and to challenge students to incorporate Internet tools and resources in a carefully planned curriculum-related activity for their workplaces. They design workshops to teach teachers the mechanics of electronic mail and various Internet search tools. They had mixed responses to the workshops, as subject-specific workshops were poorly attended, while the library/media workshops were popular. Their results indicate that teachers were not yet at a point where curriculum integration of Internet resources was of interest, as apparently was the case with library/media specialists.

In this research, teaching and learning the use of the Internet was seen to be an essential element in order to prepare teachers (especially pre-service teachers) to use and to integrate the Internet effectively into the classroom. In chapter four, the process for developing the Internet curriculum is discussed.

2.6. Web-based learning environments

There is little doubt that as more and more universities worldwide have adopted Internet technology, and the amount of information available online increases daily, universities are pressured to join this trend in order to compete on a global level (Foster, 2000). Lefoe (1998) also states that universities have been forced to look outside their traditional market to expand the undergraduate, post-graduate and international offerings. Therefore, alternate delivery methods in many universities have utilised web-based instruction as a basis for this move because of three perceptions: access by the target market is reasonably significant, it is a cost-effective method of delivery and it provides global access. Although Internet learning is seen to be a growing trend in today's educational system, according to Perrin and Mayhew (2000), students can have different experiences when they are online. They mention that for some students, taking an on-line course is merely a way to supplement their traditional on campus learning experience, while for others it is a welcomed alternative to the classroom setting.

Before talking about the pros and cons of the Web as a learning environment, it is important to identify the meaning of the term environment and the meaning of the Web-based learning environment as well.

Wilson (1995) defines a learning environment in the light of the classroom metaphor, by thinking of instruction as an environment which gives emphasis to the "place" or "space" where learning occurs. Therefore, he defines a constructivist learning environment as:

> *" A place where learners may work together and support each other as they use a variety of tools and information resources in their pursuit of learning goals and problem-solving activities."p28.*

According to Meisalo et al. (2001), the term **learning environment** refers to the framework of a learning process in its entirety, which includes the teacher and students, as well as different teaching materials e.g. books, overhead projectors etc. They also add that the learning environment is *open* when the student has a range of tools or materials or consulting support to choose from, in order to best enable understanding of the entirety of what is under study. Since the Internet is seen to have a large range of tools and resources, teaching and learning using the Internet can be referred to as an open learning environment. Jianhua et al. (2001) also consider a Web-based learning environment as potentially powerful approach to facilitate students' learning.

In order to highlight the characteristics of the Web and its potential use in teaching and learning, it is important to distinguish between different approaches to teaching and learning. Rakes (1996) compares an Internet resources-based model of learning with a traditional model of learning. This comparison can be summarised in the following figure (6).

Traditional Learning Model	**Resources-based Learning Model**
teacher as expert model	teacher as facilitator/guide
textbook as primary source	variety of sources/media
facts as primary	questions as primary
information is packaged	information is discovered
emphasis on product	emphasis on process
assessment is quantitative	assessment is quantitative/qualitative

Figure 6. A comparison between Internet resources-based model of learning and the traditional model of learning (presented by Rakes, 1996).

Liu and Ginther (1999) also distinguish between two basically different approaches of distance education. One is based on structured, pre-programmed learning materials and the other is based on the computers' communications functions. These two approaches have their roots in completely distinct philosophies of education. The former approach views the computer as a black box to substitute for the traditional face-to-face teacher. Therefore, it is the computer or black box that teaches the students e.g. computer-assisted learning software. The latter is seen as a 'networks approach' which views the computer as a channel of communication between learners and teachers e.g. computer-mediated communication systems.

Furthermore, Perkins (1991) distinguishes between two types of learning environment; these are "minimalist" and "richer" learning environments:

- *minimalist* learning environments emphasise information banks, symbol pads, and task managers. A traditional classroom would be a lean learning environment with relatively few tools for manipulating and observing content, making exploration and problem solving difficult. He also refers to minimalist learning environments as traditional learning environments.

- *richer* environments contain more construction kits and phenomenaria, and place more control over the environment in the hands of the learners themselves. Students are typically engaged in multiple activities in pursuit of multiple learning goals, with the teacher serving the role of coach and facilitator. According to him, rich learning environments could more easily be called "constructivist" learning environments.

Based on Perkins' (ibid) distinction, the learning environment in this research is considered to be a rich learning environment because it was based on the principles of constructivist learning environments and it used authentic activities and multiple tools and resources. In order to explain further the richness of the constructivist learning environment, Chee (1997) highlights the potential benefits of adopting constructivist paradigm in educational settings, which can be summarised in the following:

> "• *It frees students from the dreariness of fact-driven curricula and allows them to focus on large ideas.*
>
> • *It shares with students the important message that the world is a complex place in which multiple perspectives exist and that truth is often a matter of interpretation.*
>
> • *It acknowledges that learning and the process of assessing learning are, at best, elusive and messy endeavours not easily managed." p.83*

Kim and Kim (2001) also highlight four basic constructivist principles that should be applied to modern technology-based learning environments. These principles are:

1. Learning is an active and engaged process. Therefore, learners are actively engaged in working at tasks and activities that are authentic.
2. Learning is a process of constructing knowledge.
3. Learners function at a metacognitive level. Thus, learning is focused on thinking skills rather than memorising skills.
4. Learning involves "social negotiation". Therefore, students are able to challenge their thoughts, beliefs and existing knowledge by collaborating with other students thus assisting their cognitive development process.

In this research, social negotiation which is achieved through collaborative learning is seen to be an essential element in Web-based learning environments. Jianhua et al. (2001) point out that using a web-based collaborative learning approach is still an issue because of the nature of online communication. On the other hand, Roschelle (1995) refers to the Web as a collaborative technology tool, because it enables individuals to jointly engage in active production of shared knowledge.

Berge (1997) identifies several key characteristics in any collaborative learning environment. First, there is a shared knowledge among teachers and students. While it is recognised that teachers have a wealth of knowledge about the content, in a collaborative classroom, the knowledge, experiences, language and culture of the students are valued and brought into the learning situation. Implicit in this is a shared authority among teachers and students. A second element in a collaborative environment involves students being invited to set specific goals for themselves, within the framework of what is being taught. There are options for projects and other learning activities that capture different students' interests and learning goals.

Within the collaborative learning environment, the above elements suggest a sharing of authority that, when implemented, means the teacher is often a learner, and learners are just as often teaching. This notion of sharing responsibility and 'authority' between the teacher and the student has been considered to be a very important element in this research. Therefore, it is discussed further in chapter five.

Furthermore, Stefanov et al. (1998) state that the learning environment should support six categories for tele-learning as a part of a face-to-face course:

- *"making the course materials more organised and accessible to students;*
- *improving the effectiveness of the lesson presentation session;*
- *improving communication between the instructor and the students;*
- *improving discussion among the students;*
- *improving the range and quality of resources available to the students and shifting the responsibility to the student for the selection of appropriate resources;*
- *improving the range and quality of learning activities available to the students, particularly in terms of collaborative learning." p316*

These points were taken into account in this research during the design of the Web-based learning environment in order to support the students' learning and knowledge construction activities.

Furthermore, Kim and Kim (2001) point out some suggestions in order to improve these interactions. First of all, they find that it is essential to prepare the usable computer hardware and software. Secondly, they point out the importance of promoting students' active participation. Finally, they suggest an appropriate organisation of Internet services in accordance with the course objectives in order to enhance the effectiveness of the course.

Stefanov et al. (1998) see the Web as one of the best mediums for implementing instruction. The Web is seen to support teaching and learning in a number of ways such as using it as a source for reading materials; as a tool for self-exploration; as a medium for writing, publication and dissemination; and as a forum for communication.

Based on the attributes identified by Stefanov (ibid), the Web was found to be an appropriate medium for use in this research.

Rakes (1996) states that in order to use the Web to enhance teaching and learning, teachers should encourage students to:

- *"be active, not passive, in learning;*
- *engage in an inquiry approach to learning;*
- *accept responsibility for their own learning;*
- *be original and creative;*
- *develop problem-solving, decision-making, and evaluation skills; and*
- *develop a broad outlook on the world." p.53*

These points were considered in this research in order to highlight the teacher's roles in the Web-based learning environment. The following section is a critical review of an integrated learning approach to Web-based learning environments. The notion of an "integrated Web-based learning environment" is seen to best describe the approach developed in this study.

2.7. Integrated learning environment

The notion of integration is seen to be used in teaching and learning on many occasions and in different contexts. However, the review of the relevant literature showed that this notion was used in different ways according to different interpretations of the meaning of the word "integration".

Traditionally, an integrated learning system is defined by Underwood and Brown (1997) as a system that includes extensive courseware plus management software usually running on a networked system. This system operates traditionally on the behaviourist model of learning which uses drill and practice to deliver a core curriculum content and skills through individualised tutoring and practice.
Okamoto et al. (2001) note that traditional integrated teaching systems present very little flexibility with regard to the pedagogical strategy they use. Moreover, these systems are usually developed following a fixed strategy that would basically apply to all learners.

The traditional concept of integrated teaching and learning systems is seen to be further developed by Kirschner (2001). He defines an integrated (powerful) electronic learning environment as a learning environment that makes use of modern synchronous and asynchronous information and communication technologies to connect the different subsystems of education to each other.
According to Kirschner (ibid), education consists of minimally five discrete, but interacting, systems or environments. These environments are (see figure 7): a task environment (a task in the relevant content area), a study environment (the chosen didactic method, i.e. case-based, problem oriented, project oriented), a group or project environment with communication possibilities (a social interaction system), an administrative environment (a system for planning, recording study progress, dossier storage, and so forth) and a technical environment (technical system of which the individual student is a part). The assumption for the design process is that these five systems should be functionally compatible and interrelated.

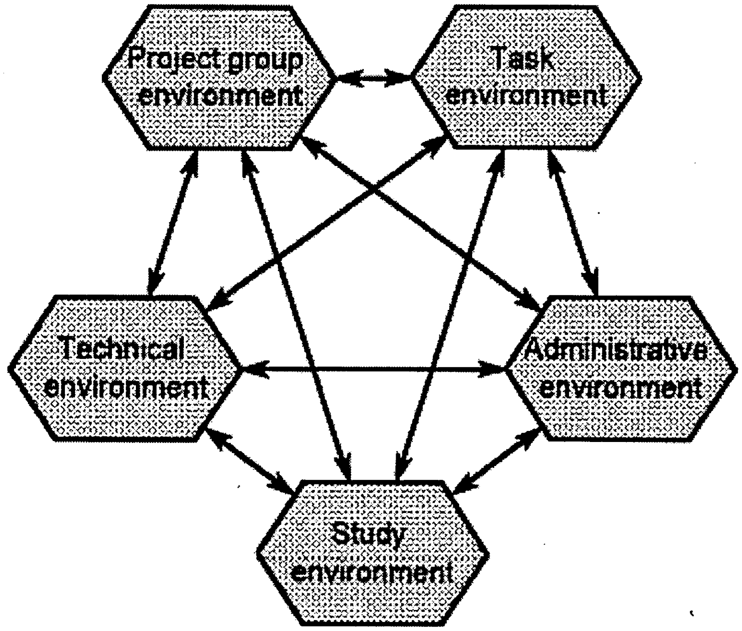

Figure 7. The Integrated electronic leaning environment from a systems perspective (adopted from Kirschner, 2001).

Moeover, Dijkstra (1997) observes that the integrative framework should include a description of the subject matter (i.e., content) and the goals to be reached. Further it should provide guidelines to instructional designers on how to select the types of problems or cases one should confront learners with in order to reach particular learning goals. Finally it should make clear how to reach these "exit behaviours" performed at pre-defined levels of performance.

Reeves (1999) also offers a systematic approach for integrating the Web as a cognitive tool. He proposes a model of Web-Based Learning that includes factors organised into three categories: inputs, processes, and outcomes. Inputs include individual differences, cultural habits of mind, and origin and strength of motivation. Processes include opportunities to construct knowledge, task ownership, sense of audience, quality and structure of Web resources, collaborative support, teacher support, and metacognitive support. Outcomes include knowledge and skills, mental models and higher order thinking skills.

Okamoto et al. (2001) integrate different pedagogical strategies in order to adapt to the students' characteristics. Therefore, they point out the importance of taking into account the students' values. Moreover, they note that offering adapted activities, producing appropriate feedback, favouring communication between students and offering assistance are crucial. Therefore, the students' values, learning styles metacognition and preferences should be taken into account.

Jonassen (1991) also emphasises the need to integrate assessment into instruction in order to have effective assessment. Therefore, as learners are acquiring knowledge, evaluation guidelines should be available, so that both the students and the teachers may know how the student is progressing.

According to Thomas et al. (1998), effective integration of new technology requires an understanding of the whole education process and a critical examination of its functions. On one hand, the innovation must be integrated with existing practice. On the other hand, we must seek to improve practice rather than simply translate it.

Passerini and Granger (2000) state that traditional system approaches to education need to be reviewed to integrate strategies appropriate to the new tools. They propose a developmental approach generated by the opportunities for student-instructor interaction and media delivery on the World Wide Web. They also stress the need for the identification of an integrated design model to support distance education initiatives. They conclude that traditional instructional design models need to be integrated with developmental approaches taking into consideration new characteristics. These characteristics include: the variety of needs and learning strengths of the students in the virtual classrooms, the inclusion of supplemental information/content resources, the elaboration of most appropriate content (with a variety of media) and communication strategies (from discussion areas, bulletin boards, chat-rooms, workgroups, whiteboards, and others).

In this research, the notion of integration has been seen as a key element in the design and the use of the Web-based learning environment. On this basis, an integrated Web-based learning environment could be defined as an environment that integrates the different resources, tools and utilities that are available on the Web alongside the different pedagogies (e.g. peer support, discussion group, etc.) in order to facilitate the construction of learning and shared meaning and to accommodate the different learning styles of the learners.

2.8. The roles of the teacher within Web-based learning environments

In the early sixties, teachers started to use non-traditional media such as television and radio programmes, called at that time "teaching aids", because they were intended to aid teaching. Recently, Internet-based learning has become a growing trend in education system. Accordingly, for some students, taking an on-line course is merely a way to supplement their traditional on-campus learning experience, while for others it's a welcomed alternative to the classroom setting (Perrin, 2000). He also refers to electronic learning as it brings education to the living room where everyone in the family can participate, rather than keeping it in the classroom where only students and their peers take part. Therefore, the teachers' vision of the Internet needs to be different from the old one of "teaching aid", not only because of its different nature but also because of its tremendous tools and resources e.g. synchronous and asynchronous discussion, email, search tools, Web design, uploading and downloading files etc. Therefore, teaching and learning using the Web has become a great challenge for both the teacher and the learner. Fetherston (2001) highlighted some pedagogical challenges for teachers who are using the Web. The most important challenge from his point of view came from the various media that can be used via the Web and the many kinds of possible interactions. Therefore, the challenge, which is faced by teachers themselves, is to find good pedagogical practices that will build on the inherently engaging nature of the Web and to produce engagement that will lead to good learning. Furthermore, teaching via the Web could be seen as time consuming and requiring more effort from the teacher rather than the traditional methods. For example, the teacher might need to spend more time online to mentor the students and to moderate the online discussion. Moreover, the teacher needs to be aware of many technical aspects that he/she can solve by his/herself. Furthermore, the teacher needs to keep up-to-date with any changes to the system and/or the learning environment e.g. new interface design, new versions with more features etc. The teacher also may face some technical difficulties e.g. if the system is down, the connection is very slow etc. The biggest challenge is considered to be the structure of the content for the learning environment. For example, the teacher might use a set of pedagogical approaches that could be beneficial with a particular subject, while they are not the same with different subject.

The relations between the teacher, the student and the content are considered to be very complex. The Didaktik triangle is a key tool for the analysis of the complex relations between teacher, student and content in the teaching/studying/learning process. The most common approach (Kansanen and Meri, 1999) is to take the pedagogical relation between the teacher and the students as a starting point (see figure 8).

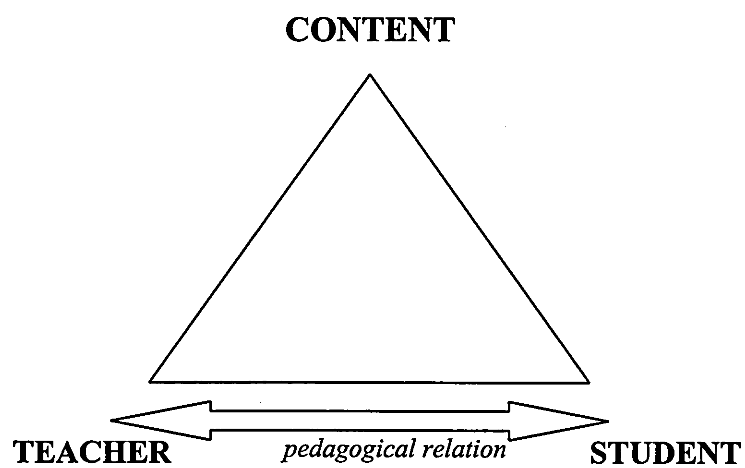

Figure 8. Pedagogical relation in the Didaktik triangle.

In considering the relationship between the teacher and the content, the teacher's competence is brought into focus. In this tradition, the teaching in itself does not necessarily imply learning and therefore the preferred term for the activities of the students is that of "studying". It is through studying that the instructional process can be observed, whilst the invisible part of this relation may be learning. The teacher key task is seen to be in guiding this relation. It is emphasised that the didactic relation is a relation to another relation and that to concentrate on this aspect, it is observed that it is difficult to think that the didactic relation could be organised universally or according to some technical rules (see figure 9). Consequently, teachers' own practical theories and pedagogical thinking are seen to be of vital importance

The tradition of Didaktik provides a framework which places the teacher at the heart of the teaching/studying/learning process. Furthermore, it provides a framework for teachers' thinking about the most basic how, what and why questions around their work. This follows from the emphasis that is placed upon Didaktik analysis and from the relative professional autonomy of the teacher within this tradition (Hudson, 2002).

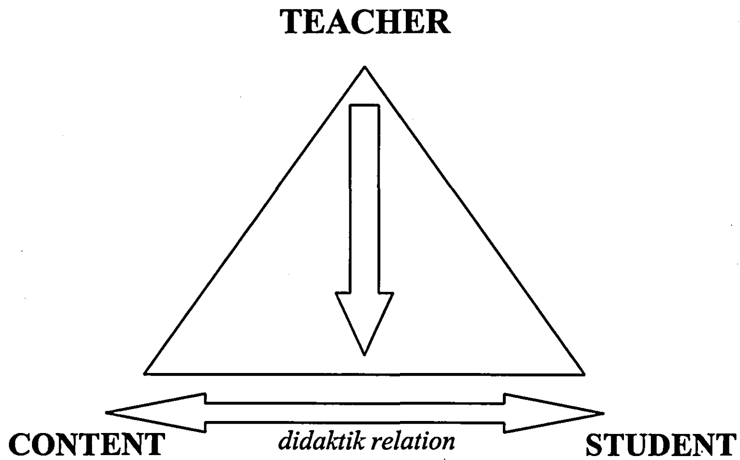

Figure 9. The Didaktik relation in the Didaktik triangle.

This tradition draws the attention to the importance of giving the teacher the professional autonomy that is needed to guide the use of the Web-based learning environment and maximise the use of its various tools and resources.

Based on the constructivistic assumptions for learning environments, Jonassen (1993, 1997a) presents a range of methods for supporting learning in constructivist learning environments 'CLEs'. These methods include exploration, modelling, articulation, coaching, reflection and scaffolding. In another model, Hannafin et al. (1999) also emphasise scaffolding as a method for supporting learning within an open learning environment. Scaffolding is also seen to be one of four aspects to be considered for designing instruction for situated learning according to Young (1993). In his study, he describes four broad tasks for the design of situated learning: selecting the situations, providing scaffolding, determining and supporting the role of the teacher, and assessing situated learning. The second task is identified as providing the necessary scaffolding for novices to operate within the complex realistic context and still permit experts to work within the same situation. Accordingly, he describes the role of the teacher as a coach. Moreover, he notes that the teacher's role should be to "tune the attention" of students to the important aspects of the situation or problem-solving activity. von Glasersfeld (1996) uses the metaphor of "midwife" in order to describe the teacher's role within constructivist learning environments. He describes the teacher as a "midwife in the birth of understanding" as opposed to being the "mechanic of knowledge transfer". Therefore, the teacher's role is not to dispense knowledge but to provide students with opportunities and incentives to build it up. Robotham (1995) also describes the role of the teacher as a "causer of learning" in a self-directed learning setting, where he sees the self-directed learner as no longer operating as a passive receiver of information, but as taking responsibility for the achievement, and ultimately the setting of learning outcomes. Moreover, according to Mayer (1999a), the learner is a sense-maker, whereas the teacher is a cognitive guide who provides guidance and modelling on authentic academic tasks. Hanley (1994) summarises the different characteristics of a constructivist teacher such as becoming one of many resources that the student may learn from, engaging students in experiences that challenge previous conceptions of their existing knowledge, allowing student response to drive lessons and seeking elaboration of students' initial responses, encouraging and accepting student autonomy and initiative etc. These characteristics are seen to be key characteristics for teachers who are teaching or intending to teach in a Web-based learning environment. In the light of these characteristics, Hanley (1994) describes the role of the teacher as organising information around conceptual clusters of problems, questions and discrepant situations in order to engage the student's interest. Moreover, teachers assist the students in developing new insights and connecting them with their previous learning.

2.9. Learning styles

In this research, learning styles were seen to be important factors that might influence student learning about the use of the Internet. Therefore, this approach was used in this research in order to identify the learning styles that best describe the way that the students are learning in this particular course. Moreover, the identification of learning styles can illuminate whether the Web-based learning environment which was used in this research can accommodate the different learning styles of the students or not. The accommodation of the learning environment to the students' learning styles was seen to be an indicator in determining whether the course was successful or not.

As discussed earlier, constructivism basically assumes that every form of human information processing requires constructive activities with regard to both the reception of sensory data and a deeper understanding of the world (Seel, 2001). From this perspective, Wageeh and Hitendra (1999) observe that learning is a constructive, cognitive and social process in which the learner strategically manages the available cognitive, physical and social resources to construct knowledge. Therefore, individuals access and process information differently. Hence the success of any transformation process depends upon the opportunities an individual has to access and process information in their preferred styles. Therefore, Sadler-Smith (1996) states that when designing, developing and facilitating learning experiences, it is often suggested that the characteristics of the learner and in particular their "learning styles" should be taken into account. Therefore learning styles were considered to be important during the design and implementation of the Web-based learning environment.

Liu and Ginther (1999) note that learning styles refer to the individual's consistent and characteristic predispositions of perceiving, remembering, organising, processing, thinking, and problem solving. Verheij (1996) also defines learning styles as self-reported study activities, entailing information-processing activities and regulation activities that a student usually executes in order to learn or to study, regardless of the specific demands of the study task. Furthermore, Beishuizen and Stoutjesdijk (1999) define a learning style as a predisposition on the part of some students to adopt a particular learning strategy regardless of the specific demands of the learning task.

Moreover, Poon et al. (2001) state that learning styles are characteristically cognitive, affective and psychological behaviours that indicate how learners perceive, interact with and respond to the learning environment. Therefore, they define learning style as the tendency to adopt a particular strategy in learning. Most students have a preferred learning style but some may adapt their learning styles according to the tasks. Those who adapt are referred to as having a 'versatile' learning style.

Liu and Ginther (1999) state that learning styles measures conventionally lie somewhere between aptitude measures and personality measures. There are a number of instruments, mostly named inventories, for measuring learning styles such as learning style inventory by Kolb (1981), field-dependent and field-independent by Witkin et al. (1977) etc. According to Liu and Ginther (1999), Kolb's learning style inventory is one of the dominant approaches to categorising learning styles. Therefore, in this research, Kolb's (1981) learning style inventory was used in order to identify the different learning styles of the students who participated in this research. The following section highlights the different assumptions for Kolb's learning style inventory and the different learning styles that the inventory measures.

Kolb's learning style inventory

The learning process, according to Kolb (1984), is not only active and passive, but also concrete and abstract. Accordingly, Kolb's (1981) learning style inventory (see figure 10) defines four basic learning modes. These are: active experimentation (AE), reflective observation (RO), concrete experience (CE), and abstract conceptualisation (AC).

Based on the four learning modes, this inventory identifies four separate learning styles. These styles are identified as the Accommodator (an individual who is action and results oriented, opportunity seeking, and pragmatic), the Diverger (an individual who has the ability to assimilate disparate observations, is oriented toward feelings, and able to see many perspectives), the Assimilator (an individual with logic, model building skills, and the ability to organise information), and the Converger (an unemotional individual good at problem solving and making decisions).

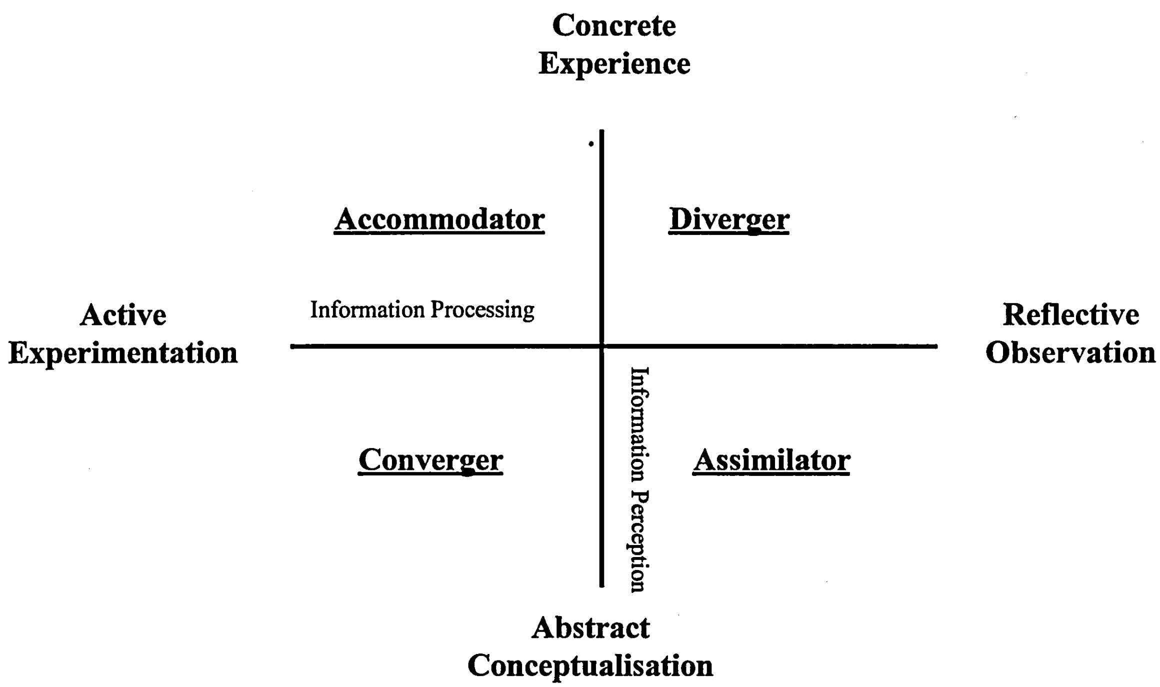

Figure 10. Kolb's (1981) learning style schema.

Robotham (1995) refers in his study to the notion of self-directed learning as the ability of an individual to select actively from a personal style or skills portfolio. In a training and education setting, a self-directed learner no longer operates as a passive receiver of information, but takes responsibility for the achievement, and ultimately the setting of learning outcomes. Therefore, a rigid training structure that is imposed on individuals may satisfy the course requirements, but it may also act as a development block for people whose learning attributes do not match that structure.

Some studies show that students' learning styles can affect the way they perceive knowledge. For example, in a study conducted by Federico (2000), he aimed to determine student attitudes toward various aspects of network-based instruction. He concludes that students with assimilating and accommodating learning styles demonstrated significantly more agreeable attitudes toward varied aspects of network-based instruction than students with converging and diverging learning styles. Accordingly, some studies, such as that of Wageeh and Hitendra (1999), consider principles in designing instruction in order to accommodate the students' preferred learning styles. They highlight two main principles. First is the manner in which the instruction is formatted to allow easy perception of issues presented in given information. The second point to consider is how individuals process information. Liu and Ginther (1999) also state that in order to effectively match the teaching styles with the students' learning styles, the teacher should make two main considerations. One is to match instructional materials with learning styles. The other is to match teaching styles with learning styles.

Although there are some studies that have looked into accommodating instruction to the students' learning styles, Liu and Ginther (1999) find that not much research has been done regarding the adaptation of distance education to students' learning styles. They also make some suggestions for the adaptation of the design and delivery of distance education with the students' learning styles. These suggestions include four major instructional stages: (a) instructional planning, (b) learning environment construction, (c) teaching method selection, and (d) evaluation administration. These suggestions were taken into account in this research during the design and the implementation stages.

Shaw and Marlow (1999) state that though there have been numerous studies on the relationship between learning styles and the use of ICT, evidence remains contradictory. They also state that some studies suggest that there is a strong relationship between student learning style and attitudes to the use of online technology whilst others suggest that no such relationship exists.
Some studies find that the use of information and communication technologies can accommodate the different learning styles of the students. Ross and Schulz (1999) note that one of the most powerful features of computer-aided instruction is its capacity to individualise instruction to meet the specific needs of the learner. They define self-paced instruction as the ability to present content in a variety of ways (e.g. text, sound, graphics etc.), and features such as hypertext which make computer assisted instruction an effective learning medium.

Ellis et al. (1993) also find that the consideration of learning styles is a significant component of individual behaviour within the hypertext environment. According to them, the student's learning style is not rigid or inflexible, and it does not necessarily

enforce a particular style of use of hypermedia upon a particular individual. Therefore, providing a variety of tools optimised for particular preferred modes of usage creates a rough equality of overall task-related performance, and allows the user to evolve an appropriate strategy for effective performance.
Shaw and Marlow (1999), in their study of interactivity, find that some students prefer a more traditional learning environment dominated by teacher-led exercises and are not comfortable interacting with computers. These students find the online learning environment impersonal and derive little satisfaction from learning in this asynchronous mode.

Stanton and Baber (1992) also conclude that hypermedia provides new possibilities for training. This follows from the idea that text and graphics can be linked in a knowledge network, allowing the learner to approach the material in a non-linear manner. Therefore, the learner has the freedom to adapt the material to his or her own preferred learning strategy, and to go into the level of detail required for his or her purpose.
Therefore, in this research, the use of the Internet was implemented using a Web-based learning environment in order to present to the students a number of options including resources and tools alongside the classroom-based options such as printed materials etc. This aimed to give them the opportunity to choose from this wide range of tools and resources in a way that best accommodated their own learning styles.

2.10. Cognitive load

The notion of "cognitive load" has been seen to be an important element in a Web-based learning environment. This is because the Web offers a large number of tools and resources that might increase cognitive load on the learner. Therefore, in this section a review of the cognitive load theory is discussed. In addition, guidelines for reducing the cognitive load are also considered.

Cognitive load theory was conceptualised by Sweller (1988) in the late eighties. Sweller's (1988, 1994) cognitive load theory (CLT) offers important tools for optimising the acquisition of complex material. This theory is directly concerned with the limits of working memory. According to Sweller (ibid), CLT also claims that an optimal use of working memory requires a maximum number of mental operations that directly contribute to the learning process and a minimum number of operations that do not contribute to the learning process.

According to Bannert (2002) cognitive load can arise from three sources. The first one is called *"intrinsic cognitive load"* (ICL) and is connected with the nature of the material to be learned. High ICL occurs in cases of high element interactivity and when learners do not yet have sufficient command over appropriate 'schemata'. The second source is called *"extraneous cognitive load"* (ECL) and has its roots in poorly designed instructional materials. Such ECL does not contribute to learning and instead it reduces working memory capacity for learning. The third source is referred to as *"germane cognitive load"* (GCL). This occurs when free working memory capacity is used for deeper construction and automation of 'schemata'.

Bannert (ibid) also notes that, when learning, humans allocate most of their cognitive resources to this activity, and in many cases it is the instructional format which causes an overload. Consequently, the basic idea is to reduce such external load in order to make available more capacity for actual learning so that better learning and performance is achieved.

Kirschner (2002) also highlights two types of factor that affect cognitive load. These factors are causal and assessment factors. Causal factors can be characteristics of the subject (e.g. cognitive abilities), the task (e.g. task complexity), the environment (e.g. noise) and their mutual relations. Assessment factors include mental load, mental effort and performance as the three measurable dimensions of cognitive load. Mental load is the portion of cognitive load that is imposed exclusively by the task and environmental demands. Mental effort refers to the cognitive capacity actually allocated to the task. The subject's performance, finally, is a reflection of mental load, mental effort and the aforementioned causal factors.

Mayer (1999) states that constructivist learning occurs when learners seek to make sense of the presented material by constructing a coherent mental representation. Valcke (2002) also stresses the fact that constructivist learning environments should foster this construction activity of (external) representations. He also states that CLT offers guiding principles in this context where it suggests the use of worked examples in the initial stages to promote sharing representations and meanwhile reducing cognitive load.

Pollock et al. (2002) note that cognitive load theory uses some aspects of human cognitive 'architecture' and of the structure of information to provide instructional designs that facilitate understanding, learning and problem solving.

Sweller (1994) based his model of instructional design upon these concepts:

1. Our limited working memories make it difficult to assimilate multiple elements of information simultaneously.
2. When multiple information elements interact, they *must* be presented simultaneously. This imposes a heavy cognitive load upon the learner of the information and threatens successful learning.
3. High levels of element "interactivity" and their resulting cognitive load can be inherent in the content e.g. learning language grammar inherently involves more element interactivity than simple vocabulary learning. However, weak methods of presentation and instruction may result in unnecessarily high overheads. An example would be to present a student with a figure the understanding of which requires repeated consultation of the text. The extra work required in decoding and translating the figure competes with the content for precious working-memory resources as the learner attempts to comprehend the material.

Kirschner (2002) states that to design, develop, and implement effective education requires us to better understand and make use of the possibilities and take into account the limitations of the human mind. Therefore, cognitive load theory (CLT) offers instructional designers a tool for achieving this goal. Valcke (2002) also notes that cognitive load theory can provide guidelines to assist in the presentation of information in a manner that encourages learner activities that optimise intellectual performance. Furthermore, Mayer and Moreno (2002) argue that cognitive load theory is an important component in any theory of learning that is intended to guide the design of multimedia learning environments. Accordingly, a major premise in cognitive load theory is that instructional messages should be designed in ways that minimise the chances of overloading the learner's cognitive system. Van Gerven et al. (2002) also find that in order to optimise the acquisition of complex material in elderly people information should be presented in a highly efficient manner. Moreover, they conclude that training should be designed in such a way that the learner is encouraged to spend as much working-memory capacity as possible on relevant operations and is not forced to waste resources on operations that are not relevant or even detrimental to the learning process. Although their case study was conducted with elderly people, their results seemed to be relevant to this research and therefore, their recommendations were taken into account.

In order to design effective training and training materials that reduce cognitive load, it is important to take into account some guidelines. The following section provides some guidelines for this purpose.

Sweller (1988) and Van Merrienboer (2002) provide guidelines to circumvent the limitations of the processing capacity of the human mind in acquiring complex cognitive skills in training situations. These guidelines include preventing cognitive over-load, decreasing extraneous cognitive load which is not relevant to learning and increasing germane cognitive load which is directly relevant to learning.

Mayer and Moreno (2002) also present a cognitive theory of multimedia learning which draws on dual coding theory, cognitive load theory and constructivist learning theory. Based on this, they develop principles of instructional design for fostering multimedia learning.

The *multiple representation principle* states that it is better to present an explanation in words and pictures than solely in words.

The *contiguity principle* is that it is better to present corresponding words and pictures simultaneously rather than separately when giving a multimedia explanation.

The *coherence principle* is that multi-media explanations are better understood when they include few rather than many extraneous words and sounds.

The *modality principle* is that it is better to present words as auditory narration than as visual on-screen text.

The *redundancy principle* is that it is better to present animation and narration than to present animation, narration, and on-screen text.

Mayer and Moreno (ibid) find also that four of their design principles — contiguity, coherence, modality, and redundancy — reflect the theme that students learn more deeply when their visual and/or verbal working memories are not overloaded. In particular, constructivist learning is most likely to occur when learners' needs have corresponding visual and verbal representations in working memory at the same time. Mayer (1999b) also concludes that well-designed multimedia presentations can help students understand material in ways that lead to problem-solving transfer. Furthermore, Van Gerven et al. (2002) conclude that the effective use of multimedia techniques, in which images or animations are combined with narration, offers great opportunities for reducing the amount of extraneous cognitive load caused by split attention or visual search.

Finally, Bannert (2002) describes two different ways to manage cognitive load. Cognitive processes of working memory can be controlled externally by presenting certain instructional formats. For instance, one can control the input into working memory by presenting a certain type and amount of information. Additionally, learners control cognitive load internally, for example, when regulating the learning process by deciding what and how to learn. Moreover, a reduction of cognitive load by ideal instructional format does not per se guarantee that all free mental resources will be allocated for deeper knowledge construction.

The guidelines and the principles for designing training materials, outlined above, were taken into account when designing the Web-based learning environment in this research. For example, the multiple representations principle was used in order to provide more than one format of materials for the students to have the opportunity to select from.

Chapter Three: Research Methodology

3.1. Methodology

3.1.1. Case study methodology

The methodology used in this research is seen to be best described as a case study. Case study is described by Bell (1999) as an umbrella term for a family of research methods having in common the decision to focus on inquiry around an instance. There are also some operative definitions of case study. For example, Bogdan and Biklen (1998) define case study as a detailed examination of one setting, or one single subject, or one single depository of documents, or one particular event.

Yin (1994) also defines the case study approach using the following technical definition:

A case study is an empirical inquiry that:

- investigates a contemporary phenomenon within its real-life context; when
- the boundaries between phenomenon and context are not clearly evident; and in which
- multiple sources of evidence are used.

Moreover, Anderson (1998) defines case study as a holistic research method that uses multiple sources of evidence to analyse or evaluate a specific phenomenon or instance. In addition, he mentions that most case study research is interpretative and seeks to bring to life a case and it often occurs in a natural setting and it may employ qualitative and/or quantitative methods and measures. Sturman (1999) also states that the techniques used in the case study investigation may be varied, and may include both qualitative and quantitative approaches. Accordingly, in this study an integration of both qualitative and quantitative methods was used in order to investigate the case of developing and implementing an Internet curriculum for pre-service teachers. The integration of both methods was seen to be essential in order to inform, validate and justify the findings of this study. According to Sturman (ibid), the case study researchers hold that to understand a case, to explain why things happen as they do, and to predict from a single example requires an in-depth investigation of the interdependencies of parts of the patterns that emerge.

Furthermore, Cohen and Manion (1994) see the case study researcher as a person who typically observes the characteristics of an individual unit- a child, a clique, a class, a school, or a community.

Another definition of the case study methodology is mentioned by Creswell (1998), as he considers a case study to be an exploration of a "bounded system" or a case (or multiple cases) over time through detailed, in-depth data collection involving multi sources of information rich in context. This "bounded system" is bounded by time and place, and examples of the case being studied might include a program, an event, an activity or an individual. This bounded system is also described by Bassey (1995) using the notion of the "study of singularity". This notion is described as a set of anecdotes about particular events occurring within a stated boundary, which are subjected to systematic and critical search for some truth.

The case in this research is teaching and learning the use of the Internet for pre-service teachers in Egypt as part of their preparation programme. This study as stated before, involved the development of an Internet curriculum for pre-service teachers to enable them to use and integrate the Internet into the teaching and learning process. After that a Web-based learning environment was developed in order to present this curriculum. Subsequently, a group of pre-service teachers at the Faculty of Specific Education, in Menofia University were selected in order to evaluate the effectiveness of the proposed curriculum and learning environment.

Before determining the type of case study approach used in this research, a distinction of the different types of case study needs to be made.

Bassey (1995) highlights two types of case study. In the first type there is a general issue that is being enquired into and a case study is made as an example of all cases where this general issue arises. The second type is the "bounded system", i.e. the case, and a local issue is enquired into for the purpose of gaining greater understanding of the local issue. Based on Bassey's (1995) categorisation, the case in this research is seen to be part of a general issue in teacher education in Egypt which is training teachers on the use of the Internet in schools. Since the Ministry of Education in Egypt initiated the programme for linking Egyptian schools with the Internet in 1997, most teachers' training programmes - especially those for pre-service teachers - are seen to be insufficient in relation to the use of the Internet. Therefore, most teachers are seen to be lacking the essential knowledge and skills for using the Internet. Accordingly, the pre-service teachers at the Faculty of Specific

Education in Menofia University were taken as an example of all these cases of pre-service teacher training.

Stake (2000) also distinguishes three types of case study:

1- The intrinsic case study: undertaken in order to gain a better understanding of this particular case: not because the case is unique or typical but because it is of interest in itself.
2- The instrumental case study: used to provide insight into a particular issue or to clarify a hypothesis. The actual case is secondary - its aim is to develop our understanding and knowledge of something else.
3- The collective case study: the study of a number of different cases. The cases may have similar or dissimilar characteristics but they are chosen in order that theories can be generated about a larger collection of cases. In this way they employ a very different mode of thinking from the single case study.

A different distinction of case study types is made by Sturman (1999) according to the focus of the case that has been enquired into. He highlights four types of case study methodology:

1- Ethnographic case study which involves a single in depth study usually by means of participant observation and interviews.
2- **Action research case study** where the focus is on bringing about change in the case under study.
3- Evaluative case study which involves the evaluation of programs and where quite often condensed fieldwork replaces the more lengthy ethnographic approach.
4- Educational case study which is designed to enhance the understanding of educational action.

The second type of case study according to Sturman (ibid), which is action research case study, is seen to best describe this research, as the case in this research involves action research in terms of considering the problems that face teachers in dealing with the new technology "the Internet". Moreover, the researcher in this case seeks to provide a solution to this problem by developing an Internet curriculum and designing a Web-based learning environment to present this curriculum for pre-service teachers.

In the following section, a discussion of the action research methodology is presented in order to highlight the use of action research in this case study. Preceding this section, it is important to highlight the advantages and disadvantages of case study methodology and the issues that arise from case study methodology.

Gall et al. (1996) draw attention to the advantages and disadvantages of case study research. The case study researcher, through a process of thick description, can bring a case to life. Thus readers of case study reports may have a better basis for developing theories, designing educational interventions, or taking some other action. In addition, thick description helps readers to compare cases with their own situations.

Furthermore, a good case study report will reveal the researcher's perspective, thus enabling readers to determine whether the researcher has the same perspective on the phenomenon as they do. Additionally, the case study method is ideally suited to investigating unusual phenomenon. Another advantage of case studies is their emergent quality.

According to Bell (1999), the great strength of the case study method is that it allows the researcher to concentrate on a specific instance or situation and to identify, or attempt to identify, the various interactive processes at work. These processes may remain hidden in a large-scale survey but may be crucial to the success or failure of systems or organisations.

On the other hand, according to Gall et al. (1996), the main disadvantage of case studies is the difficulty to generalise the findings to other situations. Another disadvantage is that ethical problems can arise if it proves difficult to disguise the identity of the organisation or individuals that were studied when reporting the case study. Case studies are also highly labour-intensive and require highly developed language skills in order to identify constructs, themes, and patterns in verbal data and to write a report that brings the case alive for the reader.

Burns (2000) also highlights the following issues in case study approach:

1- Subjective bias: which is concerned with the role of human subjectivity when selecting evidence to support or refute, or choosing a particular explanation for the evidence found.

2- Generalisation: this is concerned with the fact that case studies provide very little evidence for scientific generalisation. Robson (2002) distinguishes two types of generalisation, internal generalisation and external generalisation. Internal generalisation refers to the generalisation of conclusions within the setting studied. External generalisation is generalisation beyond that setting.

3- Time and information overload: case studies are time-consuming and produce for the investigator a massive deluge of information which is impossible to adequately analyse.

4- Reliability: reliability in case studies is more focused on dependability that the results make sense and are agreed on by all concerned. Ways of establishing reliability involve triangulation, reporting of any possible personal bias by the investigator, the existence of audit trail to authenticate how data were obtained and decisions made about data categories.

5- Validity: the validity of the case depends on the purposes to which it is put. There are two types of validity, internal and external validity. Internal validity deals with the question of how the findings match the reality. It can be assessed by a number of strategies such as triangulation, peer judgement and long-term observation. External validity, however, deals with the findings in terms of generalising it beyond the immediate case.

These issues were considered throughout the research, especially in the design of the research methods. Therefore, triangulation was mainly used as a means for maintaining the validity and reliability of research findings. Furthermore, the issue of generalisation was dealt with by building particular conclusions and recommendations on the particular situations within the case studied in this research, which is seen to be consistent with Stake's (1995) vision of particularisation. According to Stake (ibid):

> *"The real business of case study is particularisation, not generalisation. We take a particular case and come to know it well, not primarily as to how it is different from others but what it is, what it does. There is emphasis on uniqueness, and that implies knowledge of others that the case is different from, but the first emphasis is on understanding the case itself"* p8.

3.1.2 Action research methodology

The methodology used in this study is also influenced by the action research methodology. The methodology of action research can be dated back to Lewin (1946). He describes action research as proceeding in a spiral of steps each of which is composed of planning, action and evaluation. This methodology is also described by Hudson (1998) as providing a framework for thinking systematically about what happens in a teaching and learning situation, implementing action for change and monitoring and evaluating the effects of the action with a view to continuing the development.

Elliott (1991) defines action research as the study of a social situation with a view to improving the quality of action within it. Action research is also described as situational by Cohen and Manion (1994), because it is concerned with diagnosing a problem in a specific context and attempting to solve it in that context. It is also self-evaluative in that modifications are continuously evaluated within the ongoing situation. The ultimate objective for action research is to improve practice in some way or other.

A further aim of action research is to solve the immediate and pressing day-to-day problems of practitioners. Therefore, it is defined as the study of social situation with a view to improving the quality of action within it. Action research is carried out by practitioners seeking to improve their understanding of events, situations and problems so as to increase the effectiveness of their practice (McKernan, 1996).

The situation or the problem in this study is the difficulty in teaching and learning the use of the Internet for pre-service teachers and the lack of a developed curriculum for this purpose. Therefore, the first action that was taken in order to solve this problem and to improve the current situation was the development of an Internet curriculum for pre-service teachers. Subsequently this was implemented within a constructivist Web-based learning environment. Finally this action was evaluated in order to recognise its effectiveness and to enhance the ongoing development.

Burns (2000) identifies four characteristics of action research:

1- Action research is situational - diagnosing a problem in a specific context and attempting to solve it in that context.

2- It is collaborative, with teams of researchers and practitioners working together.
3- It is participatory, as team members take part directly in implementing the research.
4- It is self-evaluative - modifications are continuously evaluated within the ongoing situation to improve practice.

One of the main characteristics for action research is seen to be that it is cyclical. Lewin (1946) confirms this idea when he presents a spiral of cycles within action research. This spiral of cycles can be summarised in figure (11) below.

Action research - Lewin model (1946)

Spiral of cycles

Identify general idea

Reconnaissance (fact finding)

General planning

Developing first action step

Implementing first action step

Evaluation

Revising the general plan

Spiral into: Developing the second action plan

Implementation

Evaluation

Revising general plan etc.

Figure 11. The spiral of cycles according to Lewin's (1946) Model of action research.

According to Lewin's model (1946), research is considered to be cyclical research. Bassey (1995) also mentions that cyclical research involves a continuing process in which designing an investigation, carrying it out, analysing the results, and reflecting on it is but the first cycle, providing an interim report. On the basis of this first report, the focus may be redefined and a new round of investigations carried out in an attempt to get closer to whatever truth is being sought. In this cyclical process the direction of the research may change quite radically when a set of findings causes a rethink (see figure 12).

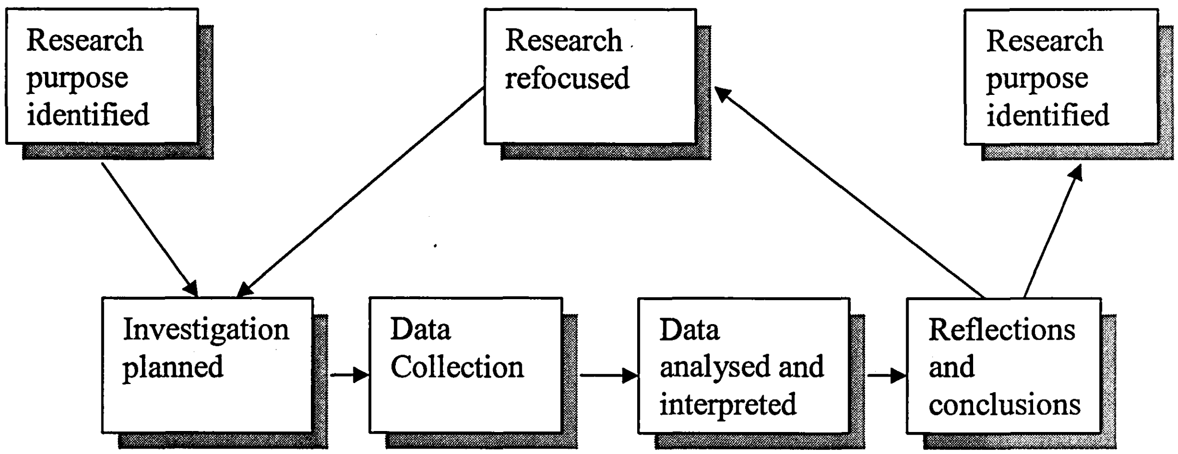

Figure 12. The different processes in cyclical research according to Bassey (1995).

Bassey (ibid) also states that carrying out a pilot study in order to try out research methods prior to conducting a larger scale study is an example of two-stage cyclical research. Classroom action research usually uses a cyclical approach.
In order to conduct this research, three main phases were carried out (see figure 13):

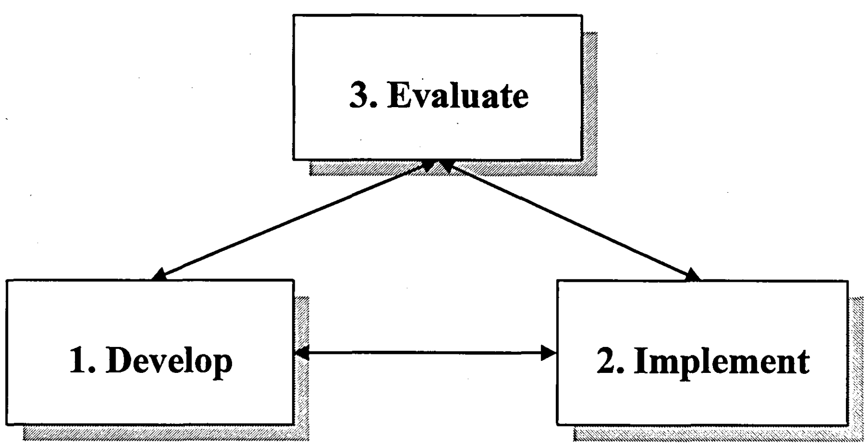

Figure 13. The different phases for conducting this research.

The first phase involved the development of an Internet curriculum through reviewing the literature related to the Internet and conducting a content analysis of the teachers' guides and users' guides. In addition, a Web-based questionnaire was used in order to inform the outcomes of the content analysis. This curriculum has been developed to be presented in a constructivist learning environment. Therefore, the objectives and the structure of this curriculum were influenced by some constructivist learning environments models such as those outlined by Hannafin & Oliver (1999) and Jonassen (1997c).

The second phase involved the design of the constructivist learning environment by developing a Web-based learning environment called "Internet-Tutoring System". Moreover, it involved the implementation of both the Internet curriculum and the Web-based learning environment namely "Internet-Tutoring System" with a group of pre-service teachers.

Finally in the third phase, this curriculum was trialled with a group of pre-service teachers in order to evaluate its effectiveness. This involved an evaluation of the effectiveness of the Internet-Tutoring System as a learning environment for the presentation of the Internet curriculum. Because of the problems that were seen as inevitable in the evaluation of constructivist learning environment, multiple perspectives were used in the evaluation e.g. the use of questionnaire, observation and interview.

3.2. Triangulation

The methodology for this research is also concerned with the notion of triangulation, which is defined by Cohen and Manion (1994) as the use of two or more methods of data collection in the study of some aspects of human behaviour. Triangulation techniques in the social sciences attempt to map out, or explain more fully, the richness and complexity of human behaviour by studying it from more than one standpoint and, in so doing, by making use of both quantitative and qualitative data. They also identify several types of triangulation. This study used two types of triangulation: the first one is theoretical triangulation, which draws upon alternative or competing theories in preference to utilising one viewpoint only. The second type is methodological triangulation, which uses either (a) the same method on different occasions, or (b) different methods on the same object of study. Both types were used appropriately according to the research objectives.

According to Elliott (1991), the basic principle underlying the idea of triangulation involves collecting observations/accounts of a situation (or some aspects of it) from a variety of angles or perspectives, and then comparing and contrasting them. The same idea of collecting data from different perspectives was also highlighted by Macintyre (2000) who states that data is best gathered in different ways by different people who are seeing things from different perspectives. He visualises this idea in figure (14) shown below.

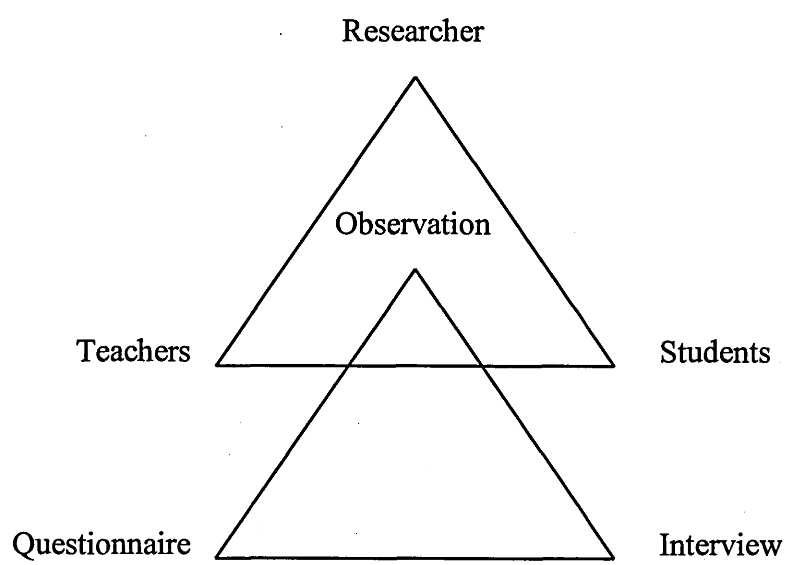

Figure 14. The notion of triangulation as visualised by Macintyre (2000).

According to Gall et al. (1996), triangulation is the process of using multiple data-collection methods, data sources or theories to check the validity of case study findings. Moreover, triangulation helps to eliminate biases that might result from relying exclusively on any one data-collection method, source or theory. The key to triangulation is to vary in some way the approach used to generate the findings that the researcher is seeking to corroborate.

In this research, triangulation was seen to be a key element to validate the findings of this case study and to underpin the results of this research.

3.3. Research ethics

Ethical issues were taken into consideration in the implementation of this research programme, because the practice of research like all human behaviour is subject to ethical principles and rules which distinguish socially acceptable behaviour from that which is generally considered unacceptable (Anderson, 1998). Therefore, the ethical standards as suggested by Anderson (1998) were considered in this study e.g. informed consent, honesty, right to discontinue...etc.
Furthermore, the ethical criteria for action researchers outlined by McKernan (1996) were taken into account such as confidentiality of data, copy right issues etc.

In addition, the policies and procedures which govern the ethical conduct of research within Sheffield Hallam University were considered (Research Ethics Committee, 2000).

Additionally, the types of ethics highlighted by Flinders (1992) were taken into account while conducting this research. These types are (see figure 15):

1- **Utilitarian ethics**, researchers judge the morality of their decisions and actions by considering the consequences. The most desirable consequence is to produce the greatest good for the greatest number of people.
2- **Deontological ethics**, researchers judge the morality of their decisions and actions by referring to absolute values, such as honesty, justice, fairness, and respect for others.
3- **Relational ethics**, researchers judge the morality of their decisions and actions by the standard of whether these decisions and actions reflect a caring attitude toward others.
4- **Ecological ethics**, researchers judge the morality of their decisions and actions in terms of the participants' culture and the larger social systems of which they are part.

	Utilitarian	Deontological	Relational	Ecological
Recruitment	1.Informed consent	1.Reciprocity	1.Collaboration	1.Cultural sensitivity
Fieldwork	2.Avoidance of harm	2.Avoidance of wrong	2.Avoidance of imposition	2.Avoidance of detachment
Reporting	3.Confidentiality	3.Fairness	3.Confirmation	3.Responsive communication

Figure 15. The research ethics framework in relation to the recruitment of participants, the conduct of fieldwork, and the presentation of research reports by Flinders (1992).

The various aspects which are related to the research ethics influenced the different phases of the implementation of this research project. For example, the students were informed of the course objectives and content, and the way of implementing this research, and they were given the right to withdraw from the course at any time. Several copyright issues faced the development of the Web-based learning environment such as the consideration of the terms and conditions for using free source software and codes which enhanced the design of the learning environment and avoiding the use of copy right protected icons, materials etc. The different issues that are related to the copyright were taken into consideration in this research.

Many other ethical issues emerged during the development, implementation and evaluation processes of this study and all of them were dealt with according to the framework of ethics highlighted in figure (15) above.

3.4. Research method *

3.4.1. Research sample

The samples for this research were selected according to the criteria for selecting cases stated by Stake (1995). The first criterion should be to maximise what we can learn. Given our purposes, which cases are likely to lead us to understandings and which to assertions. Moreover, we need to pick cases which are easy to access and hospitable to our inquiry. We also need to carefully consider the uniqueness and contexts of the alternative selections, for these may aid or restrict our learning. Furthermore, balance and variety are considered to be important factors in case study sampling. This research included three different groups of people:

- The first group included twenty education and information technology specialists. The main aim of selecting this group was to inform the development of the Internet curriculum by giving them the questionnaire for developing the Internet curriculum. They were selected on the basis of academic quality and expertise which were seen to be important criteria as they were required to judge, select, delete and modify the objectives of the Internet curriculum.
- The second group consisted of ten students of the "Education Studies" group in year one who were studying information and communications technologies in the School of Education at Sheffield Hallam University. The selection of this group, according to Burns (2000), was purposive or purposeful because the case served the real purpose and objectives of the researcher of discovering, gaining insight and understanding into a particularly chosen phenomenon. The purpose of choosing this group was to trial the Web-based learning environment "Internet-Tutoring System" and to have their feedback on it in order to evaluate the initial development of the learning environment. This trial was seen as an essential part before trialling the learning environment on a bigger scale with another group in Egypt.
- The third group in this research was a group of students at the Instructional Technology Department at the Faculty of Specific Education in Menofia University in Egypt. This group consisted of eighteen students who voluntarily agreed to take part in this course. The group was selected randomly from year two, three and four in this department. None was selected from year one as the majority of students do not have sufficient knowledge and skills in using computers which are prerequisite for the course.

3.4.2. Data collection

One strength of the case study is its use of multiple data sources; therefore to maximise the findings in a case study, researchers need to incorporate a full range of formal and informal instruments, from questionnaires to observation (Anderson, 1998).

Robson (1993) summarises the following commonly used techniques for data collection in case study (in figure 16):

Data collection in case study A summary of commonly used techniques
1 **Observation** (a) Participant observation. The researcher is more than a passive observer and participates in the events being studied. (b) Systematic observation. Use of standardised observation instrument. (c) Simple observation. Passive unobtrusive observation (e.g. facial expression, language use, behaviour).
2 **Interview** (a) Structured interview. Pre-determined questions in a set order. (b) Focused/semi-structured interview. Interview schedule specifying key areas but order of questions not fixed. (c) Open-ended interview. No pre-specified schedule or order of questions, little direction from interviewer.
3 **Use of documents and records**. Includes a wide range of written or recorded materials, e.g. minutes of meetings, pupil records, diaries, school brochures, reports.
4 **A wide range of other techniques**. Including: questionnaires, standardised tests (e.g. of intelligence, personality or attainment), scales (e.g. attitude), repertory grids, life histories, role play, simulation and gaming.

Figure 16. A summary of the commonly used techniques for data collection in case study by Robson (1993).

In this study, the researcher used a number of data collection methods such as content analysis, questionnaires, observations, interviews and learning styles inventory for two main reasons. The first reason, according to Anderson (1998), was to maximise the findings in this case study by incorporating and integrating these data collection methods. The second reason was to achieve the triangulation which is seen as a key element for validating and justifying the results of this study.
In the following section of this chapter, the data collection methods used in this study are explained in detail according to the sequence of using them in this study.

3.4.2.1. Content analysis

Generally accepted as being the major system for analysing documentary sources, content analysis aims to produce objective, systematic and quantifiable analysis of documentary data (Hitchcock & Hughes, 1995).
Content analysis, according to McKernan (1996), is also concerned with inquiring into the deep meaning and structure of a message or communication. This message may be contained in a written document, a communications broadcast, film, video, or in actual human behavior observed. Moreover, content analysis has been used primarily in communications-type research as a research technique for the objective, systematic, and quantitative description of the manifest content of communication, e.g. propaganda studies, yet it is an ideal tool for the analysis of curriculum problems.
The goal of the content analysis is to uncover hidden themes, concepts and indicators of the message content (McKernan, ibid). Therefore, content analysis of text-books is becoming a rich field for curriculum research.
As a result of the lack of a formal Internet curriculum to date, the only available sources of information about using the Internet are the users' guides and teachers' guides for using the Internet.
This research project has used the content analysis of users' guides and teachers' guides that are currently freely available on the Internet. These have been critically analysed and evaluated as a basis for the development of this curriculum. They contain details of the fundamental knowledge and skills required for using the Internet effectively. Additionally, the documents used in training teachers -which is

considered to be the main source of information for training teachers on the use of the Internet in Egypt- have been analysed to evaluate the current training needs and objectives.

The planning of a content-analysis study and the procedures of content analysis outlined by McKernan (1996) and Brog & Gall (1989) informed this study in the conduct of the content analysis. Therefore, these procedures influenced the development of the main procedures for conducting the content analysis in this study. Since the procedures for conducting the content analysis were seen to be crucial in developing the Internet curriculum, they are discussed further in chapter four with regard to developing the Internet curriculum.

3.4.2.2. Questionnaires

In this study, two main questionnaires were designed in two different situations. The first questionnaire was designed in order to inform the development of the Internet curriculum. While the second questionnaire was designed in order to evaluate the implementation of both the Internet curriculum and the use of the Web-based learning environment. Both questionnaires were designed in the English language and then they were translated into Arabic language which is the mother tongue of the participants. The guidelines and the procedures mentioned by Bell (1999) and Anderson (1998) in the design and administration of questionnaires were taken into account in the design and administration of these questionnaires.

The first questionnaire was a Web-based questionnaire (see appendix C) and as mentioned before it was designed to help inform the development of the main objectives of the new Internet curriculum, and also to validate the objectives that have resulted from the content analysis. This questionnaire is also considered to be a validation process for the content analysis results, in terms of justifying the resulting objectives. Designing a Web-based questionnaire seemed to be easy to access and quick to respond to, in addition to its ability to reach different groups of specialists around the world especially Egypt, the country where the implementation of the research took place. The questionnaire was administrated to a group of leading specialists and practitioners in the field.

In this questionnaire the questions were formed using the 'Likert' scale which is considered by Anderson (1998) to be one of the most useful response formats. A five-point scale was used because it is thought to be one of the most practical for common purposes. Additionally, it is easy to respond to, straightforward to analyse and sufficient for most needs (Anderson, 1998).

The final format of this questionnaire was divided into two main parts: general objectives and educational objectives.

This questionnaire was trialled with a small group of staff with the relevant expertise in the School of Education at Sheffield Hallam University before being distributed. Subsequently it was distributed to a number of educational and information technology specialists and practitioners. This group was chosen according to their academic quality and expertise.

Although the questionnaire sample was relatively small, the experience and the qualifications of the respondents were taken into account in order to have high quality responses. Therefore, the quality of the respondents for this questionnaire was considered more important than the quantity of the respondents.

The second questionnaire (see appendix g evaluation resources, section b course evaluation form) aimed to evaluate both the Internet curriculum and the Web-Based learning environment 'Internet-Tutoring System'. Therefore, the formats of questions included a variety of formats such as the 'Likert' scale, optional questions, open-ended question etc. The purpose of this variation was to gain significant information and increased understanding from the students' point of views about the Internet curriculum and the learning environment.

The questions in this questionnaire were categorised under six different sections, these sections are:

1- Personal details.

2- Course objectives and content.

3- Learning process.

4- Teaching methods.

5- The Internet Tutoring System.

6- Learning outcome.

After that, the questionnaires were distributed to the whole group of students after finishing the course and they were given instructions on how to fill in these questionnaires. The students were encouraged to fill in all the questionnaires, and therefore eighteen out of eighteen questionnaires were returned completed.

In addition to these two main questionnaires, a questionnaire for the training needs was designed. This questionnaire aimed to identify the different training needs for the students e.g. what their existing knowledge and skills for using the computer and the Internet were and what their expectations from this course were. This questionnaire was distributed to the students at the beginning of the course.

The validity of the questionnaires

The validity of these questionnaires was considered through trialling the questionnaires with some educational specialists. The trialling of the questionnaires aimed to recognise the extent to which the questions were actually being measured by using these questionnaires.

Both face validity (i.e. the extent to which the measure is subjectively viewed by knowledgeable individuals as covering the concept) and content validity (i.e. the extent to which the measure covers all the generally accepted meanings of the concept) (Sirkin, 1999) were considered by the trialling panel. Some suggestions were made such as adding some new questions, deleting redundant questions and changing the format of some questions.

The reliability of the questionnaires

The reliability analysis was calculated for the two main questionnaires to be able to recognise the reliability for the overall questionnaires.

In this study, the reliability coefficient Alpha was used which is considered to be one of the most commonly used reliability coefficients, and it is based on the internal consistency of a test. That is, it is based on the average correlation of items within a test, if items are standardised to a standard deviation of 1; or on the average covariance among items on a scale, if items are not standardised. It is assumed that the items on a scale are positively correlated with each other. There is no reason to believe that they are correlated with other possible items that have been selected. In this case, it is not expected to see a positive relationship between this test and other similar tests.

Interpretation of Cronbach's Alpha is the squared correlation between the score a person obtains on a particular scale (the observed score) and the score he or she would have obtained if questioned on all of the possible items in the universe (the true score). Since Alpha can be interpreted as a correlation coefficient, it ranges in value from 0 to 1 (Norusis, 1994).

As shown in table (7), the Internet curriculum questionnaire contained 20 cases and 59 items (questions). It is also shown that the overall reliability of the questionnaire is 0.8895 which is considered to be a high level of reliability (Norusis, 1994).

Table 7. Reliability coefficients for the Internet curriculum questionnaire.

N of Cases	N of Items	Alpha
20	59	0.8895

Table (8) also shows that the course evaluation questionnaire contained 18 cases and 35 items (questions). It is also shown that the overall reliability of the questionnaire is 0.7373.

Table 8. Reliability coefficients for the course evaluation questionnaire.

N of Cases	N of Items	Alpha
18	35	0.7373

These Alpha values indicate that both questionnaires are reliable and internally consistent which means that the questionnaires are more likely to yield similar results when different people administer them and when alternative forms are used.

3.4.2.3. Learning style inventory

In this study, the learning style inventory developed by Kolb (1981) was used. The focus of an individual's preferred method for receiving information in a learning environment is that individual's learning style (Kolb, 1984).

According to Reed and Oughton (1998), Kolb's learning style inventory identifies a learner as being either an accommodator, an assimilator, a diverger or a converger. Accommodators value a lack of structure, a high amount of peer interaction, and a lack of authority figures in the classroom.

Assimilators value conforming to directions, assigned readings, theory inputs and lectures.

Divergers value self-diagnostic activities, open-ended unstructured homework papers, lectures and no peer interaction.

Convergers value instructor/expert inputs, readings, discussions that link the classroom to the real world, and little open-ended peer discussions.

The use of the learning style inventory in this study was influenced by the study made by Ross and Schulz (1999). They question whether computer assisted instruction accommodates all learners equally. They used a learning style inventory in order to look into this issue.

In this research, the purpose of using the learning style inventory is to look more closely into the students' different learning styles within the group. Moreover it aimed to investigate whether the Web-based learning environment accommodates all the learners in the group or not.

The learning style inventory was distributed to the group on the second day of the course. It was explained to them and they were given instructions on how to fill it in step by step in order to gain a good indicator of the students' learning styles.

3.4.2.4. Observations

The purpose of observation is to probe deeply and to analyse intensively the multifarious phenomena that continue the life cycle of the unit with a view to establishing generalisation about the wider population to which that unit belongs (Cohen & Manion, 1994).

In order to conduct the observations in this study, it was planned to have two observers, one internal (the researcher), and one external. It was seen as important to identify the role of each observer.

Gall et al. (1996) identify four types of observer's roles:

1- A complete observer role, the researcher maintains a posture of detachment from `the setting being studied.
2- A **complete participant role**, the researcher studies a setting in which he/she already is a member or becomes converted to genuine membership during the course of the research.
3- An **observer-participant role**, the researcher acts primarily as an observer, entering the setting only to gather data and interacting only casually and non-directly with individuals or groups while engaged in observation.
4- A participant-observer role, the researcher observes and interacts closely enough with individuals to establish a meaningful identity within their group; however, the researcher does not engage in activities that are at the core of the group's identity.

Based on the categorisation by Gall and et al. (1996), two main roles of observer were distinguished in this study:

The first and the main observer role was the observer-participant role, which is the role of the external observer. As a colleague in the Faculty of Specific Education in Egypt, he acted as the main observer in this study. While he was observing, he participated occasionally in the course and in some situations where it was appropriate to interact with the students and discuss issues with them while they were working within the context of the course.

The second observer (the researcher himself) acted as a complete participant in the course. The researcher was tutoring in the course as well as observing the students while he was working very closely with them.

In order to conduct the observations, an observation sheet (see appendix i) was designed to observe the learning process during the course. This included observing their behaviours, attitudes and the aspects that they gave attention to. The observation sheet was designed in the light of the steps for building the observation identified by Burroughs (1975). These steps included identifying a range of behaviour to be observed, defining and categorising this unequivocally and determining the method of recording.

The observation sheet aimed to record the following aspects related to the course:

1- Course objectives and content.

2- Learning process.

3- Teaching methods.

4- The Internet Tutoring System.

5- Learning outcomes.

Before the beginning of the course, a meeting was held with the external observer in order to orient him with the learning environment and the Internet curriculum. This meeting also aimed to orient him with the observation sheet and to explain his role as an observer during the course. During this meeting, it was also agreed for him to be given the opportunity to participate occasionally in the course e.g. he offered a piece of software to help the students to translate English language into Arabic language. Therefore, it was agreed that he introduce this software to the students at the beginning of the course. There were also short meetings that were held almost everyday after the course with the observer.

After finishing the whole course, an "observation meeting" was held between the two observers and they discussed different issues relating to the course such as the course organisation, course content, students' feedback during the course etc. This meeting was held in the form of a semi-structured interview and it is discussed further in the following interview section.

3.4.2.5. Interviews

Bell (1999) refers to interview as a conversation between interviewer and respondent with the purpose of eliciting certain information from the respondent. The interview is also defined by Watts and Ebbutt (1987) as a conversation initiated by an interviewer for the specific purpose of obtaining research relevant information and focused by him/her on content specified by research objectives.

The use of interviews in this research was seen as essential in order to look deeply into the course implementation by having a clear understanding of the students' views about the course and its effect on learning the use of the Internet.

The approach to the interviews used in this research was semi-structured. The semi-structured interview comes somewhere between the completely structured and the completely unstructured point on the continuum (Bell, 1999). Moreover, it gives freedom to allow the respondents to talk about the topic and give their views in their own time (Bell, ibid.). Furthermore, the semi-structured interview involves some kind of interview guide or checklist and the interviewer has considerable flexibility over the range and order of questions within a loosely defined framework (Wellington, 1996).

Therefore, a main framework for the questions was prepared and most of the questions emerged during the interviews. Since the interviews were semi-structured, audio-tape recording was seen as beneficial in terms of recording all the responses and comments made by the participants in the interviews. The audio-tape recording was also seen as beneficial especially in the group interview in order to record all the issues and comments that were made by each member of the group. The consent of all interviewees was gained in order to use audio-tape recording.

The main steps for preparing an interview as outlined by Wellington (1996) were taken into consideration for designing the interviews in this research. These steps included translating research objectives or questions into interview questions, deciding the degree of structure, ordering the questions and deciding how the responses will be collected.

During designing the interviews, some types of questions were avoided. These are, according to Robson (1993), long questions, double-barrelled questions, questions involving jargon, leading questions and biased questions.

Two types of interviews were used in this research:

Group interview

The first type of interview used in this research was group interview. Focus group interview is seen by Arksey and Knight (1999) as a selection of people who are invited to respond to researchers' questions, findings from earlier studies, policy documents, hypotheses, concerns and the like.

The steps for conducting focus group interviews described by Vaughn et al. (1996) were used in this research to carry out the focus group interview with the students after finishing the course. These steps included: delineate the general purpose, designate a moderator, refine the research goals, select participants etc.

This interview was held with the group of students who participated in the course in order to assist in the evaluation process of the whole course. The interview was held using this technique because of the advantages of the group interview highlighted by Watts and Ebbutt (1987) which includes the potential for discussions to develop, thus yielding a wide range of responses. They also see this kind of interview as being useful, where a group of people have been working together for some time or towards a common purpose.

The second type is one-to-one interview, which was held between the researcher as (interviewer) and the observer as (interviewee), which was called in this research "observation meeting". According to Cohen and Manion (1994), this type of interview is defined as a two-person conversation initiated by the interviewer for the specific purpose of obtaining research relevant information, and focused by him/her on content specified by research objectives of systematic description, prediction, or explanation.

3.4.3. Data Analysis

Anderson (1998) suggests that analysing data is like walking in a maze. There are many routes available, some lead you quickly to the end, others force you to choose one path over another, and some routes lead to a dead end causing you to retrace your steps and try again. The mass of case study data can present insurmountable problems unless one knows how to approach the task. Basically data analysis involves four elements: interpreting your findings while in the field, coding and organising the data into themes and constructs, searching for disproving themes or evidence, and testing alternative interpretations of the data to see if your understanding of the information changes. Analysis also involves a great deal of contemplation, reflection, imagination and experience.

Moreover, Bogdan and Biklen (1998) describe data analysis as the process of systematically searching and arranging the interview transcripts, field notes, and other materials which are accumulated to increase the understanding of them and to present what is discovered to others. Subsequently, analysis involves working with data, organising them, breaking them into manageable units, synthesising them, searching for patterns, discovering what is important and what is to be learned, and deciding what you will tell others.

3.4.3.1. Data analysis resulting from the content analysis

By far the most common method of summarising content-analysis data is through the use of absolute frequencies, such as the numbers of specific incidents found in the data, and relative frequencies, such as the proportion of particular events to total events. Descriptive statistics such as mean, median, and standard deviation are also used to compare the occurrences of different events.

The problem which faces the researcher in using content analysis is that frequency does not, in fact, necessarily mean significance and that a striking word or phrase may turn out to be more important in determining meaning. This suggests that a more qualitative approach may be better suited to analysing these materials (Hitchcock & Hughes, 1995). Since the frequency does not necessarily mean significance, a more qualitative approach has been used to describe the main objectives for using the

Internet especially given that some of it was implicit within the Internet guides. Although a qualitative approach was conducted in order to identify the main objectives for the Internet guides, calculating the frequencies for the objectives seemed to be important in order to recognize the significance of each objective. Subsequently, an initial list of objectives was prepared in order for it to be given to a panel of experts in the form of a questionnaire to judge its relevance to the Internet curriculum. This content analysis was seen as an essential process in developing the Internet curriculum. Accordingly, more information about the steps taken in conducting this content analysis is discussed in detail in chapter four (developing the Internet curriculum).

3.4.3.2. Data analysis of the questionnaires

The first questionnaire for informing the development of the Internet curriculum was based on a five-point scale (strongly disagree, disagree, not sure, agree and strongly agree). Therefore, after having the completed questionnaires, codes were assigned for each category by giving bigger values to the positive answers e.g. strongly agree was assigned a value of (5), agree (4), not sure (3), disagree (2) and strongly disagree (1) (see appendix h for a list of comprehensive question codes). Then all the answers were summarised in a data sheet by giving them their relevant codes.

The degree of agreement was specified as a base for selecting the objectives for the new Internet curriculum. Therefore, each objective should demonstrate enough agreement (over 60%) to be selected. The "not sure" answer was counted as a disagreement to ensure that the objectives have a high level of agreement from the respondents.

Therefore, the percentage of agreement for each objective seemed to be an important criterion to take an objective into account or to delete it, i.e. if there is a high percentage of agreement for a particular objective, then this objective is added to the list of objectives and vice versa. Moreover, the interpretation of data resulting from the open-ended questions formed a basis for the addition of some new objectives. Subsequently, these objectives were organised and categorised into five main units: introduction to the Internet, searching the Internet, communication utilities, file transfer and Web design.

Both the second questionnaire (the course evaluation form) and the training needs questionnaire were analysed using the same coding system for the questions (see appendix h). The answers for both questionnaires were summarised in two summary sheets. Moreover, the students' comments on the open-ended questions were categorised under their relevant categories such as course objectives and content, teaching methods, etc. The interpretation of the data included comparing some of them. In particular, the data concerning the students overall rates on using the Internet before the course (which were taken from the training needs questionnaire) and the students overall rates after the course (which were taken from the course evaluation form questionnaire) were compared. The purpose of this comparison was to identify the effectiveness of the overall course in relation to its objectives. The students' comments were also interpreted in the light of the findings from the observation and the interviews.

3.4.3.3. Data analysis of the learning style inventory

The data revealed from the learning style inventory was analysed in the light of the procedures mentioned by Kolb (1981). These procedures, which are provided in the learning style inventory manual, were used in order to identify the different learning styles of the students who participated in the course.

After that, the results coming from the questionnaires, especially those concerning the students' overall progress in the course were interpreted in the light of their different learning styles. This was for the purpose of identifying whether the Web-based learning environment accommodated the different learning styles of the learners or not.

3.4.3.4. Data analysis of the observation

Field notes were taken by both observers, some of these notes were taken during the class and some others were written directly after finishing every day in the class.

In line with Gall and et al. (1996), the field notes were descriptive and reflective. They included descriptive information that has verbal portraits of the research

participants, reconstruction of dialogue, description of the physical setting, accounts of particular events, and description of the observer's behaviour. They also included reflective information which has the researcher's personal account of the course of inquiry, and contained the following elements: reflections and the methods of data collection and analysis, reflections on ethical dilemmas and conflict, reflections on the observer's frame of mind and emerging interpretations.
Robson (1993) makes a distinction between an observation checklist and a category system. A category system is unlike a checklist and uses a relatively small number of items, each of which is more general than a typical checklist item, but which attempts to use the system to maintain some sort of more-or-less continuous record.

The reliability of the observation was considered by using the inter-observer agreement which is described by Robson (1993) as the extent to which two or more observers obtain the same results when observing the same thing. Therefore, during the observation meeting held between the two observers, there was an agreement on the major issues in this research.

3.4.3.5. Data analysis of the interview

The interviews were analysed according to the guidelines outlined by Cohen et al. (2000). These guidelines include, for example, transcription, delineating units of general meanings and of meaning relevant to research questions, clustering units of relevant meaning etc. These guidelines were used in order to transcribe the audio-tapes for both interviews. Then the scripts were translated into English language and they were given to a colleague to check the translation. After that the content was categorised into subsections according to the categories within the questionnaire such as course objectives and content, learning process, teaching methods etc. Then these data were interpreted in the light of the data arising from both the questionnaires and the observations.

The approach to the analysis of the interviews in this research can be summarised as follows:

First of all, the audio-tape recordings were transcribed into their original language (Arabic). All the participants in the interviews were anonymous and they were given numbers such as student1, student2 etc. After that the transcripts were given to a colleague whose native language is Arabic in order to verify the transcripts.

Secondly, the transcripts were translated into English in order to interpret them in the light of the other findings arising from the observations and questionnaires.

Thirdly, the transcript text was cut into smaller paragraphs according to their relevance with each of the five main categories mentioned before in the questionnaire. The purpose of this process was to interpret and integrate the comments arising from the interviews with the other findings.

Finally, the findings from the interviews were interpreted and integrated with the findings from the questionnaires and observations.

Chapter four: Developing the Internet curriculum

4.1. Introduction

It is self evident that the use of the Internet has become widespread in recent years, and it has become essential for all teachers to know how to use the Internet. In fact, the Internet can make a real difference in teaching and learning in schools as it can be used to enhance and enrich the classroom experience (Williams, 1995).

However against this background of very rapid change in society, it has been found that there is a lack of computer knowledge and experience among teachers in developing countries (Al-Mohaissin, 1997), which presents a serious difficulty for the introduction of computers into subject teaching. Moreover, Mohaiadin (1997) found that there is a lack of knowledge and skills in using the Internet, and this could be a consequence of the fact that the use of the Internet was typically learned through friends rather than through formal curriculum or instruction. Shezhang (1998) has also found that 73% of a group of social studies' students learned how to use the Internet from friends.

In most cases, there is no curriculum for the Internet that determines specific goals and contents. Therefore this chapter is concerned with developing a curriculum for the Internet for English language teachers in prep schools in Egypt.

The development of this curriculum will involve determining the main objectives that aim to attain the basic knowledge and skills that are prerequisites for teachers to be able to use the Internet effectively. Subsequently a learning environment will be developed that will be informed by a constructivist perspective.

In order to develop the new curriculum a content analysis approach has been used to analyse the content of the documents that are related to the use of the Internet. In addition to, a Web-based questionnaire (see appendix c) has been designed to help inform the development of the main objectives of the new Internet curriculum, and to ensure the validity of the content analysis (see figure 17).

The different procedures for developing the Internet curriculum can be seen from the flowchart below.

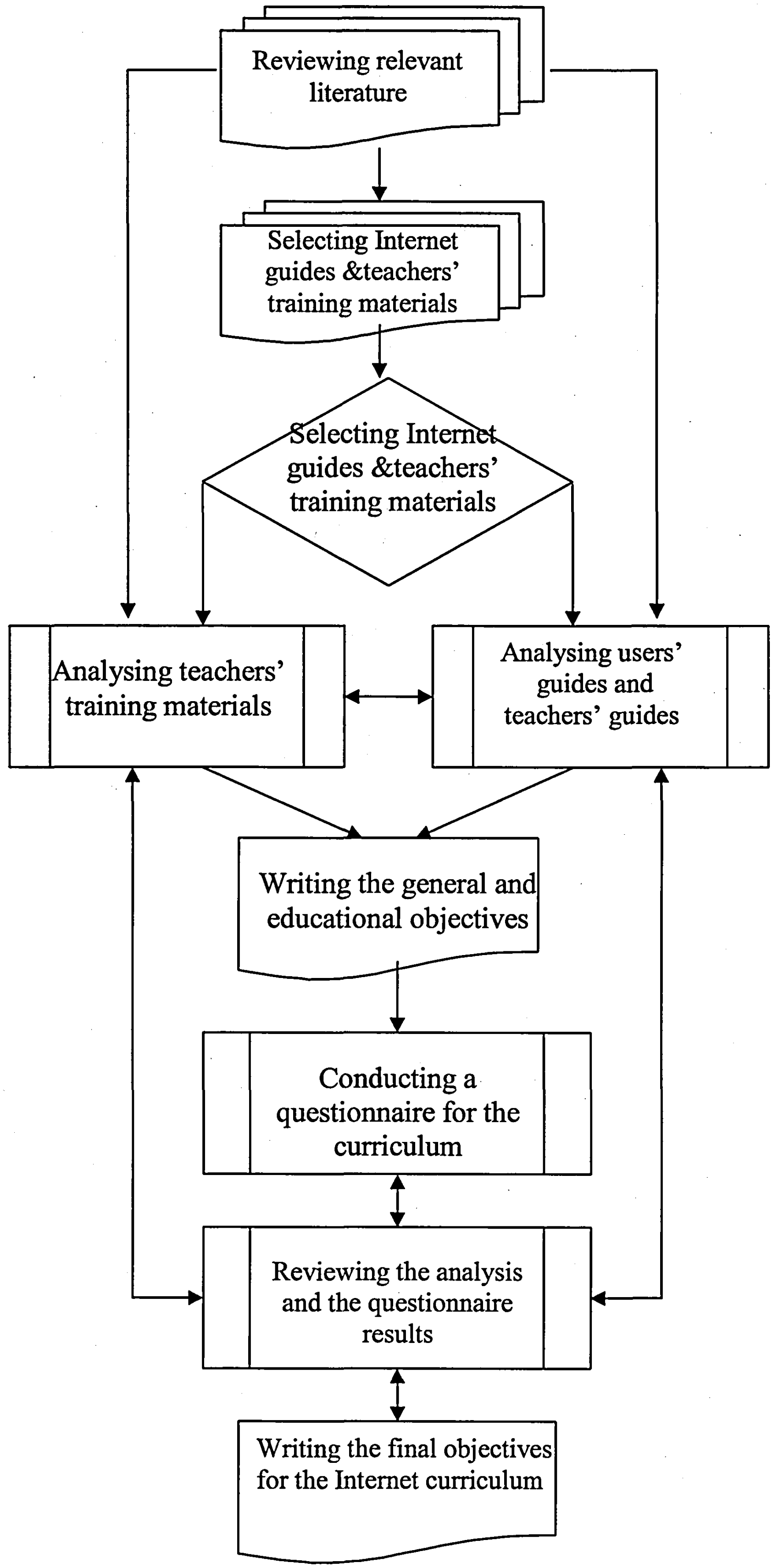

Figure 17. Flowchart of the procedures for developing the Internet curriculum.

As it is shown in figure 17, the procedures for developing the Internet curriculum started with a review of the literature relevant to the Internet, curriculum development and content analysis. These readings have influenced the process and the decision of selecting the Internet users' guides and teachers' guides. In addition to its influence on the content analysis of the teachers' training materials, the Internet users' guides and the Internet teachers' guides.

Subsequently, the decision to select a sample of Internet users' guides and teachers' guides has been taken in the light of some guides that are freely available on the Internet and among library resources. Ten guides seemed to be a reasonable and practical number and these have been selected randomly. This selection of guides was then analysed using content analysis in order to identify its main objectives and the main software and hardware for using the Internet. Then, these objectives were revised in the light of the content of the teacher training materials. They were divided into two main sections:

1- The *general objectives which are* concerned with the essential knowledge and skills for using the Internet such as connecting to the Internet, browsing the World Wide Web, sending and receiving emails etc. These objectives are designed for any new user of the Internet.
2- The *educational objectives* which are concerned with the knowledge and skills that are related to different educational uses and projects that are based on the Internet. Therefore, these objectives are designed for teachers to be able to integrate the use of the Internet into their work.

After that, a Web-based questionnaire was conducted in order to inform the development of the main objectives of the new Internet curriculum, and also to validate the objectives that have resulted from the content analysis. The resultant objectives have been revised in the light of both teacher training materials and the Internet users' guides and teachers' guides. Lastly, the final objectives for the Internet curriculum have been written in the light of all the preceding development.

4.2. The content analysis of the Internet users' and teachers' guides

As mentioned before, the planning of a content-analysis study and the procedures of content analysis outlined by McKernan (1996) and Brog & Gall (1989) informed this study to conduct the content analysis. They outline a series of points and procedures to be utilised in the planning of a content-analysis study.

The procedures that are outlined by McKernan (1996) for conducting content analysis can be summarised as:

1- Define the universe of the content of the text, message, communication, etc.
2- Write careful definitions of key categories being coded, and decide on the level of analysis: words, themes, characters, items, space-time measures, etc.
3- Analyse the data and code categories.
4- Quantify and do counts i.e. conduct word counts and frequencies of data.

Additionally, Brog & Gall (1989) describe the planning of a content-analysis study in the following procedures:

1- Specifying objectives is the first step in planning a content analysis study, this aims to establish specific objectives to be achieved. Content analysis usually aims at achieving one of the following kinds of objectives:
1.1- Produce descriptive information.
1.2- Cross-validate research findings. Content analysis is a useful tool to check research findings obtained from studies using other methods, such as the interview.
1.3- Test hypotheses. Content analysis can be used to explore relationships and to test theories.
2- Locating relevant data is the next step in the content analysis, which aims to locate data that are relevant to these objectives.
3- Gathering contextual evidence aims to establish an empirical link between the data selected and the inferences to be made from these data. In other words, it creates a rationale that the content-analysis data are really related to your objective.

4- Developing a data-sampling plan is the next step in planning a content-analysis study in order to develop a plan to obtain a representative sample of the universe of possible data that has been identified.

5- Developing coding procedures: once the content has been selected using appropriate sampling techniques, a coding or classification system needs to be developed for analysing the content. If one cannot locate a content-analysis classification system that fits his/her research, he/she will have to develop his/her own because it is necessary to define content categories that measure the variable indicated by the research objectives.

6- Planning analysis procedures, which is the final step in planning a content analysis, aim to select the specific analytical procedures to be used. As in most other research, statistical procedures are needed to summarise the data and aid in the interpretation.

These preceding procedures outlined by McKernan (1996) and Brog & Gall (1989) influenced the development of the main procedures for conducting the content analysis. Therefore, a list of procedures was developed in order to be appropriate to the nature of the Internet curriculum.

4.2.1. The main procedures for conducting the content analysis in this research

The procedures used for conducting the content analysis in this research project can be summarised as follows:

- Specifying the purpose of using content analysis in this study.
- Writing a checklist for conducting the content analysis to be used in analysing the content of the Internet users' guides and teachers' guides.
- Determining the sample of the users' guides and the teachers' guides for using the Internet to be involved in the content analysis.
- Selecting randomly the users' guides and the teachers' guides for using the Internet from the library and Internet resources.
- Determining the target audience for each user guide.

- Specifying the general and/or the educational objectives of these guides in order to inform the development of the new Internet curriculum.
- Clarifying the different topics mentioned in these guides.
- Determining the different skills for using the Internet.
- Specifying the software and the hardware used in these guides, to determine the software and the hardware that enable the new Internet curriculum to be implemented.
- Categorising the Internet resources in these guides, in order to create a list of resources to be used in the new Internet curriculum.
- Evaluating the overall content and format of these guides.
- Developing a list of objectives for the new Internet curriculum by using the main objectives, skills and topics resulting from the content analysis. This list has been also developed with reference to the objectives of the current teacher-training programme on the Internet in Egypt, in order to consider the current needs.

4.2.2. The Analysis of Internet users' guides, teachers' guides and teacher training materials in Egypt

In this study, ten Internet users' guides and teachers' guides seemed to be an appropriate and practical number to be analysed (see Appendix A). In addition, the teacher training materials for the Internet in Egypt have been analysed (see Appendices B). These guides have been selected randomly: eight guides from the library resources and two guides from the Internet. This is to ensure that a wide range of objectives will be obtained.

The following is a list of the Internet users' guides and teachers' guides that have been analysed:

1- *Beginners' Central*, created by Northern Webs, a Web design studio in Idaho, 1999, Available from URL: http://www.northernwebs.com/bc/, Visited in November 1999.
2- Cassutto, G.: 1999, *Internet Pocket Guide for Teachers*, New York, Genium Publication Corporation, Available from URL:

http://www.genium.com/catalog/products/ipg/ipgonline.html, Visited in December 1999.

3- Kalbag, A.: 1997, *World Wide Web for Beginners*, England, Usborne.

4- McLain, T. et al.: 1998, *Net Seminar: the comprehensive guide to teaching Internet basics*, California, Classroom Connect.

5- Pitter, K. et al.: 1995, *Every Student's Guide to the Internet*, New York, McGraw-Hill.

6- Steele, H.: 1996, How to Use the Internet, California, Macmillan Computer Publishing, ed. 3.

7- Wiggins, R.: 1995, *The Internet for Everyone: A Guide for Users and Providers*, New York, McGraw-Hill.

8- Williams, B.: 1995, *The Internet for Teachers*, Chicago, IDG.

9- Wingate, P.: 1997, *The Internet for Beginners*, England, Usborne.

10- Winship, I. and McNab, A.: 1998, *The Student's Guide to the Internet 1998/99*, London, Library Association Publishing, ed. 2.

Out of the ten guides there were three guides especially written for teachers. There were also only two guides that had been written for students. One of them was written for college and high school students and the other one was written for university students. The remaining five guides have been written for different general users (See Table 9).

Table 9. The different target audience of the Internet guides.

Type of Target Audience	Teachers	Students	General Users	Total No. of Guides
No. of Guides	3	2	5	10

The teacher training materials that are used for training teachers on the use of the Internet in Menofia Technological Development Centre in Egypt have been analysed in order to determine the current needs and problems associated with these materials. The following are the materials that are currently in use for training teachers on the use of the Internet:

1- Ministry of Education – Technological Development Centre: 1998, *Connecting to the Internet step by step*, Ministry of Education, Cairo.

2- Farag, Y. & Naser El-Deen, A.: 1997, *Guide for using the Internet*, unpublished training materials, Menofia, Technological Development Centre.

The analysis and the evaluation of the documents used in training teachers on the use of the Internet in Egypt has shown that the current training needs and objectives have focused on the technical aspects rather than the general aspects e.g. the focus on configuring the modem and the browser preferences rather than using search strategies and curriculum integration with the Internet. This could be as a result of the fact that the project for developing the use of the Internet in Egyptian schools is relatively new and there is a lack of technical support, so schools face many technical problems in using the Internet. Consequently, the main focus of the training programme is on delivering the technical aspects and skills to start using the Internet in schools. As aimed, developing the new Internet curriculum is to influence the main focus of training programmes by becoming more specific. In addition this research may influence the strategy of the Ministry of Education with regard to the establishment of technical support teams within each school or group of schools.

4.2.3. Software and hardware

It can be seen from table (10) that the software and the hardware used in the users' guides varied from one guide to another. In addition, some guides used more than one platform for using the Internet in order to cope with the different kinds of users, which lead to inconsistency in these guides. Consequently, this inconsistency highlights a number of points: first of all, there are no standards for using software and hardware that enables users from using the Internet. Secondly, most of the software and the hardware, mentioned in these guides, reflect the authors' own experience in using the Internet. Finally, software and hardware are changing rapidly in line with the changes in the Internet.

Table 10. The different platforms, connection programs, browsers and the other programs used in the Internet users' guides.

No	Platform	Connection software	Browser	Other programmes
1	IBM	Pipex Dial	Netscape Navigator 2.01	----
2	Unix	Direct Connection	Text-based Browser "Lynx" for Unix	Telnet, Unix Mail, FTP, WAIS, reader news "RN" and Gopher Client programme
3	IBM and/or Macintosh	TCP/IP	Netscape Navigator and/or Internet Explorer	----
4	Unix	Direct Connection	NCSA Mosaic	"Pine" software for email, "Listserv" for mailing lists, PC/TCP for FTP, "Unix Talk" for IRC, Gopher Client, WAIS
5	IBM	----	Netscape Navigator and/or Internet Explorer	----
6	IBM	Dial-Up Networking	Netscape Navigator 3.0	"Cool Talk" software for using phone on the Internet and Win-Zip for decompressing files
7	Macintosh	Mac TCP & Mac PPP	Netscape Navigator	"Eudora" for email, "Stuffit Expander" for decompressing files, NCSA Telnet, "FETCH" for using FTP, IRC and Turbo Gopher 2.0
8	IBM and/or Macintosh	Mac CP/IP, Dial-Up Networking	Netscape Navigator and/or Internet Explorer	----
9	IBM	----	Netscape Navigator and/or Internet Explorer	The features in Netscape Navigator and/or Internet Explorer for using email, Newsgroups and Telnet
10	IBM	----	Netscape Navigator and/or Internet Explorer	IRC for chatting, Real time player and "Cyber Patrol" for blocking inappropriate sites

4.2.3.1. The platform

According to table (10), the majority of users' guides (7 out of 10) explain the use of the Internet using an 'IBM' platform, while some of them (3 out of 10) used a 'Macintosh' platform (2 of these guides were using both 'IBM' and 'Macintosh' platform). The minority of users' guides (2 out of 10) used a 'UNIX' platform. Therefore, the 'IBM' platform is considered to be the main platform for using the Internet. Moreover, the results of the content analysis of the current teacher training programme on the Internet in Egypt indicates that the 'IBM' platform is the main platform for using the Internet in schools in Egypt. As a result, the 'IBM' platform will be used in order to deliver the new Internet curriculum.

4.2.3.2. Connection program

A large number of users' guides (3 out of 10) did not use a connection program at all. This could be as a result of the assumption that the user is already online. Two guides used direct access to the Internet and it was used with the 'UNIX' platform. 'Mac TCP/IP' connection software was used in three guides that used the 'Macintosh' platform. 'Dial-Up Networking', 'Trumpet Winsock' and 'Pipex Dial' were used with four 'IBM' platforms (two of them used 'Dial-Up Networking'), where they varied according to the operating system. It should be noticed that some of these software applications such as 'Trumpet Winsock' and 'Pipex Dial' are no longer in use. This indicates the rapid changes in the Internet and its related software. The latest versions of the operating systems for 'IBM' platforms have used 'Dial-Up Networking' for connecting to the Internet.

Additionally, 'Dial-Up Networking' is also used in the current teacher-training programme on the Internet in Egypt. Therefore, within this curriculum, 'Dial-Up Networking' software will be used in order to connect to the Internet.

4.2.3.3 The browser

There are four different browsers that were used in the Internet users' guides and teachers' guides, 'Lynx' (a text-based browser for 'Unix'), 'NCSA Mosaic' (each one of which was used in one guide only), 'Netscape Navigator', and 'Internet explorer'. As expected, there are two main browsers that are used in the users' guides and teachers' guides, which are 'Netscape Navigator' and 'Internet Explorer'. Although both have been used alternatively for browsing the Internet, 'Netscape Navigator' was used in eight guides alternatively with 'Internet Explorer' (in five guides) and individually (in three guides). On the other hand, 'Internet Explorer' was used only in five guides alternatively with 'Netscape Navigator' and it was not used individually.

This result refers to the popularity of 'Netscape Navigator' as a browser rather than 'Internet Explorer'. 'Netscape Navigator' was also used in the teacher training materials in Egypt. Hence, 'Netscape Navigator' will be used in this study for browsing the Internet.

4.2.3.4. Other utility programmes

There are several programmes which have been used in the Internet users' guide and teachers' guides to provide the users with some of the Internet utilities such as transferring files and chatting. None of these utilities or programmes has been used in the teacher training materials in Egypt, which means that the main focus of this training is on the skills and knowledge only for connecting and browsing the Internet.

The following are utility programmes that have been used in the Internet users' guide and teachers' guides:

- Electronic mail (email): there were many programmes that were used in the past for sending and receiving emails and were mentioned in the Internet guides such as 'Unix' mail, 'Eudora' for email, and 'Pine' software for email. After that features were developed in the Internet browsers for sending and receiving email which are the same as those in use in Egypt. In this study, a Web-based free email will be used in order to establish a unique email account for each learner, because of the lack of facilities in Egypt for allocating a unique email account for each teacher.
- Mailing lists and newsgroups: 'Listserv' were used for mailing lists, and the reader news 'RN' software was used for newsgroups. The features in the Internet browsers were also used for both utilities. Therefore, the mailing Lists and newsgroups utilities in 'Netscape Navigator' will be used within this study.
- File Transfer Protocol (FTP): there are lots of programmes that were used within the Internet guides for transferring files such as 'FTP', 'Fetch' software for 'FTP' and 'PC/TCP' software for 'FTP'. In addition, there are programmes that were used in order to decompress downloaded files e.g. 'Stuffit Expander' and 'Win-Zip'. In this study, the 'Ws_FTP' software will be used for transferring files from the Internet because of its ease of use and its compatibility with the 'IBM' platform. 'Win-Zip' software will be used for decompressing the downloaded files from the Internet because it is also compatible with 'IBM' platforms. On the other hand, the other software 'Stuffit Expander' has been used with 'Macintosh' platform.
- Internet Rely Chat (IRC): The software applications that were used in the Internet guides to enable the users to use 'IRC' were 'Unix talk', 'Cool Talk' for using phone utility and 'IRC' software with 'IBM' platform. Therefore, the 'IRC' software will be used for chatting on the Internet.
- 'Gopher', 'Telnet' and 'WAIS' are some of the Internet utilities and are used for many purposes e.g. 'Gopher' for searching the Internet, 'Telnet' for connecting to

another computer on the Internet and 'WAIS' for indexing. Although most of these utilities are relatively old and hardly used by general users, they were mentioned in some of the Internet guides. The software applications that were mentioned were ('Gopher Client' & 'Turbo Gopher') for using 'Gopher', ('NCSA Telnet' & 'Telnet') for using 'Telnet' and ('WAIS') for using 'WAIS'.

- Other programmes: finally, some other programmes were referred to in the Internet guides e.g. 'Cyber Patrol' for locking inappropriate sites and 'Real time' for multimedia reviews on the Internet.

The analysis of the teacher training materials in Egypt has shown that there is no emphasis on the different utilities on the Internet such as mailing lists, news groups, Internet rely chat and file transfer protocol. Therefore, an emphasis on delivering Internet utilities seems to be important within the new Internet curriculum.

4.3. Developing the main objectives for the Internet curriculum

4.3.1. Introduction

A Web-based questionnaire (see appendix c) was designed to help inform the development of the main objectives of the new Internet curriculum, and also to validate the objectives that have resulted from the content analysis. This questionnaire is also considered to be a validation process for the content analysis results, in terms of justifying the resulting objectives.
Designing and building the questionnaire on the Web made it easy to access and quick to respond to, in addition to its ability to reach different groups of specialists around the world such as Egypt, the country where the implementation of the research will take place. The questionnaire was administrated to a group of leading specialists and practitioners in the field. Moreover, the results enabled the researcher to select the objectives for the new Internet curriculum, according to the degree of agreement on each objective in the questionnaire.

The final format of the questionnaire was divided into two main parts:

1- The *general objectives:* these are concerned with the essential knowledge and skills for using the Internet such as connecting to the Internet, browsing the World Wide Web, sending and receiving emails etc. These objectives are designed for any new user of the Internet.

2- The e*ducational objectives:* these are concerned with the knowledge and skills that are related to different educational uses and projects that are based on the Internet. Therefore, these objectives are designed for teachers to be able to integrate the use of the Internet into their work.

4.3.2. The questionnaire reliability

The reliability of the overall questionnaire was highlighted earlier in the methodology chapter. However it was seen to be important in this chapter to highlight the different reliability of the different two parts of the questionnaire in order to make sure that the data obtained from both parts of the questionnaire are reliable.

4.3.2.1. Section one reliability

Section one of the questionnaire, which is concerned with the general objectives, has been analysed to recognise its reliability. It can be seen from table (11) that section one of the questionnaire contains 20 cases and 42 items. The reliability score (Alpha) is 0.8914 which is approximately the same as the reliability score for the overall questionnaire. It can be noted that there is a slight difference (0.0019) between the reliability scores for section one and the overall questionnaire.

Table 11. Reliability coefficients for section one of the questionnaire.

N of Cases	N of Items	Alpha
20	42	0.8914

4.3.2.2. Section two reliability

Section two of the questionnaire, which is concerned with the educational objectives, has also been analysed to recognise its reliability. Table (12) shows that section two of the questionnaire contains 20 cases and 17 items. It also shows that the reliability of this section is 0.7261, which is relatively high. However, there is a big difference in reliability score (about 0.1653) between section one and section two. This could be as a result of the nature of each section i.e. the general objectives in section one are based on the current general knowledge of the Internet, on the other hand the objectives in section two are recently developed therefore some items may seem to be ambiguous.

Table 12. Reliability coefficients for section two of the questionnaire.

N of Cases	N of Items	Alpha
20	17	0.7261

4.3.3. Alpha if item deleted

When individual items are examined, it can be seen how each of the items affects the reliability of the scale. This can be accomplished by calculating Cronbach's Alpha when each of the items is removed from the scale. It has been calculated to recognise the extent to which the items may affect the overall reliability of the scale (Norusis, 1994). The reliability (Alpha) value will have slight changes if one of these items has been deleted. Accordingly, the value of reliability varied from item to another e.g. the highest value of Alpha would be 0.8937 if objective 6.4 was deleted and smallest value of Alpha would be 0.8827 if objective 11.1 was deleted.

The educational objectives' reliability is more varied than the general objectives. This could be as a result of the small number of educational objectives. The reliability analysis of the educational objectives shows that the highest value of Alpha is 0.7575 if objective 2.3 is deleted, which means that this objective decreases the reliability of the educational objectives. On the other hand, the smallest value is 0.6870 if objective 5.1 is deleted.

4.3.4. Corrected item total correlation

The corrected item-total correlation is the Pearson correlation coefficient between the score on the individual item and the sum of the scores on the remaining items (Norusis, 1994)). Pearson's correlation coefficient actually measures how linear the relationship is and it ranges from 0 to 1 in value. It also carries a sign-positive (for a positive relationship) or negative (for inverse relationship) (Sirkins, 1999).

The analysis of data showed that the corrected item total correlation for every item is positive. Although it is relatively small in many items, it shows a positive relationship between each individual score and the sum of the scores for the remaining items.

The biggest corrected item total correlation is 0.8875 for objective 1.4, and the smallest one is 0.0065 for objective 6.4 which expectedly has the biggest Alpha if item deleted.

The biggest corrected item total correlation is 0.6949 for objective 3.1, and the smallest one is -0.0307 for objective 2.3 which also has the biggest alpha if item deleted. Moreover, objective 2.3 is the only educational objective that has a negative value of the corrected item total correlation. However, the rest of the educational objectives have a relatively large positive value.

4.3.5. Multiple Responses

The multiple responses for the overall questionnaire, which can be seen in table (13), shows that there was about 81% of agreement and about 19% of disagreement of the total percentage of responses for the questionnaire.

Table 13. Multiple responses for the questionnaire.

Category label	Code	Count	Pct of Responses	Pct of Cases
Strongly Disagree	1	17	1.4	85.0
Disagree	2	64	5.4	320.0
Not Sure	3	143	12.1	715.0
Agree	4	496	42.0	2480.0
Strongly Agree	5	460	39.0	2300.0
Total responses		1180	100.0	5900.0

Table (14) shows the percentage of the total responses of agreement for the general objectives which were about 77% -which is relatively low compared with the percentage for the whole questionnaire- and about 23% of responses were disagreed.

Table 14. Multiple responses for the general objectives.

Category label	Code	Count	Pct of Responses	Pct of Cases
Strongly Disagree	1	15	1.8	75.0
Disagree	2	57	6.8	285.0
Not Sure	3	121	14.4	605.0
Agree	4	339	40.4	1695.0
Strongly Agree	5	308	36.7	1540.0
Total responses		840	100.0	4200.0

On the other hand, the educational objectives have a high percentage of agreement, about 90.9%, and a low percentage of disagreement presented in about 9.1% of the total percentage of responses (see table 15).

Table 15. Multiple responses for the educational objectives.

Category label	Code	Count	Pct of Responses	Pct of Cases
Strongly Disagree	1	2	0.6	10.0
Disagree	2	7	2.1	35.0
Not Sure	3	22	6.5	110.0
Agree	4	157	46.2	785.0
Strongly Agree	5	152	44.7	760.0
Total responses		340	100.0	1700.0

4.3.6. Descriptive statistics

These descriptive statistics were conducted to describe the nature of these data i.e. to identify its central tendency and its variation. Additionally, to make a justification for selecting the most relevant and appropriate objectives for the new Internet curriculum.

In order to conduct the descriptive statistics, the following tests have been carried out:

- The **mode** has been used to identify the degree of agreement and disagreement for the objectives i.e. the greater the mode, the greater the agreement. In this study, the mode value is expected to be at least four to indicate a high degree of agreement. Therefore, if the mode is three or less that means that the objective is more likely to have been disagreed with.
- The **mean** has also been used in this study to indicate the proximity to either the agreement or the disagreement. Since the agreement codes were specified as 4 for agree and 5 for strongly agree, the means were expected to be more than 3.5 to give an indication of a high agreement to these objectives. Therefore, if the mean is 3.5 or less this means that the objective is more likely to have been disagreed with.
- The **standard deviation** is the square root of the variance and it is used to evaluate how far the data values vary around the population mean. The respondents to this questionnaire were expected to show an agreement or disagreement for these objectives. As a result, the responses were not expected to be distributed in a normal distribution, rather they were expected to be distributed in a skewed distribution. Therefore, there was no consistency with regard the standard deviation across the objectives.
- The **variance** is the most commonly used measure of variability. It is based on the squared distance between the values of individual cases and the mean. Therefore, the larger the variance, the more the values are spread out (Norusis, 1998). The variance, defined as the average (mean) of the sum of squares, is a concept of immense importance. It, along with the standard deviation, will enter into almost every statistical procedure that will be used. The reason for this importance lies in the simple fact that the variance is a statistic that provides an overall description of the extent to which scores differ. The variance provides a clearly defined measure of variability (Lockhart, 1998).

4.3.6.1. The frequencies of the objectives

4.3.6.1.1. General objectives

The frequencies of the general objectives have a wide range of variation in frequencies (see appendix d). These frequencies have been affected by the nature of each objective i.e. the more technical the objective, the less the agreement and the more the disagreement it has e.g. the awareness of the use of some index tools has the biggest percentage of disagreement (see figure 18). It has 70% of the total disagreement (3 strongly disagree, 4 disagree and 7 not sure) and it has only 30% of the total agreement (5 agree and 1 strongly agree). This could also be as a result of the fact that these tools are not as commonly used as in the past.

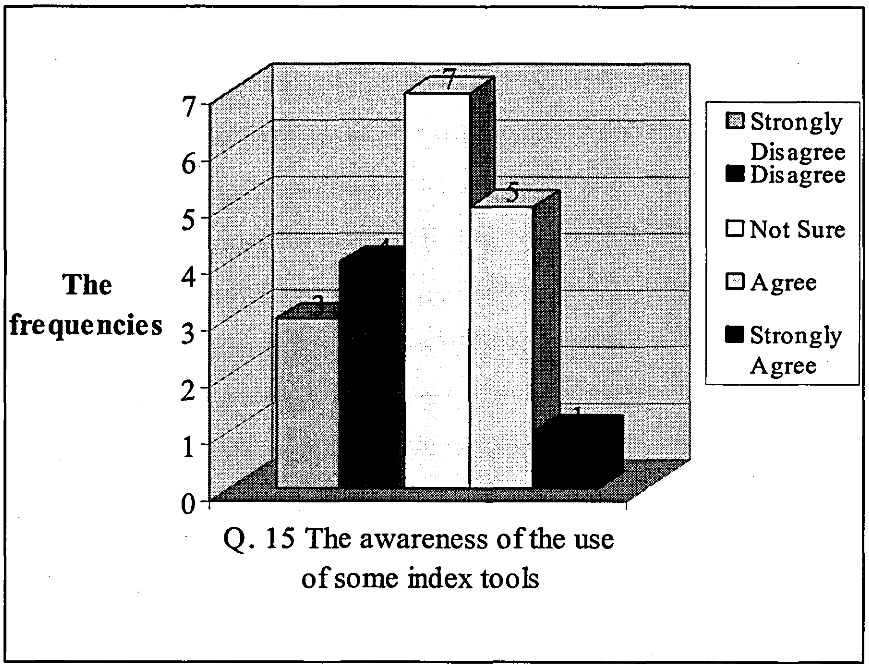

Figure 18. The responses on the awareness of the use of some index tools.

On the other hand, the common tools and facilities have a strong agreement among the other objectives e.g. electronic mail (email) has the biggest agreement among the other objectives. As can be seen in figure (19), it has 100% of the total agreement (4 agree and 16 strongly agree).

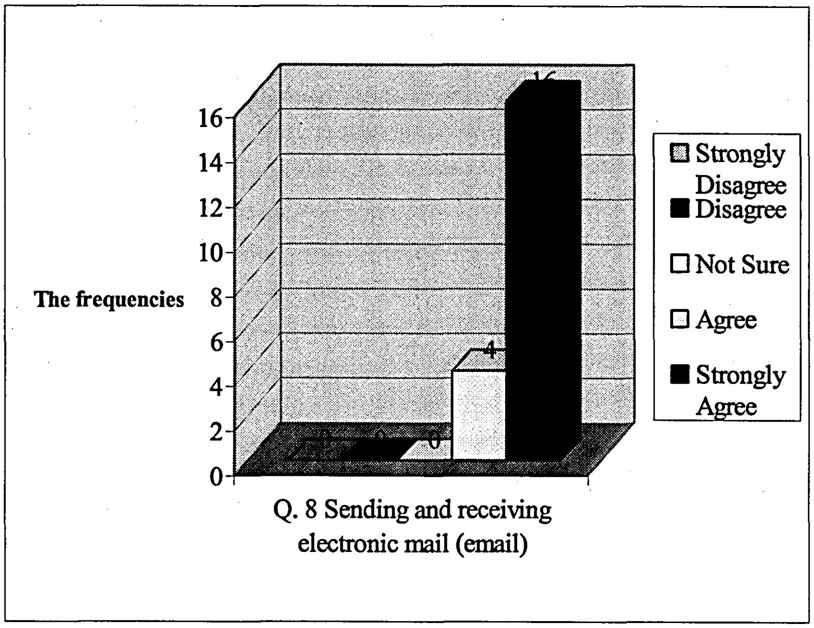

Figure 19. The responses on sending and receiving electronic mail.

4.3.6.1.2. Educational objectives

The frequencies of the educational objectives have an almost similar range of variation in frequencies rather than the general objectives (see appendix d). The biggest total percentage of disagreement for the educational objectives, as shown in figure (20), was 25% for the objective 5.2 (1 disagree and 4 not sure) and the total percentage of agreement was 75%.

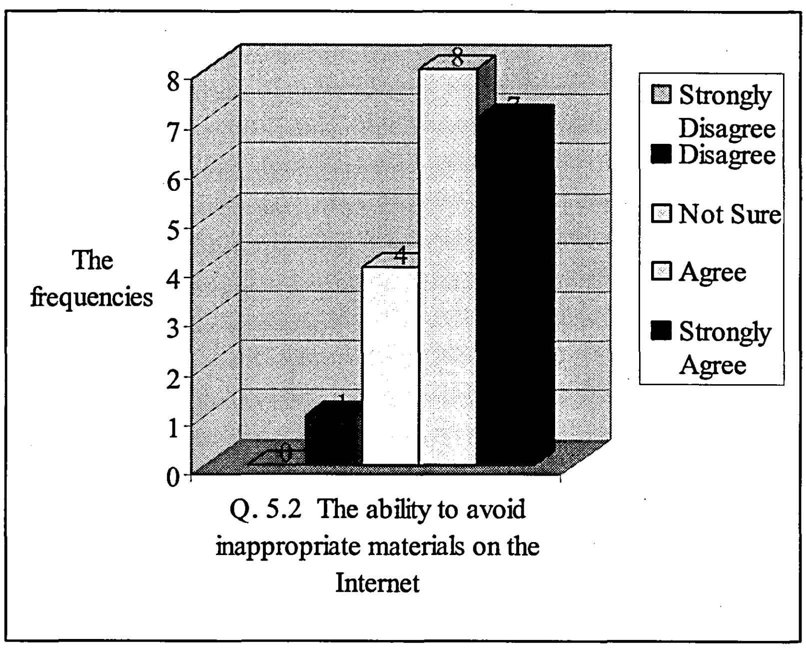

Figure 20. The responses on the ability to avoid inappropriate materials on the Internet.

On the other hand, the awareness of the impact of using the Internet on education has the biggest agreement among the other educational objectives. It can be seen from figure (21) that this objective has 100% of the total percentage of agreement (8 agree and 12 strongly agree). It indicates the importance of the awareness of using the Internet in education for teachers.

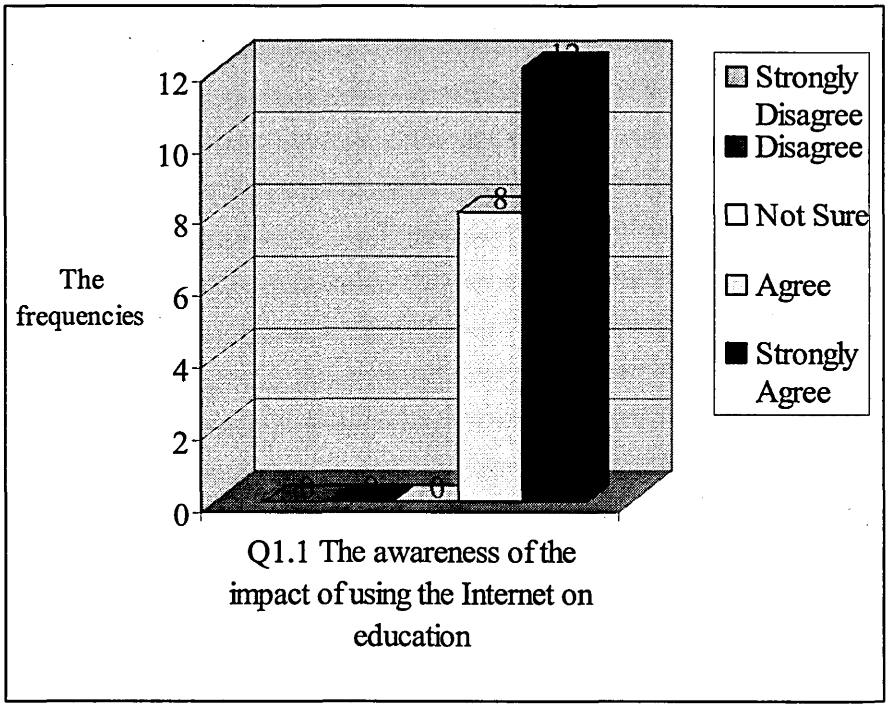

Figure 21. The responses on the awareness of the impact of using the Internet on education.

4.3.7. The main findings of the Internet curriculum questionnaire

The main results concerning the general objectives show that the focus should be on the general aspects of the Internet rather than the technical aspects, e.g. the teachers should be able to use a browser to search for information rather than the ability to install an Internet browser. It was also suggested that a technical support team could take the responsibility for any technical problems concerning the use of the Internet.

There was strong agreement on the educational objectives such as the awareness of the impact of using the Internet on education and conducting projects based on the Internet etc. It was suggested that the teachers should have the ability to assess and support students' work electronically using the Internet.

The analysis and the evaluation of the documents used in training teachers on the use of the Internet in Egypt has shown that the current training needs and objectives have focused on the technical aspects rather than the general aspects e.g. the focus on configuring the modem and the browser preferences rather than using search strategies and curriculum integration with the Internet. This could be as a result of fact that the project of using the Internet in Egyptian schools relatively new and that is a lack of technical support, so schools face many technical problems in using the Internet. Consequently, the main focus of the training programme is on delivering the technical aspects and skills to start using the Internet within schools. Therefore, developing the new Internet curriculum should affect and change the main focus of training programmes to become more specific. In addition, this research may influence the strategy of the Ministry of Education with regard to the establishment of technical support teams within each school or group of schools.

4.3.8. Selecting the objectives

The main basis for selecting the objectives for the new Internet curriculum is the degree of agreement and disagreement for each objective. Therefore, the percentage of agreement has been specified to be greater than 60% of the total percentage of agreement, in order to ensure a confidence in a high degree of agreement. Additionally, some conditions have been specified for selecting the objectives such as the mean should be at least 3.5 and the mode should be at least 4. However, these conditions have been set up as indicators for the agreement and disagreement for the objectives.

4.3.8.1. Selecting the general objectives

It can be seen from table (16) that the general objectives that have been rejected according to the mentioned conditions e.g. the percentages of agreement for these objectives are 60% or less, moreover most of these objectives have a mode less than 4 and a mean less than 3.5. In addition the values of the standard deviations and the variances are relatively high which indicate inconsistency in the responses. Furthermore, these objectives include either an old aspect for the Internet or a technical aspect that can be covered by using a technical support team.

Table 16. Statistics for the rejected general objectives.

Question No.	Mode	*Mean*	Std. Deviation	Variance	Percentage of Disagreement	Percentage of Agreement
Q4.1	3	3.8	1.01	1.011	40%	60%
Q10.1	3	3	1.17	1.368	65%	35%
Q10.2	3	2.95	1.15	1.313	70%	30%
Q13.1	4	3.45	1.19	1.418	40%	60%
Q13.2	4	3.3	1.17	1.379	45%	55%
Q14.2	4	3.55	0.83	0.682	45%	55%
Q15	3	2.85	1.14	1.292	70%	30%

The following are list of the general objectives that have been rejected:

4.1- To be able to install an Internet browser.

10.1- To recognise the use of Gopher on the Internet.

10.2- To be able to search Gopher sites for information.

13.1- To be aware of the use of Telnet.

13.2- To log on to another computer on the Internet using Telnet.

14.2- To use Internet Relay Chat (IRC) to communicate with other people on the Internet.

15- To be aware of the use of some index tools such as Veronica and WAIS.

This means that out of the 42 general objectives, 7 objectives were deleted and 35 general objectives will be included in the new Internet curriculum which will be mentioned later in this chapter.

4.3.8.2. Selecting the educational objectives

The only educational objective that is more likely to be rejected is objective no. 5.2 (to be able to avoid inappropriate materials on the Internet), according to some comments and suggestions made by the respondents. For example, one of the respondents commented on this objective saying:

> *"It is better to deal with inappropriate materials by establishing guidelines with students, also teachers shouldn't judge too quickly what is inappropriate rather each learner should face this question personally and take responsible decisions."*

Although the statistics for this objective (as shown in table 17) do not apply for the above conditions, it was found that this objective has the highest degree of disagreement among the other educational objectives (see appendix d).

Table 17. Statistics for the rejected educational objectives.

Question No.	**Mode**	***Mean***	**Std. Deviation**	**Variance**	**Percentage of Disagreement**	**Percentage of Agreement**
Q5.2	4	4.05	0.89	0.787	25%	75%

This means that out of the 17 educational objectives, only one objective was deleted and 16 educational objectives will be included in the new Internet curriculum.

4.4. The Units of the Internet curriculum

Some respondents of the questionnaire suggested that this curriculum should be divided into different units, in order to give the learners the opportunity to study at their own pace. It seemed very important to divide this curriculum into different units because of the massive amount of information about the Internet and the anticipated amount of time needed to deliver each part.

It was also found that it would be better to merge and integrate the educational objectives with the general objectives in each unit, in order to motivate teachers to learn more about the Internet so as to enhance their practice. It was also found that it would be better to rearrange the general and the educational objectives in order to make better sense of them.

In order to deliver this curriculum easily it has been divided into five main units. Some of these units were suggested by the respondents. The following are the units for the new Internet curriculum:

4.4.1. Unit one: Introduction to the Internet

The objectives for this unit consider the essential knowledge and skills that are required for using computers and the Internet. This knowledge and these skills that new users to the Internet need, such as using the computer and getting connected to the Internet, did not receive an appropriate attention in the Internet users' guides and teachers' guides. However, it has a strong level of agreement (ranging from 80% to 90%) in relation to the other objectives.

Therefore, this knowledge and these skills have been taken into account because of the fundamental role for any new user especially if he/she is using the computer for the first time. Additionally, these skills have been emphasised within the training programmes in Egypt due to the lack of experience in using computers among teachers, which was also found by Al-Mohaissin (1997). Consequently, these skills have been included within the new Internet curriculum.

Moreover, the impact of the Internet on education will be delivered. This is as a result of the necessity for discussing the Internet and education in order to bring the

Internet's impact on learners. Nothing excites teachers more about discovering the Internet than examples of educational activities which they can do on the Internet (McLain et al., 1998).

4.4.1.1. General objectives

1.1- To be able to turn on the computer.
1.2- To be able to shut down the computer.
1.3- To be able to use the mouse.
1.4- To be able to run a program using Windows.
1.5- To have some knowledge about the Internet and its history.
1.6- To have a sense of excitement about the Internet.
1.7- To know the difference between the Internet and the World Wide Web.
1.8- To know some criteria for choosing an Internet service provider.
1.9- To know the hardware and the software needed for connection to the Internet.
1.10- To create a new connection to the Internet using Dial-Up Networking software.
1.11- To connect to the Internet using Dial-Up Networking software.
1.12- To be able to connect to the Internet using direct access.

4.4.1.2. Educational objectives

1.13- To be aware of the impact of using the Internet in education.
1.14- To recognise some Internet applications in schools.
1.15- To be able to enhance teaching using the Internet.

4.4.2. Unit two: Searching the Internet for information

No one can deny the tremendous amount of information resources that are available on the Internet. This has led to a major problem mentioned by Maddux (1994) which is the lack of coherent structure, stability and documentation for Internet resources. New users usually face this problem when trying to select and locate useful and appropriate information. As a result of such problems, the decision was taken to allocate a specific unit to provide new Internet users with the skills and knowledge that are required to search the Internet efficiently e.g. finding different resources using search engines.

In many schools, teachers found that using the Web is a valuable source of ideas and information that learners can use along with other materials in the school or at home. The advantages of using the Internet to support the school curriculum are that it can provide learners with access to resources that would not otherwise be available to them. The Internet also allows students to study in a different medium, encourages them to evaluate the opinions of the authors of the web sites used and provides teachers with a range of resources and ideas that can help to enrich their own teaching (Herring, 1999).

This unit will include the following objectives:

4.4.2.1. General objectives

2.1- To be able to set up browser preferences.
2.2- To use a browser to search for information on the Internet.
2.3- To search the World Wide Web efficiently for information.
2.4- To find resources on the Internet using different search strategies e.g. using search engines.
2.5- To consider security and privacy issues on the Internet.
2.6- To be aware of the main facilities offered by the Internet e.g. online banking, online shopping etc.
2.7- To recognise the basic concepts behind each tool so users can adapt to any platform and any tool that will be available in the future.
2.8- To be aware of some Internet aspects e.g. digital libraries, electronic publishing, virtual reality etc.
2.9- To use the Internet itself to learn more about the Internet.

4.4.2.2. Educational objectives

2.10- To be able to use the Internet in the classroom e.g. exploring resources, online discussion…etc.

2.11- To be able to encourage students to find information on the Internet.

2.12- To be familiar with some useful educational resources for students and teachers e.g. educational Newsgroups, educational FTP sites, educational Web sites etc.

4.4.3. Unit three: Internet communication utilities

This unit has been designed to deliver some of the communication knowledge and skills that are based on the Internet. One of the most important and common methods for communication on the Internet is electronic mail (email). It has also been found in some studies that electronic mail is one of the major purposes for using the Internet e.g. Mohaiadin (1997) found that electronic mail is one of the most developed Internet skills among Malaysian students of all other Internet skills. This indicates that electronic mail is very popular with Internet users. Besides electronic mail, the use of Mailing Lists, Newsgroups and Internet Rely Chat (IRC) will be delivered within this unit as a means of communication through the Internet.

Once the learners recognise the use of email, mailing lists and newsgroups they can begin creating an Internet-based project. This project is a learning activity which requires learners to use the Internet research and communication tools to become involved in data exchange, team writing projects and vicarious word explorations (McLain et al., 1998). In order to create such a project, they need to be aware of the different types of projects and how to conduct an Internet-based project.

4.4.3.1. General objectives

3.1- To send and receive messages using electronic mail (email).

3.2- To recognise the use of electronic mailing lists.

3.3- To be able to find, join and use electronic mailing lists.

3.4- To recognise the main features of Usenet Newsgroups.

3.5- To use Usenet Newsgroups to exchange ideas and information with other people on the Internet.

3.6-To recognise the use of Internet Relay Chat (IRC).

4.4.3.2. Educational objectives

3.7- To be aware of the different types of projects that can be based on the Internet e.g. correspondence, problem solving, collaborative projects, teleconferencing, gathering and exchanging information.

3.8- To be able to conduct a project based on using the Internet.

3.9- To know how to conduct research using the Internet.

3.10- To use Internet resources in writing essays, dissertations…etc.

3.11- To write Internet references in the correct format.

4.4.4. Unit four: Transferring files from the Internet

Transferring files or file transfer protocol (FTP) is one of the most popular services provided by mass-market information utilities such as CompuServe and America Online. It is defined as the ability to download files from all sorts of files provided, and it is also defined as moving files from one computer to another (Wiggins, 1995). Therefore it is seen to be important to develop the knowledge and skills for transferring files from the Internet. Additionally, it was found from the content analysis that delivering the knowledge and skills for decompressing the downloaded files (e.g. using Win-Zip software) and for finding the software that can run downloaded files (e.g. Real Time) is very important and relevant to transferring files.

It becomes a fact that teachers and students can individualise learning according to their needs and interests by selecting from a host of online educational experiences. Teachers can also find up-to-date materials including articles, reports, surveys, databases, maps, diagrams, photographs, film clips, and sound bites, and download them to be used in the classroom at the very time they are needed. Users can also connect to world-wide events as they are happening, communicate instantaneously with people on every continent, participate in cooperative online projects, and explore content themes interactively (Hackbarth, 1997). Therefore, integrating the Internet into school curricula seems to have become an important aspect in teaching the Internet for teachers.

4.4.4.1. General objectives

4.1- To recognise the function of File Transfer Protocol (FTP).
4.2- To transfer files using File Transfer Protocol (FTP).
4.3- To download files and programs from the Internet.
4.4- To decompress files from the Internet using Win-Zip software.
4.5- To be able to use plug-in programs e.g. Real Time.

4.4.4.2. Educational objectives

4.6- To develop and use lesson plans that actually require the use of the Internet.
4.7- To be able to integrate the Internet into the curriculum e.g. doing some curriculum activities using the Internet.
4.8- To become aware of some issues related to the use of a single computer connected to the Internet in a school.

4.4.5. Unit five: Designing web pages

The objectives for this unit have been included in most of the Internet users' and teachers' guides (e.g. Kalbag, 1997). Moreover, it was agreed upon by a relatively high percentage of the responses for the questionnaire. It was also found (Tillman, 1998) that many teachers do not incorporate Internet curriculum materials because of the lack of information about them and the lack of evaluation standards for them. Therefore, it has been decided to allocate this unit for teachers to be able to publish their own work and also to encourage the students to publish their work e.g. teachers can publish course structure, assessment criteria etc and students can publish their written work, establish a project etc. Additionally, Wilkinson et. al. (1997) highlighted the need for criteria and procedures to help students and educators evaluate the quality of information that they have located through searching the Internet.

For this reason, teachers need to be able to evaluate the effectiveness of using the Internet in teaching and learning and to identify the strengths and weaknesses of using the Internet to enhance learning in order to create a homepage for teaching and learning.

4.4.5.1. General objectives

5.1- To be able to design a simple web page using HTML.

5.2- To be able to use an Internet based authoring package such as Dreamweaver.

5.3- To be able to incorporate media on a web page.

4.4.5.2. Educational objectives

5.4- To be able to evaluate the effectiveness of using the Internet in teaching and learning.

5.5- To identify strengths and weaknesses of using the Internet to enhance learning.

4.5. Summary

In order to develop the new curriculum a content analysis approach has been used to analyse the content of the documents that are related to the use of the Internet. This research project has used a content analysis of the users' guides and teachers' guides that are currently freely available on the Internet. These have been critically analysed and evaluated as a basis for the development of this curriculum. They contain details of the fundamental knowledge and skills required for using the Internet effectively. Additionally, the documents used in training teachers on the use of the Internet in Egypt have been analysed to evaluate the current training needs and objectives. The procedures of using content analysis to develop the Internet curriculum in this research project was presented within this chapter. It included specifying the objectives, locating relevant data, gathering contextual evidence, developing a data sampling plan, developing coding procedures and planning analysis procedures Brog & Gall (1989).

Moreover, a discussion of the Web-based questionnaire that informed the development of the main objectives of the new Internet curriculum was presented. Subsequently statistical analysis was conducted using several descriptive statistics such as mode, mean and standard deviation which described the nature of the data and identified its central tendency and its variation. The frequencies of the general objectives and educational objectives for the Internet curriculum were also calculated in order to select the objectives with a high level of agreement.

The main findings of the questionnaire have highlighted the need for technical support within schools for using the Internet. There was also an emphasis on the importance of delivering the educational objectives alongside the general objectives.

At the end of this chapter, there are five main units that have been developed within the Internet curriculum, these units are:

1- *Unit one: Introduction to the Internet.*
2- *Unit two: Searching the Internet for information.*
3- *Unit three: Internet communication utilities.*
4- *Unit four: Transferring files from the Internet.*
5- *Unit five: Designing web page(s).*

Chapter five: The impact of constructivist learning environment on developing an Internet curriculum

5.1. Introduction

As stated before, the pedagogical and epistemological model developed by Jonassen (1997a) for designing constructivist learning environments provides an overall framework for the development of the learning environment. This model is designed to engage learners in active, constructive, intentional, complex, authentic, co-operative and reflective learning activities.

In this study, this model for constructivist learning environment had influenced the development of the Internet curriculum, which was represented using a Web-based learning environment.

Most of studies concerning constructivist learning environment are mainly focusing on the design of the learning environment itself such as Jonassen (1997a, b, 1994 & 1999), and Mayer (1999). Related to this focus is the issue of evaluating the constructivist learning environments (Jonassen, 1993) and the problems that face its design (Jonassen, 1991).

It was found that there is a lack of studies concerning the development of curriculums that are appropriate for constructivist learning environments. This could be as a result of the assumption that the content can not be prespecified for the constructivist learning environments (Tobin et al., 1990), (Jonassen, 1997a), and (Honebein et al., 1993). However, a few studies considered the development of the curriculum and content for these environments e.g. (Hannafin et al., 1999) and (Jonassen, 1997c).

Therefore the issue of specifying the content and the objectives will be addressed in this part. Also an emphasis will be made on the structure of the content in constructivist learning environment and its impact on the structure of the Internet curriculum.

5.2. The content structure

The content is treated within traditional instruction as isolated facts and discrete skills to be "learned" rather than as knowledge, skills, and attitudes to be "used", which is a common error in both education and training contexts (Reeves, 1992). On the other hand, he considered the knowledge construction process as helping learners to understand the event or resolve the problem.

The context and authentic activities are seen by (Honebein et al., 1993) to be two key design strategies which guide the creation of constructivist learning environments. The focus of these strategies is on creating environments that are meaningful to learners, enabling them to successfully transfer the skills learned to tasks in the real world. They added also that constructivist learning focuses on skills and strategies, rather than facts and rote memorization. The more important skill to have learned would be how to find out the information. Moreover, establishing context creates learning environments that approach or simulate the complexity of the real world, thus preparing students to deal with the real world.

The focus of any constructivist learning environment, as modeled by (Jonassen, 1997a) is the question or issue, the case, the problem, or the project that learners attempt to solve or resolve. Problems in constructivist learning environments need to include three integrated components: the problem context, the problem representation, and the problem manipulation space.

- Problem context is an essential part of the problem representation. The same problem in different social or work contexts is different. All of the contextual factors that surround a problem should be described, such as include the physical, sociocultural, and organizational climate.
- Representation of the problem should be interesting, appealing, and engaging.
- Problem manipulation space provides the objects, the signs and tools required for the learner to manipulate the environment. In order for learners to engage in meaningful learning, they should manipulate something, construct a product, manipulate parameters, make decisions and affect the environment in some way.

The model for learning environment which is presented by (Hannafin et al., 1999) consists of four basic components: enabling contexts, resources, tools, and scaffolds. They described enabling contexts as the vehicles through which individuals are oriented to a need or problem and interpretive perspectives are situated. Enabling contexts guide students in recognizing or generating problems to be addressed and framing learning needs.

In this part of the study, the focus will be on the problem context, i.e. the content that should be represented in the learning environment.

5.3. Identification of the content

The content or the problem for the constructivist learning environment can be identified by examining the field of study, not for its topics (as in a textbook) but for what practitioners do. It is needed only to ask experienced practitioners to describe cases, situations or problems that they have solved (Jonassen, 1999). For this reason, the identification of the content and objectives of the Internet curriculum in this study depended on the analysis of the Internet teachers' guides and users' guides, which seemed to some extent reflect the experiences of the practitioners in this field. Moreover, the teachers' training materials on the Internet in Egypt have been analysed in order to identify the current practices in teaching the use of the Internet. Furthermore, there is no formal Internet curriculum to rely on when identifying the content and objectives of the Internet curriculum.

The need for evaluating all suggested problems for their suitability has been also highlighted by Jonassen (ibid.). It is also important to know if the students have prerequisite knowledge or capabilities for working on this problem. Therefore, the designer should not assume that they will produce solutions as elegant or efficient as experienced practitioners. That is not the goal, it is rather to learn about the field by thinking like a member of that practice community (Jonassen, 1999).

To evaluate this suitability, a questionnaire has been conducted in order to evaluate the objectives of the Internet curriculum. Moreover, this questionnaire was distributed to the practitioners in this field in order to reflect their own experiences on this curriculum.

5.4. Types of content structure

The content within a constructivist learning environment may be presented or discovered, well-defined or ill-defined, simple or complex, long-term or short-term, and familiar or unfamiliar (Jonassen, 1997c). From this point of view the content structure has been divided into two main types:

1. *Ill-Structured problems* which are typically situated in and emergent from a specific context. They are also the kinds of problems that are encountered in everyday practice, so they are typically emergent dilemmas. Because they are not constrained by the content domains being studied in classrooms, their solutions are not predictable or convergent.

2. On the other hand, *well-structured* problems that require the application of a finite number of concepts, rules and principles being studied to a constrained problem situation. These problems have also been referred to as transformation problems, which consist of a well-defined initial state, a known goal state, and constrained set of logical operators.

The content or the context within the constructivist learning environment has been also divided by (Honebein et al., 1993) into two main types: external context and internal context.

They stated that the context is not just an *external context* imposed by someone else. It also includes an *internal context* – the frame of reference or point of application that the learner generates (envisions). The learners bring their own framework to the task. They have real world problems that they are trying to solve and they read the text with those problems in mind. What information is attended to, how the information is organized, and what personal knowledge is combined with the information all revolves around the problem solving activities (or those problems solving activities) – those contexts of application the learner imposes.

The authenticity will be self-imposed. For the naïve learner, however, providing an authentic context is central since they do not have the experience base for generating their own context.

The notion of imposing context has been also used by (Hannafin et al., 1999). However, they distinguished three main types of context or content, these types are:

1. *Externally imposed contexts* that clarify the expected product of the learner's efforts and implicitly guide strategy selection and deployment. Externally imposed enabling contexts are often presented as explicitly situated problem statements or organising questions which aid students in referencing relevant aspects of their experience.

2. *Externally induced contexts* introduce the learner to a domain but do not identify specific problems to be addressed. Rather, a domain is encountered in which any number of problems or issues can be generated or studied at the discretion of the learner.

3. *Individually generated enabling contexts*, a specific context can not be designed in advance. The learner establishes an enabling context based on needs and circumstances that are unique. As with induced contexts, the generated context activates relevant knowledge, skill, and experience in order to frame problems and issues and to guide problem-solving strategies.

The second type, externally induced contexts, has lead to the development of the semi-structure of the content, which will be represented later in this chapter.

5.4.1. Ill-structured content

Within a constructivist framework, learning is defined by (Tobin et al., 1990) as the construction of knowledge by individuals as sensory data are given meaning in terms of prior knowledge. Learning also is an interpretive process, involving constructions of individuals and social collaboration. It is clear that in this view knowledge is created through social interaction as individuals test the fit or usefulness of their conceptual understandings in interactions with others and in the contexts in which knowledge is applied. This view is in direct contrast to the view of empiricists that knowledge comes to the learner in a prefabricated (i.e. prespecified) form.

Since constructivism proposes that knowledge or meaning is not fixed for an object, but rather is constructed by individuals through their experience of the object in a particular context (Honebein et al., 1993). Since also it is important to provide interesting, relevant, and engaging problems to solve Jonassen (1997a). Therefore, the content should not be overly prescribed, rather it should be ill-defined or ill-structured, so that some aspects of the problem are emergent and definable by the learners.

Ill-structured problem is defined by (Jonassen, 1997a) that it has unstated goals and constraints and has multiple solutions, solution paths, or no solutions at all. There is need to decide if the students possess prerequisite knowledge or capabilities for working on the problem that you identify.
Moreover, learning environments tend to be valued for exploring ill-defined and ill-structured problems. They promote the discovery and manipulation of underlying beliefs and structures rather than impose particular beliefs (Hannafin et al., 1999).

5.4.1.1 Characteristics of ill-structured content

A constructivist theory of learning and instruction that emphasises the real-world complexity and ill-structuredness of many knowledge domains was offered by (Spiro et al., 1991). They considered any effective approach to instruction must simultaneously consider several highly intertwined topics, such as:

- the constructive nature of understanding;
- the complex and ill-structured features of many, if not most, knowledge domains;
- patterns of learning failure;
- a theory of learning that addresses known patterns of learning failure.

They also specified the properties of an ill-structured knowledge domain, which are:

(1) Each case or example of knowledge application typically involve the simultaneous interactive involvement of multiple, wide-application conceptual structures (multiple schemas, perspectives, organisational principles, and so on), each of which is individually complex (i.e. the domain involves concept- and cases-complexity).

(2) The pattern of conceptual incidence and interaction varies substantially across cases nominally of the same type (i.e. the domain involves across-case irregularity).

Furthermore, (Jonassen, 1999) has described ill-structured problems in more details, and he pointed out that they:

- have unstated goals and constraints,
- possess multiple solutions, solution paths, or no solutions at all,
- possess multiple criteria for evaluating solutions,
- present uncertainty about which concepts, rules, and principles are necessary for the solution or how they are organized,
- offer no general rules or principles for describing or predicting the outcome of most cases, and
- require learners to make judgements about the problem and to defend their judgements by expressing personal opinions or beliefs.

5.4.1.2. Critiques to ill-structured content

The first critique that faces not only ill-structured content, but also the constructivist perspective was made by (Merrill, 1991) based on what he described extreme constructivism. He concluded that the real challenge, that faces constructivists, is how to make effective learning environments available to all learners most of the time. He also considered a technology built on the assumptions of extreme constructivism – that content can not be prespecified because every learning task is unique; that learners learn in idiosyncratic ways; that objectives or learning outcomes are content specific; that there are no categories of objectives; that there is no domain independent instructional strategy; that there can be no external control of the instructional events except that which the learner chooses; that there are no isolated tasks, only real-world tasks; that there can be no simplification of content; that content can not be separated from use; that the teacher must model the process but must not be scripted; and that there must always be alternative views – is extremely hard to conceive.

Stanton & Baber (1992) referred to the notion of disorientation (or getting lost) as the most cited disadvantage of non-linear environments, which seen to be one of the ill-structuredness characteristics. They indicated that the problems associated with cognitive overhead, motivation, and knowing content can not be ruled out. So there is a need to consider how the information is presented as well as how it is structured. Cognitive overhead was defined by them as the term given to describe degree of complexity in a no-linear environment such as number of choices, task scheduling, tracking and navigating.

One of the problems that also faces the learning environment found by (Jonassen, 1993) is the insensitive measures and ill-conceived i.e. the lack of ability to meaningfully evaluate the learning outcomes from the learning environments e.g. evaluating collaborative learning, knowledge construction, learner control and multiple perspectives. Although, the qualitative instruments can be used for evaluation, it seems crude when compared with the complexities of knowledge construction.

5.4.2. Well-structured content

According to Mayer (1999), the instructional designer's role is to create environments in which the learner interacts meaningfully with academic material, including fostering the learner's processes of selecting, organising, and integrating information. Mayer also refers to an important theme that one does not need discovery learning to have constructivist learning; i.e. learners can construct meaning from well-designed direct instruction.

In the model for knowledge representation which is proposed by Merrill (1991), he stands in direct opposition to what he called "the extreme constructivist views". This model assumes that knowledge, across subject matter areas, can be represented in knowledge frames of three types – entities, activities, and processes. This knowledge structure enabled him to represent knowledge in a knowledge base. This representation is independent of any particular individual. The same knowledge structure can be used for a wide variety of knowledge domains. Furthermore, he assumed that in order for adequate instruction to occur, that knowledge must be prespecified.

He also adds that most of technology-based delivery systems such as CBI (Computer Based Instruction) or interactive video require that knowledge must be prespecified and represented in some form of knowledge base. In this study, the learning process of the Internet curriculum will be implemented through a technology-based system.

In this study, the Internet curriculum will likely be specified –at least in some stages- in order to represent it in a technology-based system.

5.4.2.1. Characteristics of well-structured content

Characteristics of well-structured problems have been identified by (Jonassen, 1997c), that they:

- present all elements of the problem,
- are presented to learners as well-defined problems with probable solution,

- engage the application of a limited number of rules and principles that are organized in a predictive and prescriptive arrangement with well-defined, constrained parameters,
- involve concepts and rules that appear regular and well-structured in a domain of knowledge that also appears well-structured and predictable,
- possess correct, convergent answers,
- possess knowable, comprehensible solutions where the relationship between decision choices and all problem states is known or probabilistic, and
- have a preferred, prescribed solution process.

5.4.2.2. Critiques to well-structured content

It has been argued (Spiro et al., 1991) that there is a common basis for the failure of many instructional systems. They claimed that these deficiencies in the outcomes of learning are strongly influenced by underlying biases and assumptions in the design of instruction which represent the instructional domain and its associated performance demands in an unrealistically simplified and well-structured manner.

A distinction was made between well-structured and ill-structured problems by (Jonassen, 1997c), based on the commonly held assumption that skills in solving well-structured, classroom problems will transfer positively to real world, situated, ill-structured problems.

He also found it important to recognise that effects of well-structured problems in school contexts have limited relevance and transferability to solving problems that are situated in everyday contexts.

However, the literature review has shown that most the instructional designers are standing in direct opposition to the aspect of ill-structured content. On the other hand, most of the constructivist theorists are criticising the well-structured content. Therefore, this conclusion leads to the development of what it is preferred to call "Semi-structure content".

5.4.3. Semi-structured content

This structure is developed within this study, which is based on an assumption that there is a gap between well-structured and ill-structured domains. This gap has been found because of the extreme views of both constructivists (ill-structure content) and instructional designers (well-structure content). This gap can not be ignored or skipped, rather a bridge should be built to gradually enable the learner to transfer from well-structured domains to ill-structured domains.

This structure corresponds to some extent with the second type of context (externally induced context) proposed by Hannafin et al. (1999), which introduces the learner to a domain without identifying specific problems to be addressed. Furthermore, the assumption is that not all learning domains can be presented well-structured or ill-structured, rather they could be a combination of both structures. This structure is also based on the different stages of knowledge acquisition identified by Jonassen (1991), and the levels of understanding described by Biggs (1996), which will be referred to later in this chapter.

This also aims to enable learners to cope with the next phase of knowledge acquisition (Jonassen, 1991), i.e. to acquire advanced knowledge in order to solve complex, domain or context dependent problems. At this phase, the learners are more likely to be in the multistructural understanding level (Biggs, 1996), i.e. several aspects of the task are learned but are treated separately (understanding as knowing about).

In addition to, the cognitive process of organising, i.e. mentally organising the information into a coherent mental representation (Mayer, 1999), is seen to be developed more within the semi-structured content in terms of its role as a medium between the other cognitive processes, which are selecting the information (within well-structured context) and integrating it (within ill-structured context).

5.4.3.1. Characteristics of semi-structured content

- It has general objectives, rather than specific objectives. These objectives tend to be more implicit to the learner, but explicit to the teacher.

- Both teacher and learner share the control on the learning process.
- The learning process is directed from a distance "remote directed learning", using a technology-based environment.
- The emphasis is on scaffolding tasks and activities (Hudson, 1998). These scaffolding activities aim to help learners to bridge the gap between their actual and potential level of development in association with their peers and/or tutor interaction (Vygotsky, 1962).
- Gradually developing the complexity of the context.
- Supporting peer interaction and providing face to face sessions are essential parts and based on Vygotsky Zone of Proximal Development.

The notion of the "Zone of Proximal Development", see Vygotsky (1962) and Cunningham (1991), reflects on this structure in terms of determining the role of the teacher as a more expert partner. This notion refers to the distance between the actual development level as determined by independent problem solving and the level of potential problem solving under adult guidance or in collaboration with more capable peers (Hudson, 1998). Within this notion, there is an end goal in terms of the environment in which it is expected that the learner will be able to function effectively. The end goal reflects a level of performance that the learner can achieve only with assistance; i.e. it is in the learner's zone of proximal development (Honebein et al., 1993).

Vygotsky (1962) proposed that each child has a Zone of Proximal Development where, with the assistance of a more mature partner (a teacher or more advanced student), the child can accomplish more, solve more advanced problems than he/she could alone. The role of the teacher, under a Vygotsky view, also changes from authority figure who presents knowledge to students, to one of senior partner, or master in a master/apprentice relationship. The teacher moves the students from the point of completing tasks with help to independence in an ever-increasing cycle.

This also leads to the issue of ownership by the learner, and the development of metacognitive skills, which means the development of the ability to direct and monitor one's learning and performance. If learners are to function effectively in real-world environments, they must develop metacognitive skills required to function in those authentic environments (Honebein et al., 1993).

They also discussed the issue of ownership in the context of Vygotsky's zone of proximal development. They stated that both the student and the teacher work together in the zone of proximal development. They also addressed an important question: who has ownership of the tasks in the zone of proximal development? They argued that the students must have control of their own learning. Without this ownership the student will fail to develop many metacognitive skills, and perhaps even the cognitive skills, essential for effective performance in the transfer environment. The teacher is there to coach and to share in evaluating their progress. However, by placing the student in control the emphasis is on self-directed learning and on the development of the metacognitive skills necessary to support it.

In the semi-structured content, the learners will likely start to develop their metacognitive skills in order to be able to direct the learning in the ill-structure content.

As referred to, the teacher has the control on the learning process in well-structured domains, while the learner has it in the ill-structured domains. Since semi-structured domain is the medium between well-structured and ill-structured domains, it aims to transfer the control gradually from the teacher to the learner. Therefore, semi-structured content refers to the type of content that both the learner and the teacher share the control of the learning process.

Moreover, the teacher should establish what the researcher prefer to call "remote direct learning", which means that learning process is not fully directed by the teacher or even fully self directed by the learner, rather it is remote-directed, which could be established using technology-based environment.

Therefore there is a need for an intelligent tutoring system -suggested by (Merrill, 1991) - that can carry on a dialogue with a student, and it must have prespecified knowledge. In fact, specifying enough knowledge to make such systems viable is one of the challenges that intelligent tutoring system has encountered. Prespecification does not mean that the knowledge is static, linear, or that all student responses have been anticipated. An appropriate syntax for representation makes such intelligent systems possible.

In this kind of learning, there will be a tutoring system or a guiding system, which will likely direct the learning process through implicit direction to the learner but explicit to the teacher.

5.5. Stages of knowledge acquisition

There are some models that represent the different stages of knowledge acquisition e.g. Jonassen model (1991) and Mayer model (1999) which represents the cognitive processes that involve in learning. These models were represented in order to identify the different stages of knowledge acquisition and model the stages of knowledge acquisition for the Internet curriculum in this study.

Firstly, the levels of understanding described by (Biggs, 1996) -which may be used for structuring curriculum objectives hierarchically- will be presented in order to recognise the growth of the learner's performance. Secondly, the models for the stages of knowledge acquisition will be presented. Finally, the structure and the stages of knowledge acquisition for the Internet curriculum will be modeled.

According to Biggs (1996), he provides a systematic way of describing how a learner's performance grows in complexity when mastering many academic tasks. He distinguishes five levels of understanding:

1. *Prestructural*: the task is not attacked appropriately; the student has not understood the point.
2. *Unistructural*: one or a few aspects of the task are picked up and used (understanding as nominal).
3. *Multistructural*: several aspects of the task are learned but are treated separately (understanding as knowing about).
4. *Relational*: the components are integrated into a coherent whole, with each part contributing to the overall meaning (understanding as appreciating relationships).
5. *Extended abstract*: the integrated whole at the relational level is reconceptualised at a higher level of abstraction, which enables generalisation to a new topic or area, or is turned reflectively on oneself (understanding as far transfer, and as involving metacognition).

He concludes that a performative notion of understanding enables teachers to specify the things the students need to do in order to demonstrate particular levels of understanding.

The first model which is seen describing the different stages for knowledge acquisition is designed by Mayer (1999). This model represents the several cognitive processes in the learner during learning. According to this model, constructivist learning can occur when a learner engages in three cognitive processes: attending to relevant information (i.e. selecting), mentally organising the information into a coherent mental representation (i.e. organising), and integrating the information with existing knowledge (i.e. integrating). This model was explained in more details in the background literature chapter.

These three cognitive processes are seen to be essential when the learner is acquiring knowledge.

The second model is described by Jonassen (1991), which presents three stages for knowledge acquisition, these stages are (see figure 22):

1. *Introductory learning* occurs when learners have very little directly transferable prior knowledge about a skill or content area. It represents the initial stages of schema assembly and integration.
2. The second phase of knowledge building is *advanced knowledge acquisition*, which is an intermediate stage in learning that follows introductory knowledge acquisition and precedes expertise. Learners must acquire advanced knowledge in order to solve complex, domain or context dependent problems.
3. *Expertise* is the final stage of knowledge acquisition. We know that experts have more internally coherent, yet more richly interconnected knowledge structures, and they represent problems differently.

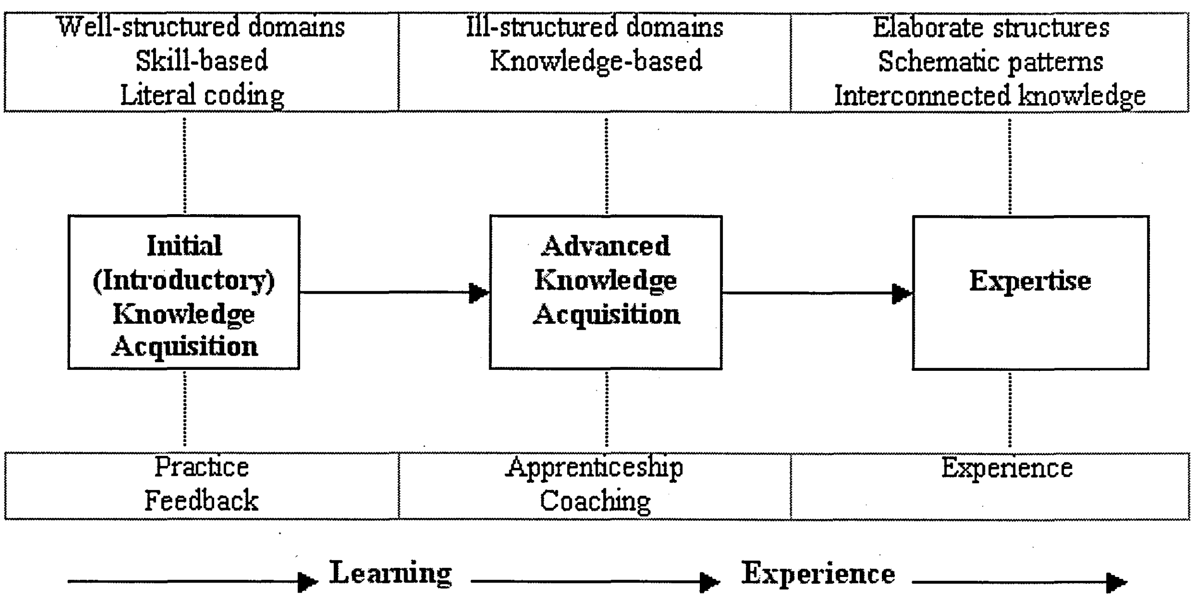

Figure 22. The three stages of knowledge acquisition presented by (Jonassen, 1991)

5.6. The structure of the Internet curriculum

The structure of the Internet curriculum has been based on all the previous assumptions, structures and stages of knowledge acquisition. Moreover, it is built to enable cognitive flexibility which results from learning knowledge in a variety of contexts (Dick, 1991 and Spiro et al., 1991).

This aspect of the variety of contexts was also presented by Honebein et al. (1993). According to their definition, it is a long-standing prescription for instruction that numerous examples of a concept should be provided for study and practice. Furthermore, the contexts in which a concept is instantiated should vary widely providing the full range of contexts in which that concept might appear. In addition, learning requires a rich variety of experiences with a concept to see how changes in the environment lead to changes in meaning and application. It is only through the richness of prior experience that the learner will be able to assemble the appropriate complex of concepts and strategies to guide performance in a new situation.

It was found that it would be better to merge and integrate the educational objectives with the general objectives in each unit, in order to provide a greater sense of purpose. It was also found that it would be better to rearrange the general and the educational objectives in order to categorise them into a meaningful structure. The objectives for the Internet curriculum have been organised into five main units (see table 18).

Table 18. The main units of the Internet curriculum and the number of objectives in each unit.

The Internet curriculum units	General Objectives	Educational Objectives	Total
1- Unit one: Introduction to the Internet.	12	3	15
2- Unit two: Searching the Internet for information.	9	3	12
3- Unit three: Internet communication utilities.	6	5	11
4- Unit four: Transferring files from the Internet.	5	3	8
5- Unit five: Designing web pages.	3	2	5

As shown in table (18), the number of objectives gradually decrease from one unit to the next, the more the learner advances in the learning process the less the specification of content. The structure of these units can also be demonstrated as three connected circles, each one leads to the other and they have common objectives, and the structure is developed according to the development of the learners' understanding (see figure 23).

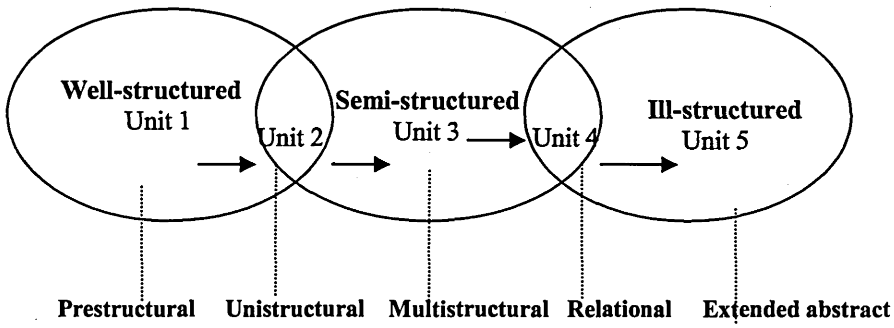

Figure 23. The relationship between the content structure and the learners' understanding.

Within this structure, the first unit (Introduction to the Internet) is represented as well-structured because it contains the basic skills and knowledge for using the Internet. According to Biggs (1996), the learners are more likely to demonstrate prestructural understanding during the first unit, as they are just being introduced to the Internet.

The second unit (Searching the Internet for information) aims to develop the skills for selecting and exploring the information at the same time. Therefore it has a common position between well-structured and semi-structured content. In this unit, the learners are more likely to demonstrate unistructural understanding, because it is supposed at this stage that they will understand only a few aspects concerning the Internet.

The third unit (Internet communication utilities) is represented in a semi-structured content, because it is based on communication utilities on the Internet. Therefore, peer support can be used in order to develop the communication skills between the learners. In this unit the learners are more likely to demonstrate the multistructural understanding, because they will have experienced several aspects of the Internet individually, but each of these aspects is likely to be learned relatively independently of each other.

The fourth unit (Transferring files from the Internet) includes the first two cognitive skills (selecting and organising the information) and then it prepares the learners for the third process which is to integrate this information from the Internet. Therefore this unit has a common position between the semi-structured and ill-structured content. Within this unit, the learners are more likely to demonstrate relational understanding, in which they will likely establish relations between the different Internet aspects and of course its relation to their field or subject area.

The fifth unit (Designing web pages) is considered to be the most advanced unit in this curriculum, in which the learner integrates all the knowledge that he/she has acquired. Therefore, this unit has an ill-structured content and the learner has the control in this unit. In this unit, the learners are more likely to demonstrate the extended abstract level of understanding, because at this time, they should be able to reflect on their experiences in the process of designing a web page.

5.6.1. A suggested model for the structure and the stages of knowledge acquisition for the Internet curriculum

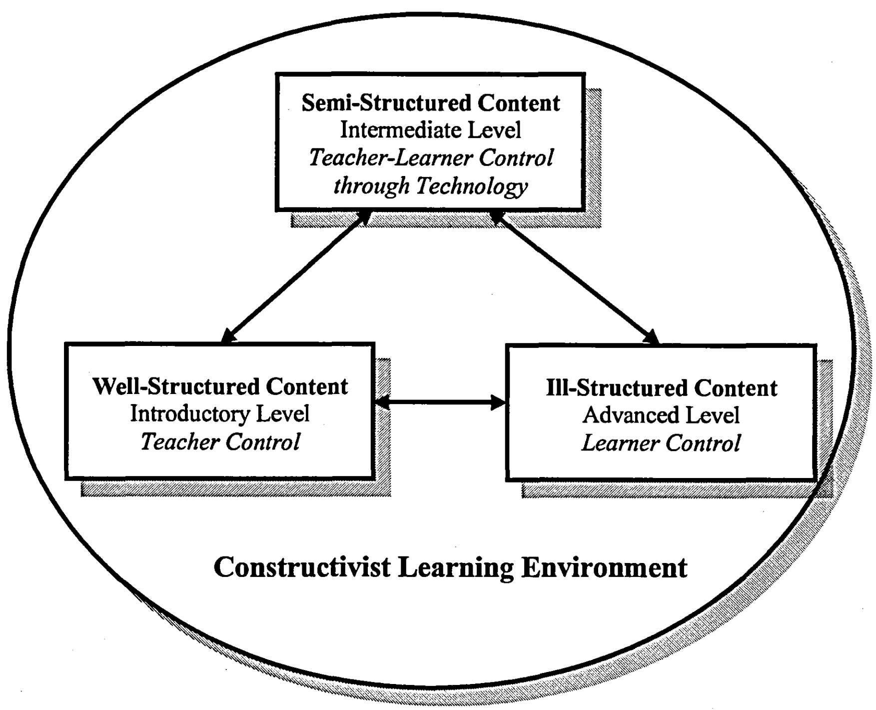

Figure 24. Model for the structure and the stages of knowledge acquisition for the Internet curriculum.

The model, shown in figure (24), represents three main content structures for the Internet curriculum. These content structures are:

1- *Well-structured content*, which has a specific and detailed objectives for the learning process.
2- *Semi-structured content*, which has general objectives that guide the learning process.
3- *Ill-structured content*, which does not have overly prescribed objectives.

It was found by Dick (1991) that designs based solely on constructivist principles hardly considered the entry level of students because without this level research shows they will not be able to learn new skills. Designs that are too reliant on constructivist principles tend to overlook the gap between the level of understanding of beginners and the tools and information that they are provided with.
It was also found (Spiro, et al., 1991) that the objectives of learning tend to differ for introductory and more advanced learning. When first introducing a subject, teachers are often satisfied if students can demonstrate a superficial awareness of key concepts and facts, as indicated by memory tests that require the student only to reproduce what was taught in roughly the way that it was taught. Thus, in introductory learning, ill-structuredness is not a serious problem. Learners are not expected to master complexity or independently transfer their acquired knowledge to new situations.

For all these reasons, it is considered to be appropriate to write the objectives for the first unit in the Internet curriculum in some detail. This unit (Unit One: Introduction to the Internet) aims to provide the learners with the appropriate amount of knowledge and skills in order to start using the Internet. Jonassen (1991) also suggested that introductory knowledge acquisition is better supported by more objectivistic approaches, with a transition to constructivistic approaches that represent complexity and ill-structuredness as the learners acquire more knowledge. This is as a result of the fact that learners have not assembled or integrated adequate knowledge structures during introductory knowledge acquisition. This transition can be accomplished by presenting semi-structured domains. Furthermore, this transition has been made from the first unit to the third unit (from well-structured to semi-structured) using the second unit as a connector. It has been also realised between the third unit and the fifth unit (from semi-structured to ill-structured) using the fourth unit as a connector. Constructivist learning environments seem to be most appropriate for the third stage, advanced knowledge acquisition. It is at this stage that misconceptions are most likely to result from instruction that oversimplifies and pre-packages knowledge (Jonassen, 1991).

At the end of the learning process, experts need very little instructional support and will likely be served by the rich level of instructional support provided by most constructivist environments (Jonassen, ibid.). This stage is seen as the advanced level, in which the learner will able to master the complexity and transfer the knowledge. These two goals become prominent only later (mastery of complexity and transfer), when students reach increasingly more advanced levels of the same subject matter. It is then, when conceptual mastery and flexible knowledge application become paramount goals, that the complexity and diversity characteristic of ill-structured domains become a serious problem for learning and instruction (Spiro, et al., 1991).

These three types of content are presented into three main levels of knowledge acquisition:

1. Introductory level.
2. Intermediate level.
3. Advanced level.

A basic element in learning environments seen by (Jonassen, 1991) is authentic tasks which provide appropriate levels of complexity, and that allow students to select appropriate levels of difficulty or involvement. Therefore, these levels are presented in order to provide appropriate levels of complexity.

In introductory learning, learners are not expected to master complexity or independently transfer their acquired knowledge to new situations (Spiro, et al., 1991). Honebein et al. (1993) argue that providing realistic levels of complexity in the learning environment could actually make learning easier. They also argue that the use of the complex stimulus environment applies best to advanced knowledge acquisition in ill-structured domains.

In the following part, a discussion of the different types of control over the learning process "that are likely to emerge within the learning process" and its relation to the content structure is addressed.

The issue of control over the learning process is seen to be crucial in terms of designing a learning environment that facilitates the different types of control over the learning process. Learner control is defined by Perez and Jo (2000) as the level of self-determination that learner has in making decisions about his/her learning. They also define it as the degree of autonomy that learners have in organising, pacing, sequencing and using the available learning resources. That is the ability and power of adapting the technology-mediated environment to suit their individual specific learning needs. They also add that control over their learning direction and pace can be made possible by the many alternatives and choices that a technology-mediated learning system offers that learner. In this research, within the three levels of knowledge acquisition, the learning environment was designed to allow three types of control over the learning process that are likely to develop (which are illustrated in figure 25).

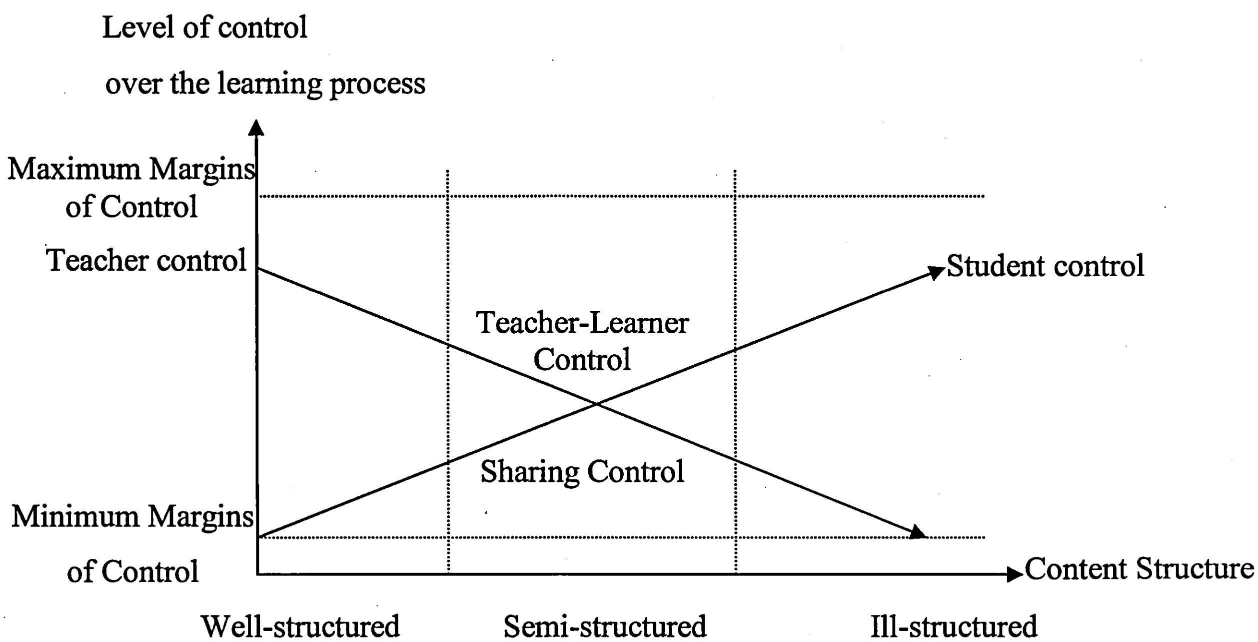

Figure 25. The relationship between the content structure and the level of control over the learning process.

Firstly, *teacher control* develops at the introductory level, where the learner does not have prerequisite knowledge and skills. In this level the teacher is likely to present well-structured content in order to enable the learner to get oriented with the learning environment. Secondly, "*teacher-learner control*" both the teacher and learner are sharing the control over the learning process and at this stage the teacher is more likely to become a "mature partner" to the student. Finally, *learner control* develops gradually as the learner gains advanced knowledge and skills and become more familiar with the learning environment and the content. Moreover, both teacher and student have minimum and maximum margins of control over the learning process, i.e. none of them can fully control the learning process, and none of them can totally loose control over the learning process.

According to Perez and Jo (ibid), the level of control that the learner needs to exert over the learning environment is not constant over time. Learners will engage in different levels of control depending on their individual learning style, prior knowledge of the material or related material, attitudes toward information technology, and past experience, initiative, intellectual and social maturity, metacognitive proficiency and insights.

Chapter six: Designing the Web-based learning environment

6.1. Introduction

This chapter aims to highlight the process of designing the Web-based learning environment in this research. At the beginning of this chapter, the Web characteristics are discussed in order to highlight their influence on teaching and learning. Furthermore, the web design principles and guidelines are discussed in the light of the constructivist design principles in order to emphasise their implications on the design of the Web-based learning environment. Subsequently, the different phases that were involved in the design of the Web-based learning environment in this research are discussed in detail. The design of the Web-based learning environment included eight different phases which are: the planning of the overall learning environment; Web-based learning environment prototype; user interface design; selecting and organising information resources; enabling and providing communication tools; designing course activities; designing and enabling the use of digital portfolios; and evaluation 'of the design of the Web-based learning environment.

The design of the Web-based learning environment is also seen to be influenced by the researchers' own experience in using different types of Web-based learning environments. This experience included the use of two Web-based learning environments which are 'Blackboard' and 'LC Profiler'. These two learning environments are seen to be influenced by two different theoretical perspectives. For example, while the 'Blackboard' learning environment is seen to be more influenced by a behaviourist perspective to teaching and learning, the 'LC Profiler' is seen to be more influenced by a constructivist perspective to teaching and learning. Although these two learning environments are influenced by two different perspectives, the design of the two learning environments has influenced the design of the learning environment in this research. Subsequently, the design of the two learning environment were critically analysed in order to identify the strengths and weaknesses of both designs. For example, the researcher's experience gave him the opportunity to look into a range of tools and resources that are used in both learning environments in order to support the teaching and learning processes such as the use of synchronous and asynchronous communication tools.

Two main perspectives to teaching and learning using the Web can be distinguished. The first perspective is seen to be influenced by the distance learning perspective. According to Federico (2000), distance learning typically implies instruction via non-traditional means, i.e. courses via correspondence, radio, television, satellite, and, more recently, the Internet with its associated software, hardware, multimedia and digital links. He also notes that distance learning might imply on-campus classes, seminars, and workshops where the instructor is not physically present, but communicates with students at several sites simultaneously via electronic media.

This kind of distance learning is also seen by King et al. (2001) to be formalised instructional learning where the time/geographic situation constrains learning by not affording in-person contact between student and instructor. Therefore, the time and place constraints are seen to be major characteristics of this kind of learning.

The second perspective is seen to be less constrained by time and place. Therefore, the capabilities of the Web can be integrated into the teaching and learning process in order to facilitate and support the students' learning alongside the use of same place and same time 'synchronous' methods e.g. the use of workshops, demonstrations etc. This kind of Web-based learning is defined by Bannan-Ritland et al. (1998) as a hypermedia-based instructional program which utilises the attributes and resources of the Web to create a meaningful learning environment where learning is fostered and supported. Berge (1999) also defines Web-based learning as a technology system that has given features and capabilities such as hypermedia and tools such as email, Web-based computer conferencing, and/or synchronous chat.

This research is considered to be more influenced by the constructivist theory of learning. Therefore, the design of the learning environment has been influenced by the different constructivist principles for the design of constructivist learning environments. A major goal of constructivism is seen by Lefoe (1998) to be the design of rich learning environments where the prime emphasis is placed on the unique interests, styles, motivations and capabilities of individual learners so that learning environments can be tailored to them. Harper (1997) also highlights seven pedagogical goals for designers of constructivist learning environments. These goals include providing experience with the knowledge construction process; providing experience in and appreciation for multiple perspectives; embedding learning in realistic and relevant contexts; encouraging ownership and voice in the learning process; embedding learning in social experience; encouraging the use of multiple modes of representation and encouraging self-awareness of the knowledge construction process.

Jonassen (1999) notes that the characteristics of meaningful learning provide guidelines for designing constructivist learning environments. These characteristics propose that meaningful learning should keep students active, constructive, collaborative, reflective, and conversational. Therefore, technologies such as the Web should be designed in order to facilitate and support meaningful learning that hold to the above characteristics. Similarly, Kraus et al. (2001) find that the attributes of hypermedia and the Web can support and facilitate meaningful learning. Therefore, hypermedia can represent the non-linear, ill-structured knowledge domains needed for advanced knowledge acquisition. The important aspect of integrating hypermedia systems for advanced knowledge acquisition is its ability to foster learning, while exploring and experiencing these ill-structured domains. They also add that the learning environment must be designed to provide understanding through meaningful knowledge representations and challenge. The user must actively explore information and create meaning through interactive experiences. This process allows the learner to experience similarities and differences in content across a variety of contexts and cases. Through these experiences the learner can create a flexible knowledge structure for applying knowledge within complex, ill-structured domains.

The following section highlights the different characteristics of the Web with an emphasis on the implications of these characteristics for teaching and learning.

6.2. Characteristics of the Web and Web-Based teaching and learning

This section discusses the different characteristics and attributes of the Web. The characteristics of the Web and its potential benefits for teaching and learning have led to the development of the Web-based learning environment in this research. Accordingly, the Web has been used in this research in order to facilitate and support the teaching and learning process of the use of the Internet.

Within the framework of constructivist learning theory, the Web can be referred to as a cognitive tool. According to Jonassen's (1999) model, cognitive tools are seen to be generalisable computer tools that are intended to engage and facilitate cognitive processing. Cognitive tools are also both mental and computational devices that support, guide, and extend the thinking processes of their users. They are also knowledge construction and facilitation tools that can be applied to a variety of subject matter domains (Jonassen, 1994a). Reeves (1999) also defines cognitive tools as technologies that enhance the students' cognitive powers during thinking, problem-solving and learning.

Harper (1997) states that cognitive tools can help learners organise, restructure and represent what they know. Therefore, a series of cognitive tools should be developed to support the perceived needs of the learners and incorporated during the design processes. Jonassen and Reeves (1996) summarise the theoretical foundations for using cognitive tools:

- *"Cognitive tools are most effective when they are applied within constructivist learning environments.*
- *Cognitive tools empower learners to design their own representations of knowledge rather than absorbing the representations preconceived by others.*
- *Cognitive tools can promote the deep reflective thinking that is necessary for meaningful learning.*
- *Cognitive tools enable mindful, challenging learning rather than the effortless learning promised but rarely realized by other instructional technologies.*
- *Cognitive tools should be applied to tasks or problems defined by learners with the support of their teachers.*

- *Cognitive tool use for education should be situated in realistic contexts with results that are personally meaningful for learners."* p.698

Reeves (1999) also notes that the Web is considered to be a cognitive tool. Accordingly, he highlights some common uses that teachers are making of the Web. These uses include enriching access to course materials; documenting course discussions; posting student writing, art, projects, etc. for critique; providing tutorials, simulations, and drills and facilitating group work.

Additionally, Berge (1999) highlights some salient characteristics of the Web such as permitting students or instructors to give presentations, to use the Web system for various forms of communication and allowing linkage to other presentations. The Web also enables both asynchronous and synchronous communication among participants and it provides individual, small group and mass communication.

Starr (1997) highlights three key educational values of the Web which are important to the instructional designer. These are hypertext which enables the user to easily access information; the delivery of multimedia which provide text, audio and video to the user and true interactivity which enables information exchange between the user and the server.

Hackbarth (1997) also emphasises some characteristics of the Web, which he summarises in the following:

- *"It provides economical access to people and multimedia information in ways unmatched by any other combination of media.*
- *Much content on the Web cannot be found in any other format, except the authors' originals.*
- *The Web permits the work of individuals such as teachers and students to be shared with the world.*
- *It is a powerful, flexible resource, in some ways unlike any others that students are likely to encounter and rely on in the workplace.*
- *Students approach the Web with eager anticipation and fear, knowing that it is at the cutting edge of technology used by their most progressive peers and by successful adults."* p.60,61

6.3. Web design principles and guidelines

The principles for constructivist teaching and learning outlined by Jonassen (1993), Merrill (1991) and Runlee and Daley (1998), which are highlighted in chapter two, influenced the design of the Web-based learning environment. Moreover, the overall design is also influenced by the different models of constructivist teaching and learning which are designed by Spiro et al. (1991), Hannafin et al. (1999), Mayer (1999) and Jonassen (1999). Accordingly, the Web-based learning environment was designed in order to provide collaboration and conversation tools; information resources etc.

The principles for constructivist teaching and learning, which are highlighted earlier in chapter two, are general principles. Subsequently, more specific constructivist principles which are particularly related to the design of the learning environment are highlighted in this section.

Jonassen (1994b) identifies a number of constructivist principles for the design of learning environments. These principles include the following:

1. *"Provide multiple representations of reality;*
2. *Represent the natural complexity of the real world;*
3. *Focus on knowledge construction, not reproduction;*
4. *Present authentic tasks (contextualizing rather than abstracting instruction);*
5. *Provide real-world, case-based learning environments, rather than pre-determined instructional sequences;*
6. *Foster reflective practice;*
7. *Enable context and content dependent knowledge construction;*
8. *Support collaborative construction of knowledge through social negotiation". p.35*

Shih and Chen (2000) also identify some guidelines for constructivist instructional system design. These guidelines emphasise that the learning environment should be capable of providing process for knowledge construction; circumstances for forming learning groups; an easy to use environment; an environment for dynamically exploring information and a cooperative learning environment for groups. Based on these guidelines, they recognise the Internet as a suitable tool for developing constructivist learning environments. Accordingly, in this research, the Web-based learning environment was designed in the light of the principles and guidelines highlighted above.

Ruffini (2000) provides some basic guidelines for designing and creating a website using a systematic approach. He identifies some elements of the instructional design process in developing effective Web pages for a faculty website. These elements include: target audience, objectives, home page and contents, site navigation structure, page design, text and graphics and the selection of a Web authoring program. Although these guidelines are for designing a faculty Website, they have influenced the design of the Web-based learning environment in this research in terms of identifying the different design elements. The design of the different elements in the Web-based learning environment was conducted in different design phases. Most of these phases were influenced by the different steps for developing Web-based learning which are identified by Jolliffe et al. (2001). These steps include, for example, developing a storyboard, designing the graphical user interface, selecting learning resources etc.

The different phases for designing the Web-based learning environment are discussed further in the following section.

6.4. Design phases of the Web-based learning environment

6.4.1. Planning the overall learning environment structure and organisation

As outlined earlier, the pedagogical and epistemological models developed by Jonassen (1997a), Honebein et al. (1993) and Hannafin et al. (1999) influenced both the development of the Internet curriculum and the design of the Web-based learning environment in this research. Accordingly, the main purpose of this learning environment is to enable all the participants to become active and to promote their own learning by maximising the use of a wide range of tools and resources which are available on the Internet. Subsequently, the planning of the overall learning environment aims to include and integrate some design elements (see also appendix e for the different screens of the Web-based learning environment namely 'Internet-Tutoring system'). In addition, the design highlights the different aspects which are relevant to the constructivist learning environments. The different elements and aspects that are related to the design of the Web-based learning environment can be summarised in the following:

- Considering learners' prerequisite knowledge and needs.
- Designing flexible content structure (such as designing well-structured, semi-structured and ill-structured contents).
- Organising course content and course information.
- Providing a number of seminars and demonstrations.
- Enabling peer support through discussion and hands-on-sessions.
- Providing individual learning opportunities.
- Providing synchronous discussions by using videoconferencing and instant messaging.
- Providing asynchronous discussions by using email and discussion boards.
- Providing learning materials and information resources including Web resources and course documents.
- Engaging learners in authentic activities.
- Evaluating learning outcomes using multiple products of learning rather than a single product through the use of digital portfolios in order to maintain records of the students' learning products.

- Supporting and developing a learning community which can be built up from the community of learners, teachers and the technical support teams.
- Providing technical assistance which is seen to be a crucial element of the Web-based learning environments by using a tutorial and providing possibilities for technical questions to be asked.

Moreover, the design of the Web-based learning environment integrated different approaches to teaching and learning. For example, there is an integration between the use of the Web and the use of the demonstrations and workshops. Furthermore, the overall design aims to integrate the different learning resources e.g. there is an integration between the Web resources and the course documents in order to provide the students with a wide range of resources to choose from. This integration is considered to be a key element in the design of the Web-based learning environment in order to facilitate and support the students in having a meaningful learning experience. This integration also considers the students who are lacking prerequisite knowledge and skills e.g. at the beginning of the course, demonstrations were used in order to orient the students to the use of the Internet and the learning environment. According to Dick (1991), constructivist approaches tend to overlook the gap between the students' prerequisite knowledge and the tools and information that they are provided with in a constructivist learning environment. Therefore, this research also took into account the students' prerequisite knowledge by providing different types of content structures such as well-structured, semi-structured and ill-structured contents. Furthermore, the course included face to face interactions with the students in order to support and facilitate their own individual learning. In addition, the overall design included all the necessary course information in order to assist the students in learning the new knowledge and skills at their own pace.

Rankin (2000) outlines the information that should be contained in a course Website. It can be summarised as follows:

- Up to date information: the site should be updated continuously and reflect any changes occurring such as changing due dates for assignments, Web links etc.
- Email link: the online course should always provide crucial contact information (including instructor's office phone, email and technical assistant) to students to encourage them to ask questions and make comments out of class.
- Course topic links: instructors can provide direct links to related content-based sites on the Web.

- Administrative links: course Websites can play a valuable role in disseminating important administrative information by providing links to the institution catalogue and schedule of classes.
- Study aid (tutorial) links: the course is linked to online tutorials and study guides.
- Department link: instructors should include links to the relevant department. Therefore, students can have information about any subject that they are interested in.
- Institution link: by linking to the institution's homepage, the instructor can strengthen the relationship between the course and its students beyond the department to the campus as an interrelated community.

All the information outlined above was taken into account during the design of the overall learning environment (see figure 26) in order to provide the students with all the necessary information that they need during the learning process.

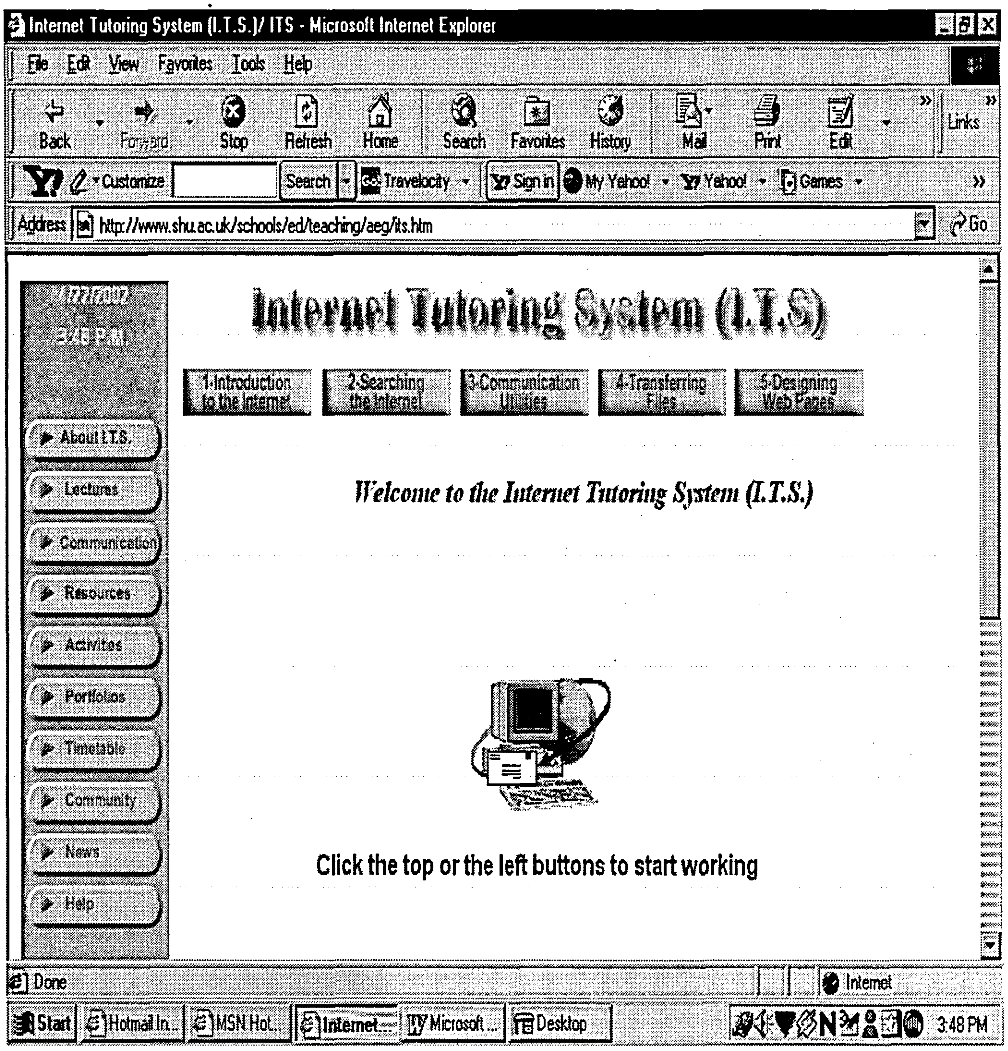

Figure 26. The main Web-based learning environment elements.

The overall Web-based learning environment is designed to accommodate the different learning styles of the learners. Subsequently, the suggestions, which are outlined by Liu and Ginther (1999) and highlighted in chapter two, for adapting the design of education to the students' learning styles were considered during the design of the Web-based learning environment in this research. For example, at the beginning of the design process, careful planning of the instruction took place. In addition, there was careful consideration of relevant teaching methods.

Furthermore, the overall design took into account the cognitive load theory (Sweller, 1988) in order to reduce the cognitive overload that the students might face during learning in the Web-based learning environment. Subsequently, the principles for reducing cognitive overload when designing multimedia, which are highlighted by Mayer and Moreno (2002) and outlined in chapter two, were also considered during the design process of the Web-based learning environment. For example, the multiple representation principle was considered by presenting materials using text and pictures.

Moreover, Wilson (1996) highlights some design guidelines which consider the students' cognitive load such as using simple content, using coherent representations, eliminating redundancy etc. These guidelines were also taken into account during the overall design of the Web-based learning environment.

In addition, the principles for reducing users' memory load in a computer interface, which are identified by Mandel (1997), have also influenced the design of the Web-based learning environment e.g. reliving short term memory and relying on recognition, providing visual cues, organising information, etc.

6.4.2. Web-based learning environment prototype

6.4.2.1. Storyboarding

The prototyping phase of the Web-based learning environment began with a storyboard. According to Preece et al. (2002), storyboarding is an example of 'low-fidelity' prototyping which determines the main outline of the design. They also add that a storyboard consists of a series of sketches showing how a user might progress through a task using the device being developed. Quinn and Wild (1998) note that a storyboard needs to be completed first before starting the programming phase. They describe this process using the notion of "Four Ps", which means Postpone Programming and Prefer Paper.

A storyboard, according to Jolliffe et al. (2001), helps the designer to ensure that the learning materials are developed to the correct specifications. Therefore, the storyboard in this research was designed on paper in order to determine the different functions and processes in the learning environment. It also aimed to determine the different sections, i.e. Web pages that need to be developed in order to implement those functions and processes. Furthermore, the storyboard was used in order to draw upon the relationship between the Web and the different components of the learning environment such as the use of demonstrations and workshops in order to establish links between them in order to be used in an integrated way.

The storyboard designed in this study aims to outline the main framework and the overall structure of the Web-based learning environment. The non-liner structure was seen to be appropriate to the design of the Web-based learning environment because of the non-linear structure of the Web itself. This structure aims to give the students the opportunity to freely search the learning environment and the Web for information which is related to the use of the Internet. It also aims to give the students the freedom to look into the different aspects related to the course at any time they want and at their own pace. The design of the storyboard also aims to enable the students to use a wide range of resources including Web resources, course documents etc. using a number of formats such as HTML files, Doc files, PDF files etc. It also enables the students to find information resources using different techniques such as using search engines, downloading files, etc. Enabling this wide range of resources in a wide range of formats and techniques is seen to be the best way of accommodating the different learning styles of the students.

6.4.2.2. Prototyping

Hackos and Redish (1998) define a prototype as an easily changeable draft or simulation of at least part of an interface. Therefore, prototypes can range from 'low-fidelity' sketches of what the interface and screen flow might look like to 'high-fidelity' interactive simulations that are essentially indistinguishable from the final product. They also highlight the different techniques for prototyping such as using paper and pencil, word processing, presentation software or even development software such as 'Director' or 'Dreamweaver'. Preece et al. (2002) also note that a prototype can be a paper-based outline of a screen or set of screens, an electronic picture, a video simulation of a task, or hyper-linked screen shots. The prototype in this research was conducted first on paper and then it was developed using the Web authoring tool 'Dreamweaver'. This prototype is seen to provide many advantages for the design of the Web-based learning environment. These advantages are seen to be related to the characteristics of prototyping which are highlighted by Budde et al. (1992) in the following:

> "*- Prototyping is an approach based on an evolutionary view of software development and having an impact on the development process as a whole.*
>
> *- Prototyping involves producing early working versions (prototypes) of the future application system and experimenting with them.*
>
> *- Prototyping provides a communication basis for discussions among all the groups involved in the development process, especially between users' and developers.*
>
> *- Prototyping enables us to adopt an approach to software construction based on experiment and experience."* p.6, 7

The prototyping in this research aimed to determine the main layout of each screen in the Web-based learning environment. Therefore, it aimed to highlight the different interactions that the students might have during the use of the learning environment. This includes determining the different buttons, links, and forms that the students are interacting with. Furthermore, the prototyping aims to identify the various techniques for linking the different pages in the learning environment and the external links on the Web. The final prototype was tested in the Learning and Teaching Institute in Sheffield Hallam University with two observers from the Centre for Multimedia in order to determine any issues that might be found in the current design in order to make improvements before the trial.

6.4.2.3. Selecting authoring software

Hemard and White (1995) describe the hypermedia authoring process as a means of conceptualising, designing and implementing a wide range of dedicated hypermedia applications such as Web materials. They also add that this process involves inputting text and media-based materials with a view to assembling all the component parts into a computer-based package using computer mechanisms and other relevant programming facilities. Moreover, the assembly of those components (such as text, graphics, sound etc.) is realised by means of links created by the designer and subsequently activated by the user to navigate through the application. Accordingly, in this research, a wide range of software was used in order to design the Web-based learning environment entitled 'Internet Tutoring System'. Two different types of software can be distinguished. The first type of software is considered to be authoring software such as 'Dreamweaver'. The second type of software is considered to be supporting software such as graphics software e.g. 'Paint Shop'. The software used in this design can be summarised in the following:

- *'Dreamweaver'* was used for designing the main pages and for formatting the pages' layout. It was also used for creating the different links in the learning environment and for many other different functions such as inserting email links, images etc.
- *'HTML' tags* were used in order to enhance and modify some of the layout design, which were difficult to make using 'Dreamweaver'.
- *'Java' scripts* were used in order to design some interactivity elements such as the use of a password script.
- *'Perl' scripts* were used for programming the server-side operations such as processing students' inputs e.g. the use of mail script in order to obtain the students' inputs from the course registration form.
- *'Fireworks'* was used for designing the graphics and icons especially those in the navigation toolbars.
- *'Paint Shop Pro'* was also used for designing the different graphics and icons in the learning environment such as changing the format of some 'Bitmap' pictures into 'Vector' pictures to have them smaller in size and easy to download from the Web.

The software highlighted above was selected on two bases. The first basis was the goals of the design and the functions that were planned to integrate them into the design. The second one was the characteristics of each software and its appropriateness to the design goals.

6.4.3. User interface design

6.4.3.1. Graphical user interface design

According to Jolliffe et al. (2001), the graphical user interface contains all the various elements that are seen by learners and with which they will interact as they progress through the learning process. The graphical user interface includes elements such as navigation buttons, forms etc. All these elements are used in order to increase the interactivity with the learning environment. Berge (1999) also notes that the interaction includes a means for teacher and learner to receive feedback and for adaptation to occur based upon information and activities with which the participants are engaged. He also finds that interaction involves complex activities by the learner, such as engaging, reflecting, discussing, inquiring, problem-solving, linking, constructing, analysing, evaluating and synthesising.

Based on a holistic view of the distance education interactions, Tuovinen (2000) develops a four-way interaction model (see figure 27). This model takes into account the four interactions that are likely to emerge in a distance learning situation.

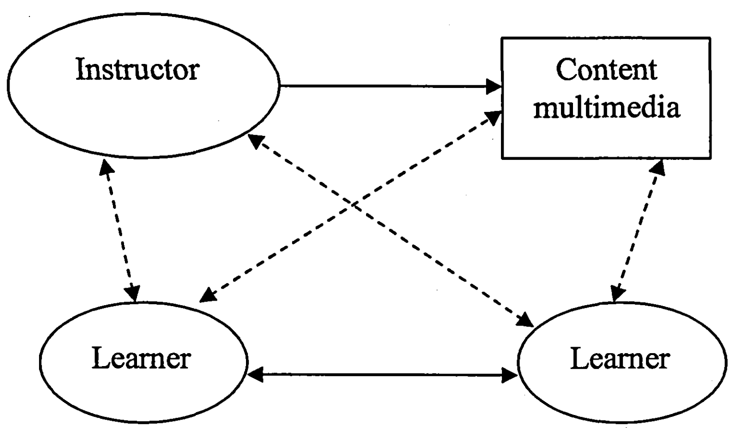

Figure 27. The four-way educational interactions model.

He considers that the four-way educational interactions model, which was developed for distance education, can be applied to flexible learning contexts. Each of the four interactions represented in the figure above needs to be addressed in planning, implementation and evaluation of flexible learning. Flexible learning, according to Tuovinen (ibid), emphasises student control of "when, what, where, how and at what pace they learn". Therefore, this model is seen to be best describing interaction because the students were interacting with the tutor and with each other during the course. Furthermore, both the students and the tutor were interacting with the course materials and information resources which are related to the learning environment.

Harper (1997) highlights a number of key design issues that need to be specifically addressed such as the issue of interactivity and control. He emphasises that clear information representation and access facilitate the user's ability to find and manipulate much of the available information. Therefore, effective student use of the materials depends on three things: access, understanding and available tools. As a result, the students should have flexible access to the information resources. They should also have clear understanding of the metaphors used to structure information. Furthermore, the students should use cognitive tools which permit the user to extract, create, organise and orchestrate information in their own way when solving personally meaningful tasks.

Marcus (1992) identifies some key components for well-designed user interfaces such as appropriate organisation of data, efficient navigation, quality appearance etc. These key components were taken into account during the design of the user interface in this research. Therefore, the data and the information given in the learning environment were organised in a coherent way e.g. the colour, font sizes and formats were consistent throughout the design. The quality of appearance was taken into account by considering the readability of the text and information throughout the design. Moreover, the navigation was also designed in order to enable the students to use the learning environment effectively. Since navigation is seen to be an important element in the user interface design, it is described further in the following section.

6.4.3.2. Navigation design

Hackos and Redish (1998) emphasise that navigation (getting to where you need to be) is a critical aspect of almost all interfaces, including software products and Websites. Therefore, a product is considered to be usable if users can find what they need, understand what they find and use what they understand appropriately to achieve their goals.

Ruffini (2000) identifies four basic navigation structures that can be used in order to access pages in a Website. *Sequence structure* is the simplest organisational structure and it can be alphabetical, chronological or general to specific order. *Grid information structure* is arranged in no particular order of importance. However, grid structure can be hard to follow unless users recognise the interrelationships between the pieces of information. *Hierarchical structure* is the most common way to organise complex navigational schemes. *Web structure* provides the user with free flowing, non-linear navigation. This structure allows users to explore Web links in an autonomous manner.

The navigation structure used in this research is considered to be Web navigation structure because it is a free flowing and non-linear structure.

According to Harper (1997), access and navigation are considered to be key design issues that need to be addressed. He finds that creating access to information, especially using hyperlinks, can create new meanings not previously considered possible. Consequently, using hyperlinks gives the users the opportunity to interact with information and therefore, gives the autonomy back to the user.

The navigation in this research is designed by developing two toolbars for the learning environment. The first toolbar is at the top of each page and it is designed to facilitate access to the different information concerning each unit in the course. The second toolbar is to the left side of each page and it was designed in order to facilitate access to the different sections in the learning environment such as course information, communication utilities etc. Furthermore, the two toolbars were developed in each page in order to avoid the use of frames, because some studies such as Hsiang (2000) found that students preferred to use a one-frame design rather than a two-frame design because it is easy to follow and less confusing, simple but effective. Moreover, he finds that information is straight forward on a one-frame page because it is considered by students to be easier to read and to understand than a two-frame page. In addition, he finds that one-frame design is easy to use for people who are less competent at using a computer.

6.4.3.3. Technical support

The course was designed to meet the needs of students, such as those from Egypt, who had no previous experience of using a Web-based learning environment. Therefore, provision of fast and reliable technical support was seen to be a key element in the design of the Web-based learning environment. Subsequently, a 'Help' section for the provision of technical support to the students was designed in order to provide them with the relevant technical information that they might need related to the learning environment.

The technical support in this research is provided through three main parts:

The first part is the learning environment tutorial namely "ITS Tutorial" (see appendix F (a) ITS Tutorial). This tutorial aims to give the students the essential technical information that they need in order to use the learning environment on a step by step basis.

The second part is the technical assistant form (see figure 28) that the students can fill in and submit in case they have any technical query regarding the learning environment.

The final part is technical contact which provides the students with the contact email for technical enquiries to be sent to. Accordingly, this form is designed to be easy to use and straightforward.

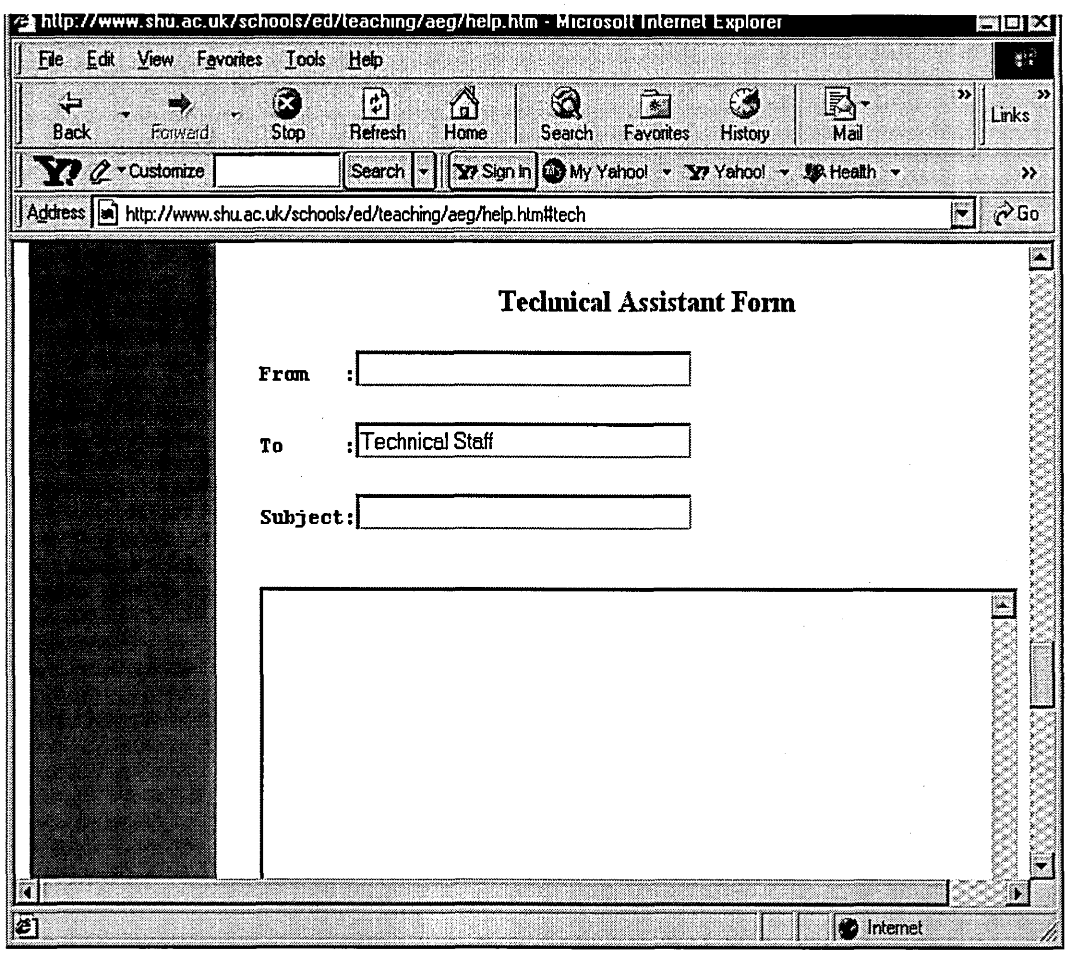

Figure 28. The technical assistance form.

6.4.4. Selecting and organising information resources

6.4.4.1. Web information resources

According to Harper (1997), providing access to information in different ways for different types of learners requires developers to employ a variety of devices such as metaphor, cognitive tools and search engines. Subsequently, the Web-based learning environment in this research included a wide range of information and learning resources. For example, the learning environment included links to Web resources and course documents (see appendix f section c Internet Tutoring System resources). In addition, the Web-based learning environment included a Web search tool that enables the students to search a group of search engines simultaneously.

The selection of the information and learning resources which are related to the use of the Internet in this research are based on a set of criteria. These criteria are described by Jolliffe et al. (2001) for selecting learning resources which are used in this study. These criteria can be summarised as follows:

- *"Identify the type of resource e.g. video clip, audio, text etc.*
- *Relate the content of the resource to the need of the learning event and review the resource against the appropriate learning objectives.*
- *Determine the pace of the materials in the resource; does it fit with the existing materials?*
- *Judge how recent the materials are.*
- *Assess the resource for both comprehension and readability, and compare it to the abilities of the learners.*
- *Determine any copyrights related to the materials."* p.78, 79

Since the information and learning resources which are used in this research included Web resources, it was seen to be important to evaluate the quality of the information found on these Websites. Accordingly, the quality of the information was evaluated in the light of the criteria determined by Wilkinson et al. (1997). These criteria are: site access and usability, resource identification and documentation, author identification, authority of the author, information structure and design, relevance and scope of content, validity of content, accuracy and balance of content, navigation within the document and quality of the links.

The information and learning resources in this research are categorised into two main categories. The first category is Internet resources, which include the resources that are related to the general use of the Internet such as the use of email, search engines etc. The second category is educational resources, which include the resources that are related to the educational use of the Internet such as the different resources that aim to integrate the use of the Internet into the school curriculum (see figure 29).

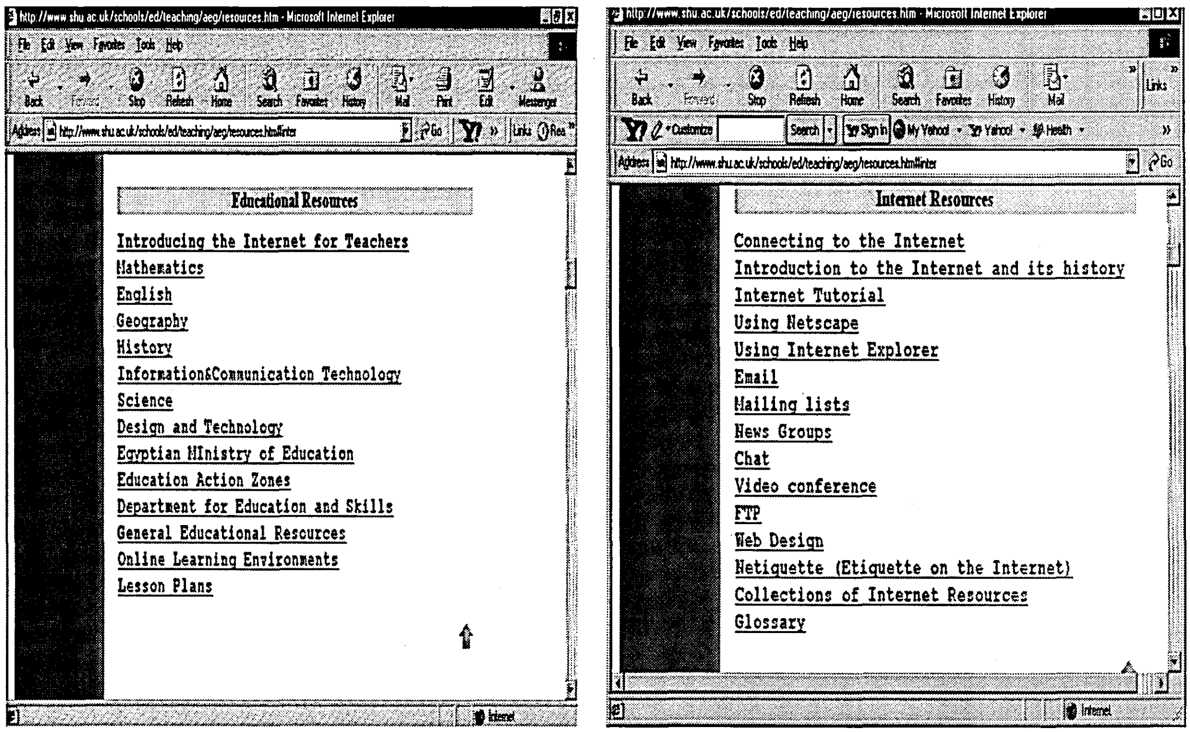

Figure 29. The information resources categorised into Internet resources and educational resources.

6.4.4.2. Information resources search tool

Hannafin et al. (1999) distinguish different types of tools for supporting the learning environment. Among these tools, they identify seeking tools and collection tools. Seeking tools help the learner to locate and select relevant information, while collection tools are used to gather resources for individual purposes. Accordingly, a tool was developed in order to enable the students to search the Web for information (see figure 30). This tool was integrated into the design of the Web-based learning environment in order to give the students the opportunity to submit their search keywords to a group of search engines on the Internet. Moreover, direct links to the different search engines on the Web were provided in order to give the students the freedom to search each search engine individually according to their own search strategies.

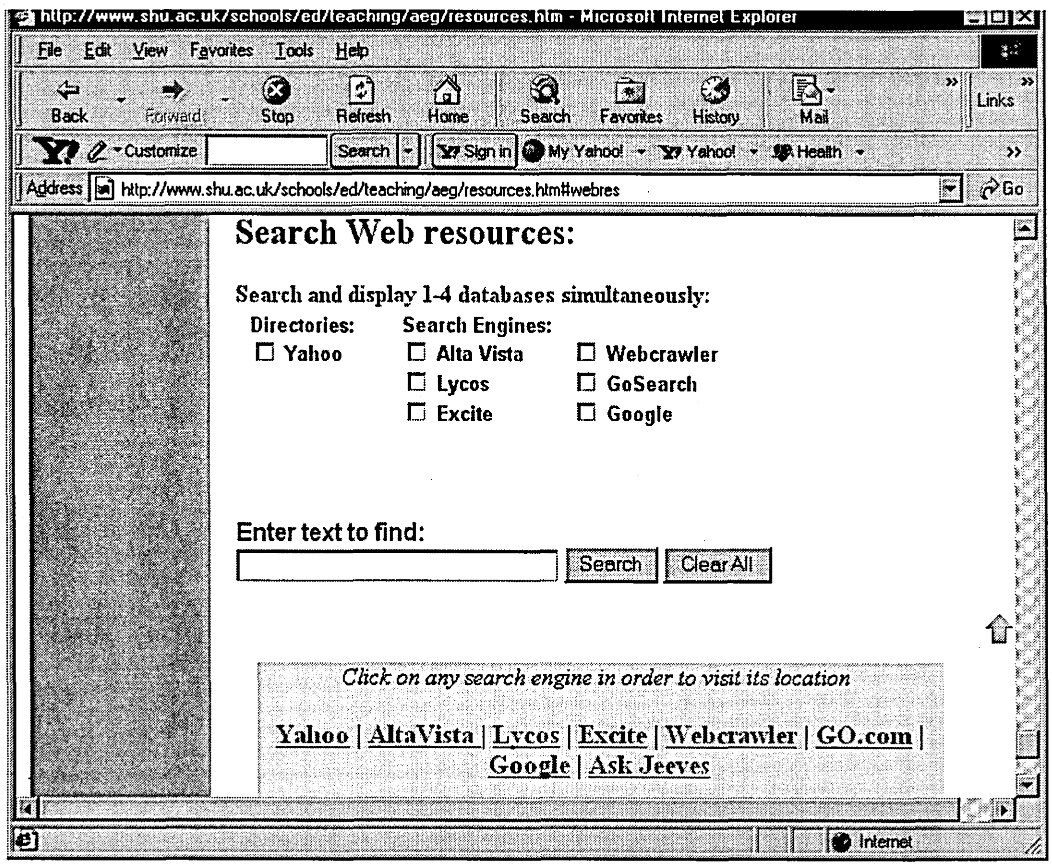

Figure 30. The Web resources search tool.

6.4.4.3. Course documents and course information

In addition to the information and learning resources which are available on the Web, the learning environment provided the students with links to the different course documents. Subsequently, the students could download these documents and read them offline. Furthermore, the learning environment provided the students with the different course information in a special section for this purpose called "Course Info". This section provided the students with the different course information such as the course theoretical background, developing teams etc.

6.4.5. Enabling and providing communication tools

According to Passerini and Granger (2000), a networked environment needs to provide access to several channels of communication such as student-to-content, student-to-student, student-to-instructor but also student-to-other-hypermedia content and student-to-other-instructors. Therefore, the Web-based learning environment was designed in order to provide a wide range of communication tools. Consequently, the design of the learning environment provides conversational tools as means for conversation, communication and collaboration between the students. These tools are considered to be essential elements in constructivist learning environments according to Jonassen's model (1999). Based on his model, constructivist learning environments should provide access to shared information and shared knowledge-building tools to help learners collaboratively construct socially shared knowledge. He also states that constructivist learning environments can support communities of learners. Therefore, when learners collaborate, they share the same goal, requiring shared decision-making, 'consensus' building activities, etc.

Passerini and Granger (2000) also note that the interaction and collaboration opportunities, opened by communication technologies to students, facilitate the transition to a richer learning environment. Moreover, they identify asynchronous and synchronous interactions on the network as the main instructional components of the virtual classroom. Furthermore, Hannafin et al. (1999) describe, in their model of an open learning environment, communication tools as tools for supporting the learning environment. They also categorise the communication tools into synchronous communication tools and asynchronous communication tools. While synchronous communication tools support real-time interaction among participants, asynchronous communication tools allow for extensive exchange of ideas and or resources, but do not rely on the simultaneous availability of all participants. This distinction is also made by Federico (2000), as he distinguishes two types of distance education. Synchronous instruction requires the simultaneous participation of all students and instructors and interaction is conducted in `real time', e.g. computer videoconferencing. On the other hand, asynchronous instruction does not require the simultaneous participation of all students and instructors. Students do not need to be gathered together in the same location at the same time, e.g. electronic mail, discussion boards etc.

The distinction between synchronous and asynchronous distance education is also described further by O'Malley and McCraw (1999) based on the two-dimensions of time and place. They summarise these dimensions in table (19) below. According to their instructional mode matrix, they describe the different cells as current primary delivery (synchronous and same), distance learning (synchronous and different), on-line (asynchronous and different) and recorded (asynchronous and same).

Table 19. Instructional Mode Matrix.

		Place	
		Same	Different
Time	Synchronous	Current Method	Distance Learning
	Asynchronous	Recorded	On-Line

Although they describe online learning as the kind of learning that takes place in different time and different place (asynchronous and different), the design of the learning environment in this research is seen to be integrating different modes and tools of instruction in order to support and facilitate the teaching and learning processes e.g. the design integrates synchronous, asynchronous, different place and same place methods. Two main categories of communication tools can be distinguished in this research. These are synchronous communication tools and asynchronous communication tools.

Synchronous communication tools were designed in order to facilitate and support real-time interactions such as student-student interaction and student-teacher interaction. These tools included instant messaging, chatting and computer videoconferencing. Subsequently, a number of tools were incorporated and integrated into the design such as 'MSN Messenger©' and 'NetMeeting©'. In addition to these tools, face to face interactions were used especially during the orientation sessions and the workshops in order to support the students' learning especially those students who lacked prerequisite knowledge and skills. Furthermore, in-classroom discussions were used in order to discuss and highlight the different issues that might emerge from using a Web-based learning environment.

Asynchronous communication tools were also used in order to facilitate the communication between the students. These tools included the use of email and a discussion forum namely 'Discuss©' (see figure 31), which was incorporated into the design. This discussion forum provided the students with some suggested topics for discussion such as the use of the Internet in education and the different issues related to it. In addition, some discussion areas were devoted to updating course information such as the course announcements area.

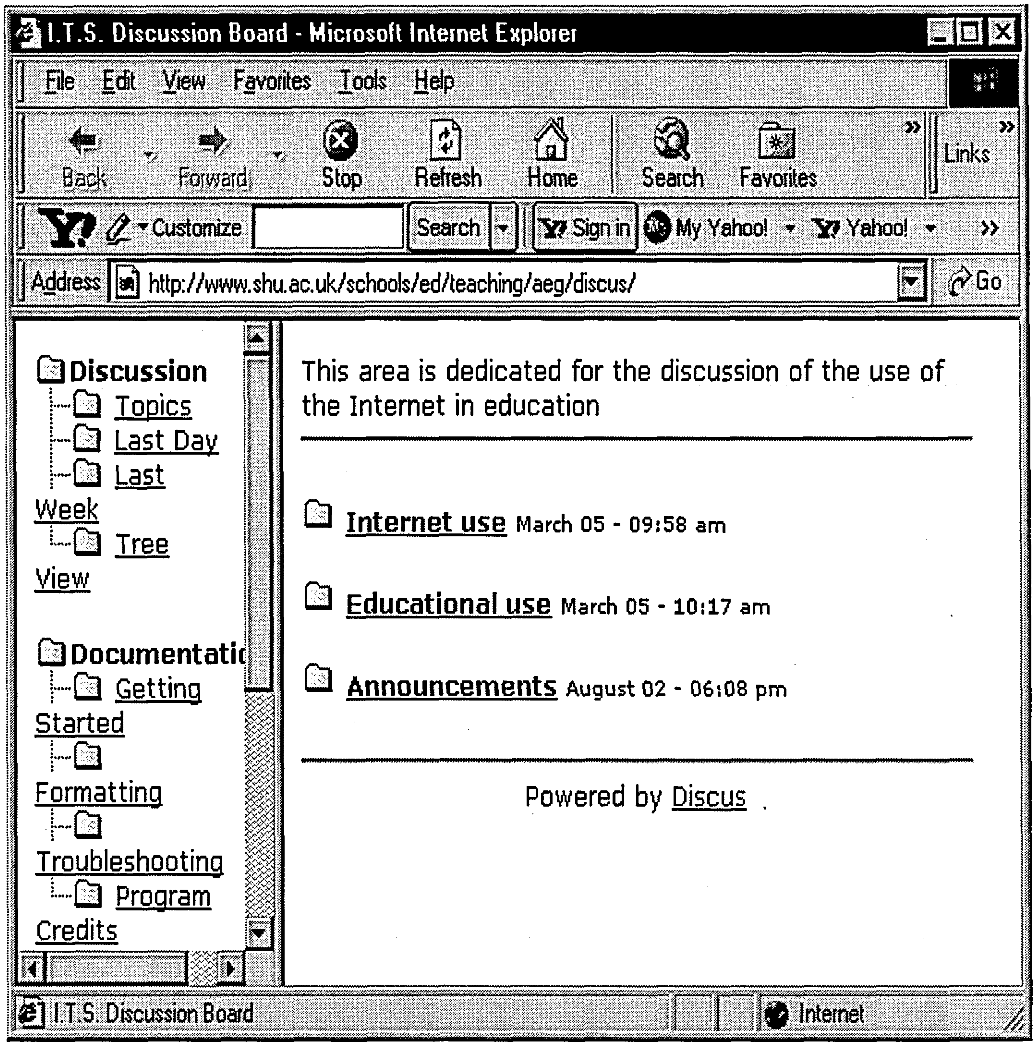

Figure 31. The main discussion areas in the discussion forum 'Discuss©'.

A big advantage of using a discussion forum is that the messages that are sent by the students and teachers can be kept for future reference and for some students to be able to catch up with the discussion. For example, the students can use them to find links to different information resources which have been sent by their peers.

Furthermore, some students can use previously sent messages in order to take the conversation further while they are progressing in the course. Further advantages of using both synchronous and asynchronous discussion are also seen to be in line with the findings of Kim and Kim (2001). They found that group learning using the Internet enabled the students to undertake a high level of critical thinking, problem solving and successful co-operative learning. They also found that through the synchronous and asynchronous discussions, the students could approach the problems more freely and come to their decisions more easily. Moreover, the asynchronous discussion through the Web discussion forum is more appropriate for lessons that require critical thinking. In contrast, the synchronous discussion through chatting, like a face-to-face discussion, is more suitable for immediate problem-solving. Accordingly, face to face discussions and demonstrations were used in order to orient and facilitate the students' use of the different discussion tools in order to use them effectively. Furthermore, guidelines for using the communication tools were developed for the students in order to help them in using these tools (see appendix F (e) guidelines for using communication tools). The students were also given the opportunity to read these guidelines online and/or to download them from the Web-based learning environment and print them out for future reference.

6.4.6. Designing course activities

Authentic activities are seen by Jonassen (1999) to be an essential element in constructivist learning environments. Henze and Nejdl (1997) also consider the use of authentic activities in the learning process as a critical element in the design of constructivist learning environments.

Jonassen (1991) identifies authentic activities as activities that have real-world relevance and utility, that integrate those activities across the curriculum, that provide appropriate levels of complexity and that allow students to select appropriate levels of difficulty or involvement.

The influence of authentic activities on the learning process is described by Henze and Nejdl (1997) in the following:

> *"Authentic activities shift part of the ownership for learning and performance from the teacher to the student. While working on their tasks in real-world situations, students have to learn and apply the required skills at least partly by themselves. This does not allow learners to passively consume a lecture without critical reflection, learned knowledge and skills are needed to perform the task which stimulates the students to think about the arising problems and techniques."* p2.

In this study, the course activities were designed in the light of the course objectives (see appendix F (b) ITS activities). Therefore, the course activities were categorised according to the main five units in this course.

Each unit in this course included a number of activities are related to the unit's objectives. Therefore, the degree of complexity of the activities was influenced by the degree of complexity and the structure of each unit. Subsequently, the degree of complexity of the activities was increased gradually from one unit to another according to progress in the learning process.

6.4.7. Designing and enabling the use of digital portfolios

Hackbarth (1997) states that evaluation of what students learn has both process and product components. He also highlights a number of tools that can be used in order to evaluate students' learning in Web-based learning such as observation and portfolios. Both tools were used in this research in order to evaluate the students' learning of the use of the Internet. Furthermore, the students were asked to fill in a section in the course evaluation form related to their 'self-evaluation' of their own progress in the course.

The evaluation of the students' progress and the learning outcomes was implemented in the light of the evaluation criteria highlighted by Hackbarth (ibid.). He identifies criteria for evaluating learning outcomes such as originality, complexity, coherence, inference, predictability etc.

According to Jonassen (1991), a portfolio of products, rather than a single product of learning, should be evaluated in a constructivist learning environment. This portfolio should describe either different student interpretations of the assignment or different stages in its development. Therefore, the evaluation in this research is designed in order to emphasise the evaluation of a portfolio of products rather than evaluating a single product. The evaluation process also emphasises the evaluation of the learning process by observing, monitoring and analysing the students' online activities. In order to evaluate a portfolio of products, digital or electronic portfolios were seen to be as appropriate tools for evaluating the learning products.

Lankers (1998) defines electronic portfolios as a purposeful collection of student work that exhibits the student's efforts, progress and achievements. According to Ray et al. (2001), electronic portfolios differ from traditional portfolios in that information is collected, saved and stored in an electronic format. They also allow students to demonstrate problem-solving and critical thinking skills using authentic and performance based assessment.

The digital portfolios in this research were developed in the light of the processes described by Barrett (1998). She outlines the different processes for developing electronic portfolios, which can be summarised as follows:

- Determine portfolio goals based on learner outcome goals.
- Determine and describe the assessment context.
- Determine and describe the audience for the portfolio e.g. student, parent etc.

- Determine content of portfolio items and the type of evidence to be collected.
- Determine which software tools are most appropriate for the portfolio context.
- Determine which storage and presentation medium is most appropriate for the situation.
- Gather multimedia materials that represent a learner's achievement and include them in the portfolio.
- Record student self-reflection on work and achievement of goals.
- Record teacher feedback on student work and achievement of goals.
- Organise the materials using hypermedia links between goals, student work samples and assessment,
- Record portfolio to appropriate presentation medium and store.
- Present portfolio to appropriate audience.
- Evaluate portfolio's effectiveness in light of its purpose and the assessment context.
- Depending on portfolio context, use portfolio evidence to make instruction/learning decisions.
- Develop a collection of exemplary portfolio artefacts for comparison purposes.

Based on these steps, a special section for digital portfolios was designed in the Web-based learning environment. This section includes three different parts or functions:

- The first part was designed in order to give the students the opportunity to upload their own learning products in the learning environment such as the Web pages that the students designed during the course (see figure 32). This part was designed to enable the students to upload different formats of files such as 'HTML' files, document files, images etc.
- The second part was designed in order to enable the students to link the different files that they already uploaded on the Web-based learning environment. This part aims to allow the course participants to view and share their own learning products and files. Moreover, the students can use this part in order to establish a link to an external Website that they see relevant to the course in order to share it with the other course participants.

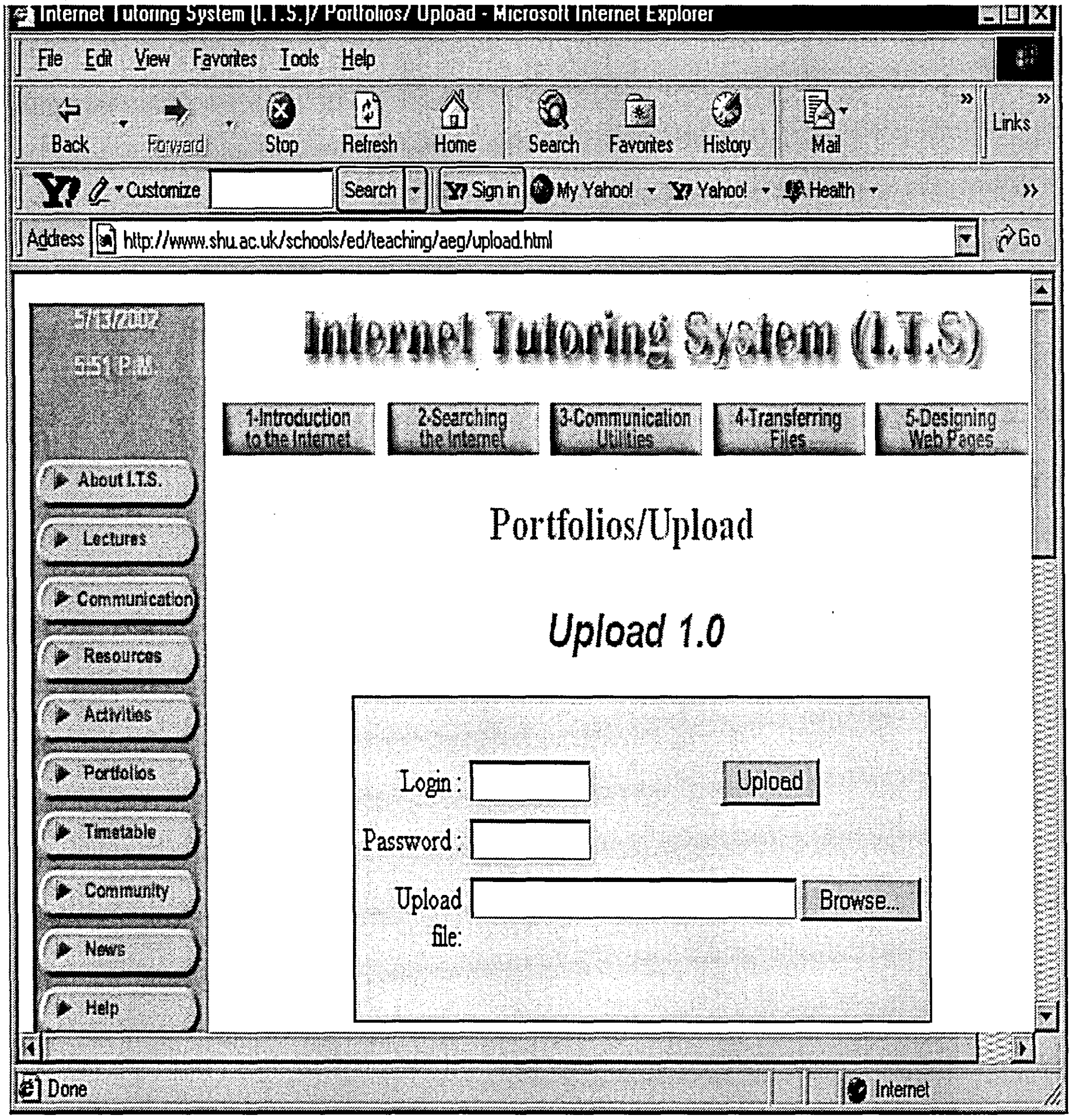

Figure 32. The uploading file screen in the portfolios section.

- The final part was designed in order to include links to the different course documents such as course objectives, course activities, etc. Therefore, the students can view and/or download these documents into their own computers in a 'Word' format. This section was developed in order to adapt to the different study patterns of the students, because some students were seen to prefer reading printed documents rather than reading them directly from the Web. Furthermore, having downloadable 'Word' documents is seen to be giving the students the chance to have a better and more organised print-out version of the information rather than printing it directly from the Web for their future reference.

6.4.8. Evaluation of the design of the Web-based learning environment

Kemp and Kemp (2000) distinguish between two types of evaluation, which are formative evaluation and summative evaluation. According to them, formative evaluation is the type of evaluation where improvements to a system under development can be determined. While summative evaluation is the evaluation which assesses the overall performance. According to Kennedy et al. (1998), the aim of formative evaluation is the refinement and improvement of a program or package while the aim of summative evaluation is to determine the impact and outcomes of a particular program or package. They also note that evaluation may be used for a variety of functions such as needs' assessment, refining goals, improving products or programs or estimating costs. In this research, the main function of the evaluation is to enhance and improve the design of the Web-based learning environment. Moreover, it aims to evaluate the effectiveness of the Web-based learning environment in relation to the students' learning of the use of the Internet.

Jolliffe et al. (2001) identify the formative evaluation as an essential step for designing Web-based learning. According to them, a formative evaluation is the step where the concepts, metaphors, ideas, graphics and all other aspects that might influence the learning process are reviewed by the various members of the team involved in the project. Therefore, any changes that might result from this review should be considered and incorporated into the design before the initial implementation.

In this research, the formative evaluation of the learning environment included a continuous testing of the learning environment throughout the different design phases, as some 'bugs' in the Web design occurred throughout the design process. For example, the format of the text on the authorware 'Dreamweaver' was not always the same as the one on the preview on the Internet browser 'Internet Explorer'. Therefore, the formative testing was seen to be necessary in order to find these 'bugs' and to alter or change the design to eliminate them. Both formative and summative evaluations were used in order to test the design and the effectiveness of the design of the learning environment. Accordingly, the evaluation of the design of the Web-based learning environment was conducted in three different stages.

The first stage of the evaluation is considered to be the prototype evaluation. Hackos and Redish (1998) identify one method for testing a prototype which is the use of observers in order to test the prototype and make note of any changes that should be made. This type of evaluation was used in this research in order to evaluate the initial prototype of the Web-based learning environment. This evaluation took place in the Centre for Multimedia in Education in the Learning and Teaching Institute at Sheffield Hallam University. It was conducted by two observers who critically navigated through the Web-based learning environment and made their notes on the different design issues. Several issues emerged from their observations such as the copyright issue that was related to the use of some icons on the design, changing some colours to make them more readable, etc. Furthermore, the observers suggested developing some guidelines and/or orienting the students to the use of the portfolio section.

The second type of evaluation used in this research is the field trial of the design. Jolliffe et al. (2001) consider conducting a field trial as an essential design step. They emphasise that a field trial should be conducted in real time with a small number of people working through the learning materials. Moreover, the field trial should be evaluated to determine what, if any, changes are needed to be made to the learning materials. Therefore, the field trial was conducted with a group of information and communication technologies (ICT) students in Year One of their Educational Studies course in the School of Education at Sheffield Hallam University. Several issues emerged from the field trial such as the need to develop a discussion forum especially for the Web-based learning environment, as the students in the field trial used the 'Blackboard' learning environment as a discussion forum.

The final evaluation stage was conducted with a group of Instructional Technology students in the Faculty of Specific Education, in Menofia University in Egypt. This stage is considered to be the summative evaluation of the design of the Web-based learning environment. Therefore, this stage aimed to look into the different aspects related to the Web-based learning environment. According to Jolliffe et al. (2001), a summative evaluation needs to determine the ability of the Web system to support the learner; the learning gained; the effectiveness of the learning environment and the effectiveness of the support offered to the learner. Accordingly, this evaluation stage looked into the course organisation, the course objectives, the teaching methods used to support students' learning, the learning process and the students' learning progress.

Chapter seven: Implementing the Web-based learning environment

7.1. Introduction

This chapter aims to discuss the implementation process of the Web-based learning environment in teaching and learning the use of the Internet. Subsequently, it aims to highlight the different phases of implementation of the Web-based learning environment. The implementation process in this study took place in two different phases.

The first phase was conducted with a group of Year One Education Studies students who were taking a unit entitled 'An Introduction to Information and Communication Technologies (ICT)' in the School of Education at Sheffield Hallam University. This phase was conducted in order to identify the different issues that might emerge from using a Web-based learning environment in teaching and learning the use of the Internet. This phase is considered to be part of the formative and ongoing evaluation of the design of the Web-based learning environment. Accordingly, this phase aimed to have students' feedback and critical reflections on the different issues that are related to the design of the Web-based learning environment. As a consequence, this phase influenced both the design and the implementation of the Web-based learning environment in the main phase.

The second phase of the implementation is considered to be the main implementation phase of the Web-based learning environment. Accordingly, it was conducted with a group of students who are studying Instructional Technology in the Faculty of Specific Education at Menofia University in Egypt.

This chapter focuses on the two different implementation phases in order to highlight the implications of the Web-based learning environment in teaching and learning the use of the Internet. A particular emphasis is given to the different teaching strategies that were used with both groups. Subsequently, this chapter also emphasises the integration of the different teaching strategies. Moreover, it emphasises the integration of the different tools and resources that are available on the Web in order to facilitate and support students' learning. Furthermore, the major issues that emerged from the implementation in both phases are highlighted.

As highlighted earlier in the design chapter, the learning environment is designed in order to give the students the opportunity to actively participate in the learning environment in ways that are intended to help them construct their own knowledge, rather than having the teacher interpret the world and ensure that students understand the world as they have been told (Jonassen, 1994). Harper (1997) also notes that the integration of technologies into the teaching and learning process offers instructors unique opportunities to individualise instruction, place learners in open ended student-centred investigations and for instructors to shift from their traditional instructor role to the role of mentor and co-learner. In order to shift the traditional role of the teacher, more control over the learning process should be given to the students. Stanton and Baber (1992) note that the use of hypermedia for education and training gives control to the learner by encouraging exploration. They also highlight the different advantages of a non-linear environment such as the way in which it allows for different levels of prior knowledge and encourages exploration.

Berge (1997) describes student-centred learning as a characteristic of online teaching. However, he also describes collaborative learning as one of the main characteristics of online teaching. Accordingly, he highlights two elements of collaborative learning. First, there is a shared knowledge among teachers and students. He describes this shared knowledge further as a 'shared authority' among teachers and students.

A second element in a collaborative environment involves students being invited to set specific goals for themselves by providing options for projects and other learning activities that capture different students' interests and learning goals.

According to Liu and Ginther (1999) in order to support and facilitate collaborative learning on the Web, the teacher should attempt to construct a supportive learning environment and provide online contact and assistance to all the students. This online contact and assistance includes two major types. One is the online peer contact between students and students. The other is the online contact between the teacher and students.

The Web-based learning environment in this research is designed in order to support and facilitate the online contact between the teacher and the students and between the students themselves. The online contact is supported by using a number of tools and resources such as email, discussion forums etc. Furthermore, this research takes into consideration the different types of Web-based learning support that are discussed by

Jolliffe et al. (2001). They highlight four basic categories of Web-based learning support which are made up of the following:

1. *"online materials- distributing learning materials;*
2. *computer-based training - drill and practice, simulations, computer-managed learning;*
3. *asynchronous communication - non-real-time interaction by people using the computer;*
4. *synchronous communication- real-time interactions by people using the computer."* p.43

Moreover, the different synchronous and asynchronous techniques and devices that are identified by Berge (1999) are also taken into account during the implementation of the Web-based learning environment. He notes that these techniques can be used for the different levels of cognitive skills. He summarises these techniques in table (20).

Table 20. The techniques of synchronous and asynchronous communication.

		Type of Communication	
		Synchronous	*Asynchronous*
Level of Performance	*Instructor Controlled*	- Lecture - Demonstration	- Assigned readings (hard- or soft-copy) - Audio/video taped - Demo and lectures - Mail (postal or email)
	Guided Learner Controlled	- Annotated problem-solving - Case study/self-contained	- Role play - Tutorials - Guided simulations
	Learner Controlled	- Original problem-solving - Open-ended case study - Interactive video - CBI	- Open-ended case study

In addition to these techniques, Ross and Schulz (1999) also describe some guidelines for the successful implementation of computer technology. These guidelines can be summarised in the following:

1- Educators should closely monitor -and mediate where necessary- all computer instruction.

2- Students should be asked to express their views toward computer assisted instruction.

3- Opportunities for group work should be given to those students who are hesitant to work on the computer alone.

4- To avoid isolating a certain learning style group, educators should continue to incorporate a number of different teaching strategies into their lessons. Therefore, if a particular student is unable to learn from the computer, instructors should provide alternative ways for the content to be presented.

Although these guidelines are for the general implementation of computer assisted instruction, they are seen to be relevant to the implementation of the Web-based learning environment in this research. Thus, these guidelines were taken into consideration in implementing the Web-based learning environment. Subsequently, a number of teaching strategies were integrated and incorporated with the Web-based learning environment. This integration aims to accommodate the different learning styles of the students. Relevant to this is what Clay (1999) suggested including opportunities for at least four different types of training in a Web-based training programme. These types include group sessions; one-on-one lab sessions; web-based tutorials; printed materials; list-servers and discussion sessions among peers. He also suggested that effective training programs must be designed to meet the needs of students with a variety of learning styles. While many students learn well from group training sessions, others do better with self-paced printed materials (Clay, ibid.).
According to Wilson (2000), in order to use the Web effectively for learning, three core principles should be taken into consideration. These principles include providing access to rich sources of information; encouraging meaningful interactions with content and bringing people together to challenge, support, or respond to each other. These principles were taken into account during the implementation of the Web-based learning environment in order to use the Web as effectively as possible in teaching and learning.

An essential part of the implementation is seen to be the evaluation of the students' learning. As a consequence, it is seen to be important to identify means for evaluating students' learning.

According to Young (1993), traditional means of assessment should be replaced by cognitive tasks and assessments that can focus on the processes of learning, perception and problem solving. In addition, assessment should become an integrated, ongoing, and seamless part of the learning environment. Consequently, in this research, a number of authentic activities were integrated in the design of the Web-based learning environment in order to evaluate the students' learning. Furthermore, Cunningham (1991) notes that in order to assess a member of the group, the literature on group work provides a way for this. The teacher should gather as much information as possible, observe the students, talk to them, talk to other teachers, read the students' class diaries, videotape the students and show the tapes to others and give them many tasks to do both as individual and in groups. Observations were used in this research with both groups of students in the two trial phases in order to evaluate the students' learning. Furthermore, questionnaires and interviews were used in order to evaluate the students' learning in the main trial phase.

In the following sections, a discussion of the two implementation phases is made in order to highlight the different techniques, tools and resources that were used with both groups of students. Furthermore, this discussion aims to outline the main issues that emerged from the two different trial phases.

7.2. Initial trial phase (Sheffield Group)

In this research, the initial trial is seen to be an important phase for the ongoing and formative evaluation of the Web-based learning environment and its influence on the teaching and learning the use of the Internet. Accordingly, the initial trial phase took place with a group of students in the first year in the School of Education at Sheffield Hallam University. This group consisted of ten students in the first year of their BA course in Education Studies. This trial phase was implemented within the context of the unit entitled 'Introduction to Information and Communication Technologies (ICT)'. The students who are studying this course are usually required to take this unit during their first year. This unit aims to introduce the students to a range of information and communication technologies that can be used in education, such as the Internet. As a result, the objectives of that unit are seen to be relevant to the objectives of the Internet curriculum in this research.

The initial trial phase was conducted with this group of students in order to introduce them to the use of the Internet and its different uses in education. Accordingly, a session was organised in order to introduce the students to the Internet.

This initial trial was conducted according to the Sheffield Hallam University research ethics guidelines and issued by the Research Ethics Committee (2000). Subsequently, all the students were informed about the research trial in advance and they have been given the opportunity to decide whether to participate in this trial or not.

In this trial phase some research instruments were used in order to collect data such as observations and the record of the students' online discussions.

During this trial phase, there was a need to create an online discussion forum in order to give the students the opportunity to discuss the main issues that are related to their course. However, the Web-based learning environment developed in this research 'Internet Tutoring System' at this time did not include a discussion forum. As a consequence, a discussion forum was created for the students in another Web-based learning environment called 'Blackboard'. This discussion forum was integrated into the session in order to facilitate and support the students' discussions during the course. In addition, the students were guided to use the resources and tools in the 'Internet Tutoring System'. Therefore, a message was sent to the students in order to give them a direct link to the 'Internet Tutoring System' as shown in figure (33) below.

Internet Tutoring System

The following is a location that you can use in order to learn how to use, search, FTP and design for the Web.

http://www.shu.ac.uk/schools/ed/teaching/aeg/its.htm

Figure 33. The link to the 'Internet Tutoring System'.

At the beginning of this trial, an introduction to the Internet was given to the students. This introduction included the following:

- A demonstration of the use of Web browsers such as 'Internet Explorer' and 'Netscape Navigator'. An emphasis was given to the use of 'Internet Explorer' as most of the students are using it across the University.
- An orientation to the 'Internet Tutoring System' was also given to the students in order to enable them to use it to facilitate and support their own learning about the Internet. This orientation also aimed to introduce the students to the different tools and resources that are provided by the 'Internet Tutoring System'.

Following this introduction, all the students started to work individually and in pairs on the Internet. During this stage, they had the opportunity to work with their peers in order to search the Internet for information. It was noticed during this stage that most of the students were familiar with the use of the Internet and with the use of 'Internet Explorer'. However, some students needed tutor support in order to identify the different features that are related with the use of the Internet and 'Internet Explorer' such as the use of 'search engines', changing browser preferences etc.

Following the orientation stage, the students were guided to the activities section in the 'Internet Tutoring System' and they were asked to carry out some of these activities. The session activities are mainly part of unit one in the Internet curriculum. Therefore, the students were asked to carry out the following activities during the session:

1- Create a new 'bookmark' folder under your name, and add a Web site to it.

2- Use 'Windows Explorer' to create a Web resource folder for yourself.

3- Save an image and a file from the Web to your own floppy disk.

As highlighted earlier, the students used the Web-based learning environment 'Blackboard' as their main discussion forum for this session. Therefore two main discussion forums were established for the students. These two discussion forums were created in order to give the students the opportunity to discuss the different issues related to the course. These discussion forums also aim to maintain and facilitate the discussions between the students themselves and between the students and the teacher.

The discussion forums were established in the 'Communication/Group Pages/Education Studies/Group Discussion Board' area, and they were entitled 'Web Educational Use and Experience and 'Netiquette' (see figure 34 for examples of the early stages of this discussion).

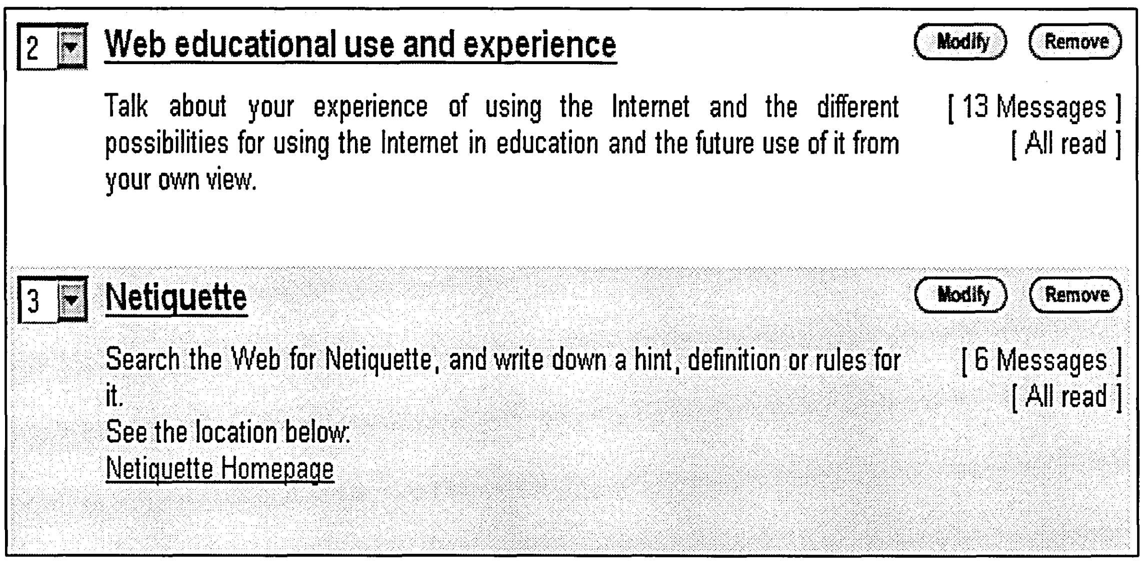

Figure 34. The two main discussion forums during the initial trial phase.

The following section outlines the main discussions by the students during the trial which took place in the two main discussion forums.

The first discussion forum is related to the educational use of the Web. In addition, this discussion forum aims to give the students the opportunity to discuss their own experiences of using the Internet. Therefore, the students were asked to talk about their own experiences of using the Internet and the different possibilities for using the Internet in education. Several messages were sent by the students concerning these issues (see figure 35).

SHOW OPTIONS

the internet	Helen	Thu Oct 4 2001 11:45 am
MY EXPERIENCE OF THE WEB	Amjad	Thu Oct 4 2001 11:45 am
⊟ web educational use and experience	Sarah	Thu Oct 4 2001 11:46 am
Re: web educational use and expe...	Alice	Thu Oct 4 2001 11:59 am
Re: web educational use and expe...	Tutor	Thu Oct 4 2001 12:15 pm
The web	John	Thu Oct 4 2001 11:50 am
ICT	Alice	Thu Oct 4 2001 11:55 am
Web education	Diana	Thu Oct 4 2001 11:59 am
Yahoo link	Amjad	Thu Oct 4 2001 12:01 pm
My experience of the net	Mark	Thu Oct 4 2001 12:01 pm
the web	Susan	Thu Oct 4 2001 12:05 pm
web use for education, part 2	Sarah	Thu Oct 4 2001 12:29 pm
ICT WEB EXPERIENCE	Sue	Wed Nov 14 2001 2:05 pm

Figure 35. The different threads that were sent by the students concerning the educational use of the Internet.

Most of the students were active during the discussions and all the students participated in the discussions either by sending messages and/or by responding to them. An example of the students' discussions can be seen in figure (36) below.

Current Forum: Web educational use and experience
Read 17 times
Date: Thu Oct 4 2001 11:46 am
Author: Sarah
Subject: web educational use and experience
I think that as today's society becomes more computer-oriented it is important that students are given the opportunity to use computers from an early age. There are many educational websites available for teachers to research, as well as resources available on the internet for them to use in the classroom, which is a good idea. My own experience of the internet has been good so far. The DFEE website isn't very good, but the National grid for learning is useful, as is the Times website, because here you can catch up on the news of the day without having to buy a paper.

Figure 36. An example of the students' discussions of the educational use of the Internet.

The role of the tutor at this stage of the trial is seen to be more as a mentor as highlighted by Wang (2001). Subsequently, the tutor role is to facilitate and support the students' discussions during the course. The tutor also needs to participate - where necessary- in order to guide and support the students' learning. Furthermore, the tutor should maintain the discussion and make sure that none of the students is left behind i.e. all the students have actively participated.

The second discussion forum was related to issues involving 'Netiquette', which is the etiquette or the different rules and/or guidelines that are related to the use of the Internet. Accordingly, the students were asked to search the Web for 'Netiquette', and find out the different definitions, rules and guidelines that are related to it. Some Web resources which are related to 'Netiquette' were provided for the students to use in the resources area in the 'Internet Tutoring System'.
Figure (37) shows an example of the students' postings for the different issues that are related to the 'Netiquette'.

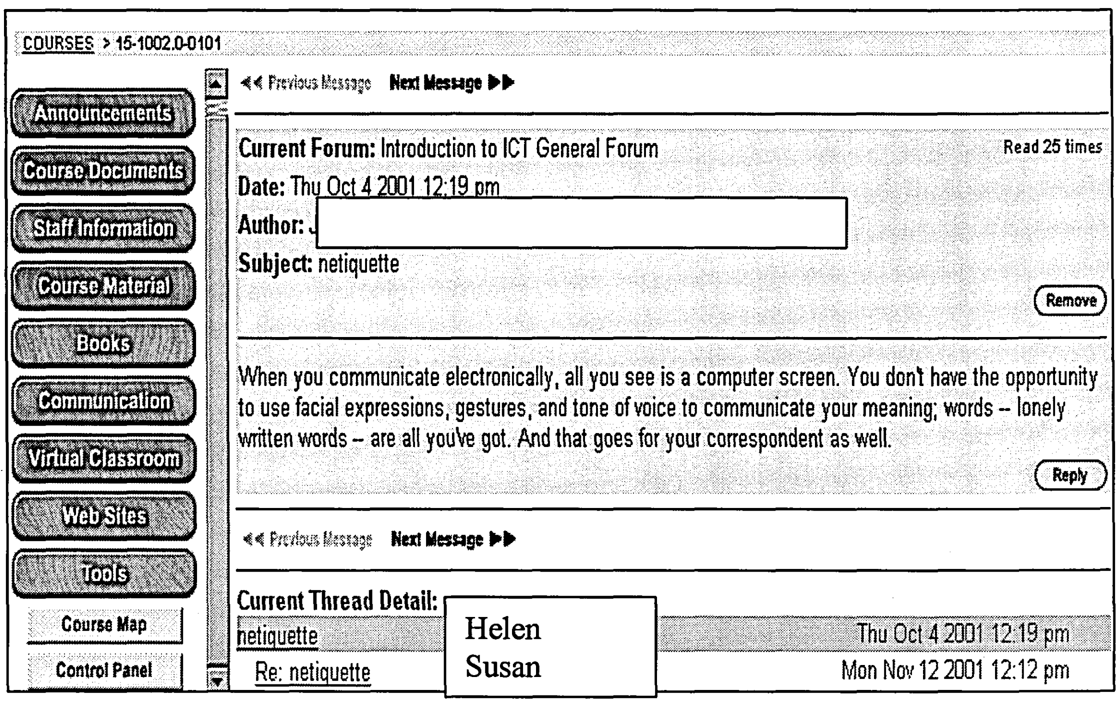

Figure 37. An example of a student message concerning 'Netiquette'.

During the session, a videoconference meeting for the students with the 'unit leader' was arranged in order to give the students the opportunity to experience the use of videoconference. Furthermore, this meeting aimed to give the students the opportunity to identify the different communication facilities that can be offered by the Internet and which can be used in teaching and learning.

The students reacted very positively to this experience because most of them did not have experience of the use of Web videoconferencing. As a result, the students were very enthusiastic and keen to explore the different features of the videoconference.

Summary of the initial trial outcomes

It was very important to conduct this initial trial on a small scale in order to avoid any technical 'bugs' that might appear in the system during its use and in order to observe the way in which students usually learn from the Web-based learning environment. Accordingly, the importance of giving the students the opportunity to use a range of learning resources was noticed. When the students had more than one learning resource about the same aspect or topic, they browsed and searched through these resources. Subsequently, they selected the learning resources that they found most relevant to their own goals. Furthermore, the students were searching the Internet according to their own search strategies such as using Web links, 'search engines' etc.

During this trial phase, the students were seen to be learning using the following strategies and/or methods:

- Searching and browsing online resources and hence supporting their own learning by finding the relevant information themselves.
- Online discussion. This was seen to be important in many respects such as the way in which the students can discuss their different views and ideas about the topic and hence enrich their own knowledge and share their own experiences. Furthermore, students often quoted some material from the Web and referred each other to the different Websites that were relevant to the discussion topic.
- Having hands-on experience helped the students to explore the different features that are offered by the Internet.

- Implementing the different learning activities which were related to the course which led to keeping them active and involved in the learning process most of the time.

The implementation of the initial trial phase led to some development in the Web-based learning environment. During the use of the learning environment, some technical 'bugs' had emerged. The main technical 'bug' appeared when the system was used on the instructor computer. Since this computer has a larger screen, some changes to the system layout occurred. Subsequently, this led to changing the system layout to be suitable for different sizes of screens and in order to avoid this 'bug' happening in the future.

During this session, the importance of the students' online discussions highlighted the importance of developing a discussion forum in the 'Internet Tutoring System'. Accordingly, a synchronous discussion tool and a asynchronous discussion tool were integrated in the Web-based learning environment in order to facilitate the students' discussions. A videoconference element namely 'Netmeeting©' was also integrated into the learning environment in order to facilitate the use of synchronous discussions. Furthermore, asynchronous discussion was integrated in the design by using the discussion forum 'Discuss©'.

7.3. Main trial phase (Menofia Group)

The main trial phase was conducted over a four day period between Monday 4^{th} of March 2002 until Thursday 7^{th} of March 2002. This trial phase took place in two different places. The first day of the trial took place in the Technological Development Centre in Menofia in Egypt, while the last three days of the trial took place in 'Susan Mubark' Prep-school in Menofia in Egypt. The preparation for the final trial was made in collaboration with the Technological Development Centre in Menofia. Accordingly, a series of meetings were held with the staff who work in the centre in order to arrange for the trial. Several issues were discussed during these meetings such as the facilities that the centre could provide, and the composition of the group of students to be involved. The arrangements also included testing the internet connections, installing the Web camera software and checking the software required on all computers. Moreover, a piece of software called 'Easylingo' was installed on the computers in order to assist the students in translating difficult words of the English language into Arabic. Furthermore, the 'Internet Tutoring System' was installed on the computers in order to make it available for the students. Hence, the students could use it offline if they were unable to connect to the Internet. When the timetable for the course was agreed, a group of students was selected from amongst the students in the Instructional Technology Department in the Faculty of Specific Education in Menofia University in Egypt. The students in this department are educated to be Instructional Technology Coordinators in Egyptian schools. The group consisted of eighteen students from different years across the department. The students were at the Faculty of Specific Education (Years Two, Three and Four). The students were selected from these years in order to ensure that they had sufficient knowledge and skills in using the computers. Therefore, no students were selected from Year One because most of them were not competent in using computers which is a prerequisite for using the Internet. A range of methods was used in order to collect data from the trial. For example, the use of two observers (the researcher being one of them), field notes, interviews and questionnaires (see chapter three on research methodology).

The following section includes a discussion of the different characteristics of the student in the Menofia group. These characteristics include the students' gender, year and learning styles.

7.3.1. Students' characteristics

This section provides an overview of the characteristics of the students who participated in Menofia group in Egypt. These characteristics include the students' gender, students' years and students' preferred learning styles.

7.3.1.1. Gender

In the final trial in Egypt, the group of students consisted of fourteen male students and four female students. It can be seen that there is an imbalance between the number of male students and the number of female students who participated in the final trial. This imbalance was not intended; rather it is a consequence of the admission policy in the Department of Instructional Technology in the last few years which limited the number of female students studying in this department. Although this policy has changed, its influence on the number of females' students can be seen in table (21) later in this section. This highlights the fact that the majority of female students (three out of four female students) who participated in this trial are at Year Two, while only one female student is in Year Three and no female students can be found in Year Four.

7.3.1.2. Years

The students were selected from three different years, i.e. Year Two, Three and Four, in order to ensure that they had prerequisite knowledge and skills. No students were selected from Year One because they would not have prerequisite knowledge and skills for use of the computer. The majority of students (55%) who participated in the final trial were in Year Four, while 17% were in Year Three and 28% in Year Two. As the students involved were in three different years, their ages ranged from 17-21 years old. The influence of the students' years on their learning outcomes is discussed later in chapter 'eight' on the discussion.

7.3.1.3. Students' preferred learning styles

Some studies such as Federico's (2000) and Hu and Chen (2000) find that students' learning styles can affect on the way they perceive knowledge. Ross and Schulz (1999) note that certain students may only achieve through selected instructional methods (e.g. CAI, whole-group instruction etc.) and that matching can significantly improve academic achievement. Clay (1999) also finds that training programs should be designed to meet the needs of the students with a variety of learning styles. As highlighted earlier in the literature review chapter, the findings of the studies by Ellis et al. (1993); Stanton and Baber (1992) and Kraus et al. (2001) emphasise that hypermedia and Web-based learning environments have potential to be rich learning environments that provide a variety of tools and opportunities that accommodate the different learning styles of the students. Ross and Schulz (1999) also found that the use of information and communication technologies has the potential to accommodate the various learning styles of the students. As highlighted earlier in chapter six on the design, the Web-based learning environment was designed to accommodate the preferred learning styles of the students. Accordingly, the suggestions and principles identified by Wageeh and Hitendra (1999); Sadler-Smith (1996) and Liu and Ginther (1999) were taken into account in this study in order to accommodate the preferred learning styles of the students. Table (21) highlights the preferred learning styles of the students according to Kolb's (1981) learning style inventory. Accordingly, it can be seen that the group of students who participated in the final trial in Egypt have a wide range of preferred learning styles. This group included six students who were "convergers", three who were "accommodators", seven who were "assimilators" and two who were "divergers".

Table 21. Summary of the different characteristics of the students.

Student ID	Gender	Year	Preferred Learning Style
Mohamed	M	4	Converger
Ali	M	4	Accommodator
Hussein	M	4	Assimilator
Ahmed	M	4	Converger
Mostafa	M	2	Assimilator
Tarek	M	3	Assimilator
Mona	F	2	Converger
Asmaa	F	2	Assimilator
Nadeen	F	3	Accommodator
Azaa	F	2	Diverger
Fouad	M	4	Converger
Amer	M	4	Assimilator
Omar	M	4	Converger
Monir	M	2	Accommodator
Farid	M	3	Converger
Yosef	M	4	Assimilator
Khaled	M	4	Diverger
Noor	M	4	Assimilator
Total 18 students	4 Female 14 Male	10 at Year 4 3 at Year 3 5 at Year 2	6 Converger 3 Accommodator 7 Assimilator 2 Diverger

7.3.2. Students' levels of ability of computer use

This section provides an overview of the students' existing knowledge and skills on computer use before the trial. The basic knowledge and skills on computer use considered to be prerequisite for using the Internet include using keyboard and mouse and the 'Windows' system in general.

According to Al-Mohaissin (1997), the lack of computer knowledge and experience among teachers in developing countries could create a serious difficulty for the introduction of computers into subject teaching. Jonassen (1997a) also emphasises that there is need to decide if the students possess prerequisite knowledge or capabilities for working on the problem that are identified. Accordingly, the identification of the students' prerequisite knowledge and skills is considered to be an essential process for the implementation of the Internet curriculum. This process aims to identify the students' levels of computer use prior to the course. The identification of the students' level before the course aims to find out whether the students possess prerequisite knowledge and skills or not. The analysis of data obtained from the training needs form indicates that eighteen out of eighteen students consider themselves capable computer users. During a discussion before the beginning of the course, the students confirmed that they have the basic knowledge and skills for using the computer such as using the keyboard, mouse and the 'Windows' system in general. However, the students' levels computer use varied from beginner level to advanced level (see figure 38).

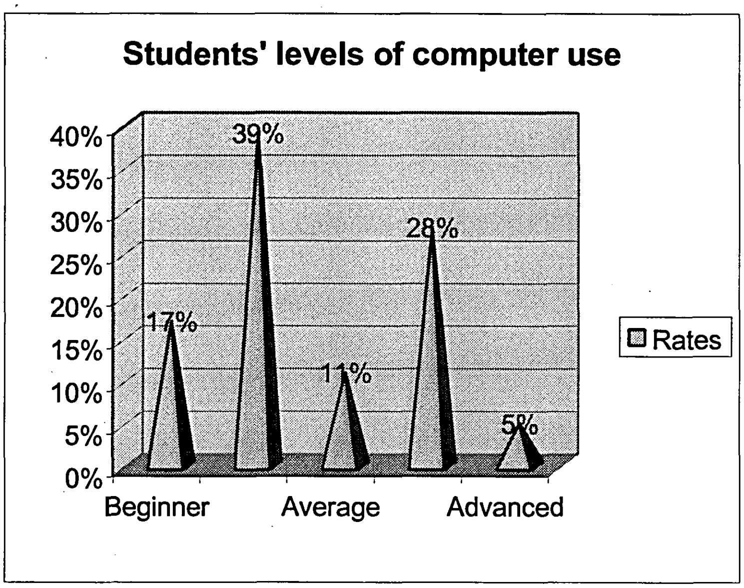

Figure 38. The levels of the students' computer use.

As illustrated in figure (38), 44% of the students consider their levels of computer use as average or above level, while 56% of the students consider their levels of computer use below the average level. Although these finding indicate that the students have the essential knowledge and skills for using the computer, the majority of the students are seen to be lacking confidence in their own levels of computer use. As a result, the students approached the course on the use of the Internet with some fears. These fears were also noted by the external observer who noted that:

> *"Although the students were very enthusiastic about the course, a few of them were afraid of not having enough information about the use of the Internet. They felt fear for several reasons such as their ability to attend the whole course and their ability to cope with the course. However, once the course started, their fears started to calm down."*

These findings are consistent with the findings of a study by Hackbarth (1997) who found that:

> *"Students approach the Web with eager anticipation and fear, knowing that it is at the cutting edge of technology used by their most progressive peers and by successful adults."* p.60,61

Furthermore, Perrin and Mayhew (2000) note that for some students, Internet technology might be frightening at some stages especially at the beginning of the course. It was decided to look into the relationship between the students' year (i.e. Year Two, Three or Four) and the students' levels in using the computer. However, the correlation coefficient value is 0.194912 which indicates that there is no relationship between the students' years and their levels in using the computer.

7.3.3. Students' levels of ability in the use of the Internet

This section highlights the students' levels of ability in the use of the Internet before the trial. In addition, they highlight the various resources (e.g. books, training courses, friends etc.) and places (e.g. home, school etc.) that the students used in order to learn the use of the Internet.

It was decided to identify the students' levels of ability in the use of the Internet. Accordingly, the students were asked to indicate whether they used the Internet before the course or not and what were their own levels in using the Internet. This aims to identify the students' entry levels of using the Internet in order to highlight the influence of this factor -if any- on the students' learning of the use of the Internet. The relationship between the students' entry levels of Internet use and their learning outcomes will be discussed in chapter 'eight' on discussion. Despite the limited facilities available for the students, a large percentage of the students used the Internet to some extent before the course. As illustrated in figure (39), 67% of the students had used the Internet before the course. However, during a discussion before the course, several of the students who used the Internet previously emphasised that they only used it once or twice and some of these students stated that they had only seen their friends using it. Furthermore, 33% of the students indicated that they had not used the Internet before the course.

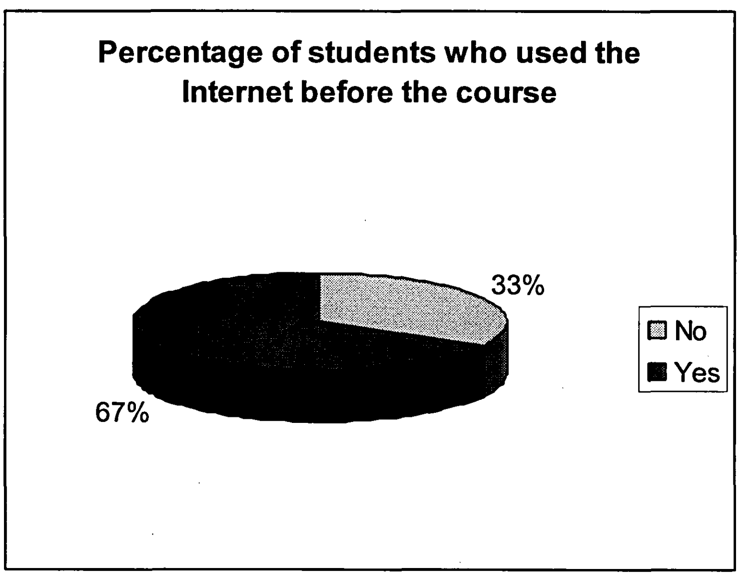

Figure 39. The percentage of students who used the Internet prior to the course.

These figures reveal a fact that there is a major difference between the students in the two trial groups in relation to the differences in the students' entry levels in computer and Internet use. For example, the total number of the students in Sheffield group used the computer and the Internet prior to the trial either at home or at school more intensively than the students in Menofia group. This is a reflection of the differences in the cultural and educational settings between the two groups. The major difference arises from the fact that the majority of Egyptian students do not have the opportunity to use the computer and the Internet in schools and the majority of the students do not have their own computers at home. Although a large number of the students used the Internet before the course, their levels in using the Internet varied. For example, the majority of the students (56%) considered their level in using the Internet as beginners or near the beginners' level, while 11% of the students considered themselves as average users (see figure 40). While all the students' levels of Internet use were average or below, most of them expressed the need to learn the use of the Internet from the beginners' level.

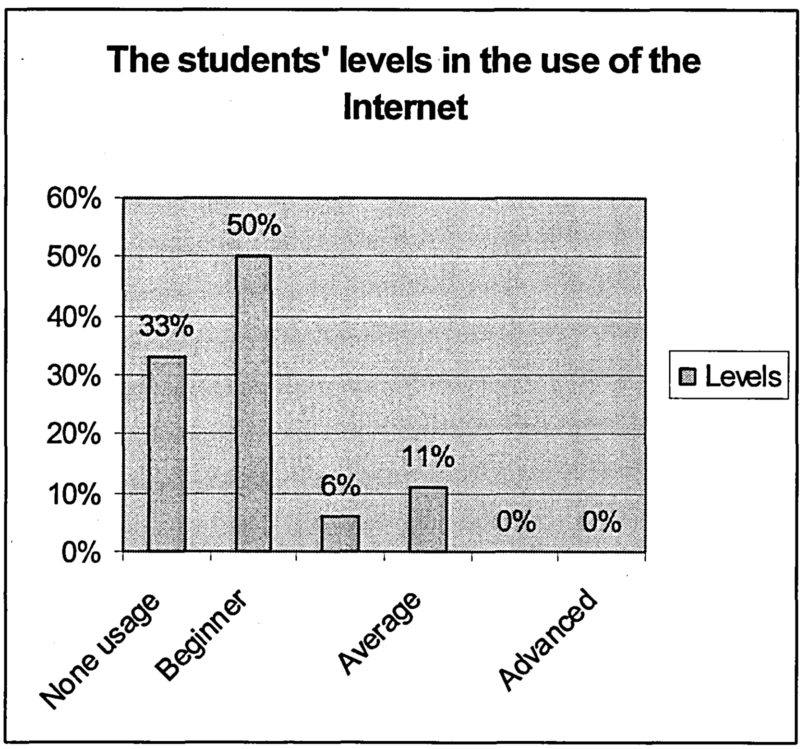

Figure 40. The students' levels in the use of the Internet prior to the course.

7.3.4. Students' resources and facilities for using the Internet

It was seen to be important to identify the facilities that the students had in order to use the Internet. Thus, the students were asked to indicate the places in which they usually use the Internet. As shown in figure (41), 39% of the students indicated that they used the Internet in other places such as Internet café. During a discussion before the course, some of the students, especially those in Years Three and Four, stated that they used the Internet in schools during their school placements. Furthermore, only 28% of the students used the Internet at their own and/or friends' homes.

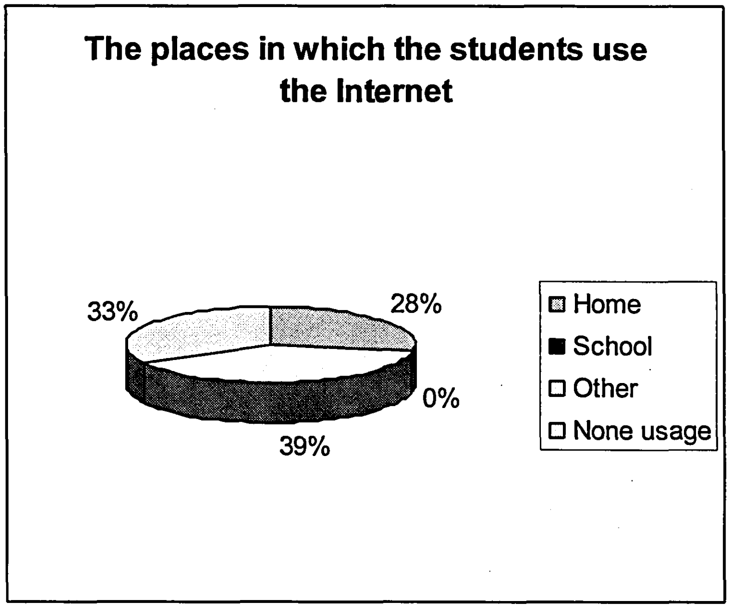

Figure 41. The places in which the students usually use the Internet.

The findings of this study indicate that friends and peers play a major role in facilitating the use of the Internet, not only by providing the Internet connection, but also by acting as a peer tutor. This result is confirmed by the students, 50% of whom indicated that they learnt to use the Internet through the help of friends (see figure 42).

These findings are also consistent with the findings of Mohaiadin (1997), who found that the Internet is typically learnt through friends rather than through formal curriculum or instruction. Shezhang (1998) also found that the majority of the students learnt to use the Internet from friends.

As illustrated in figure (42), only 22% of the students learnt about the use of the Internet from books. While a few students (11% of them) took training courses in order to learn the use of the Internet.

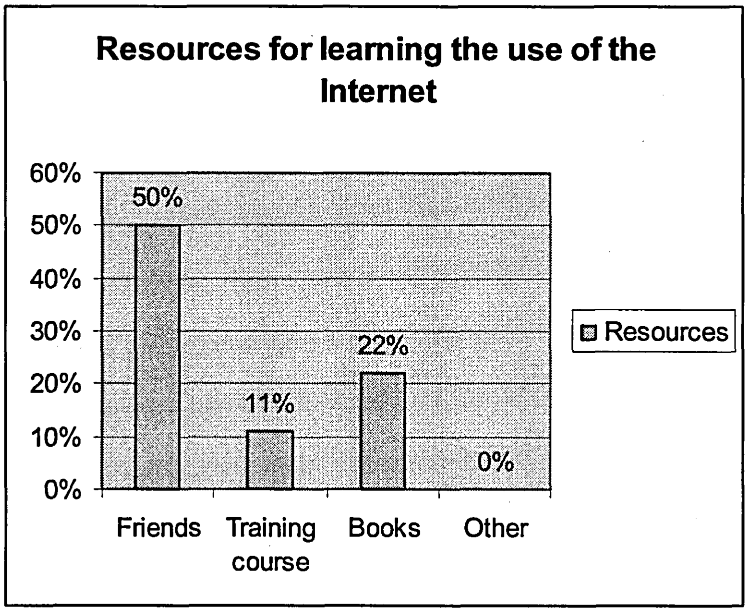

Figure 42. The resources for learning the use of the Internet.

It was decided to investigate whether the students had any previous experience of using Web-based learning environment. Accordingly, the students were asked to indicate whether they used a Web-based learning environment before the course or not. It was found that none of students had used a Web-based learning environment before the course. It was also the same situation with the students in Sheffield group because the students had not experienced the use of Web-based learning environments before the trial. As highlighted earlier in chapter one on the introduction, the underpinning dominant theory of teaching and learning in Egypt is behaviourism. Accordingly, the majority of the Egyptian students are completely reliant on the teacher to lead the teaching and learning process. As a result, the Egyptian students tend to be less autonomous than the students in the UK because of the differences in the educational settings. Furthermore, the Egyptian students' lack of confidence in using the computer along with their fears at the beginning of the course made it necessary to give more time in order to orient them with the Web-based learning environment. On the other hand, the students in the initial trial group needed less time to orient themselves with the Web-based learning environment because of their existing knowledge and skills and their confidence in using the computer.

7.3.5. Phases of the implementation of the main trial

At the beginning of the first day of the final trial, checklists were given to the students in order to identify their entry levels in using computers and the Internet. An introduction to the use of the Internet was then made which covered the history of the Internet and the difference between the Internet and the World Wide Web. Subsequently, a videotape about the Internet, its history and its main uses was used in order to provide the students with an overview. The students found the videotape to be an interesting and visual way of providing some information that is difficult to understand.

A demonstration was also given about the use of the 'Internet Tutoring System'. This demonstration aimed to orient the students with the different screens and functions in the system in order to give them the opportunity to use it in an effective way. The students were also guided to the 'Help' section, which contained information about the use of the system. Moreover, the 'help' section included a tutorial (see figure 43) for using the system and a technical inquiry form for the students to fill in case if they need any technical assistance. At the end of the demonstration, each student was given his/her own username and password in order to log into the system.

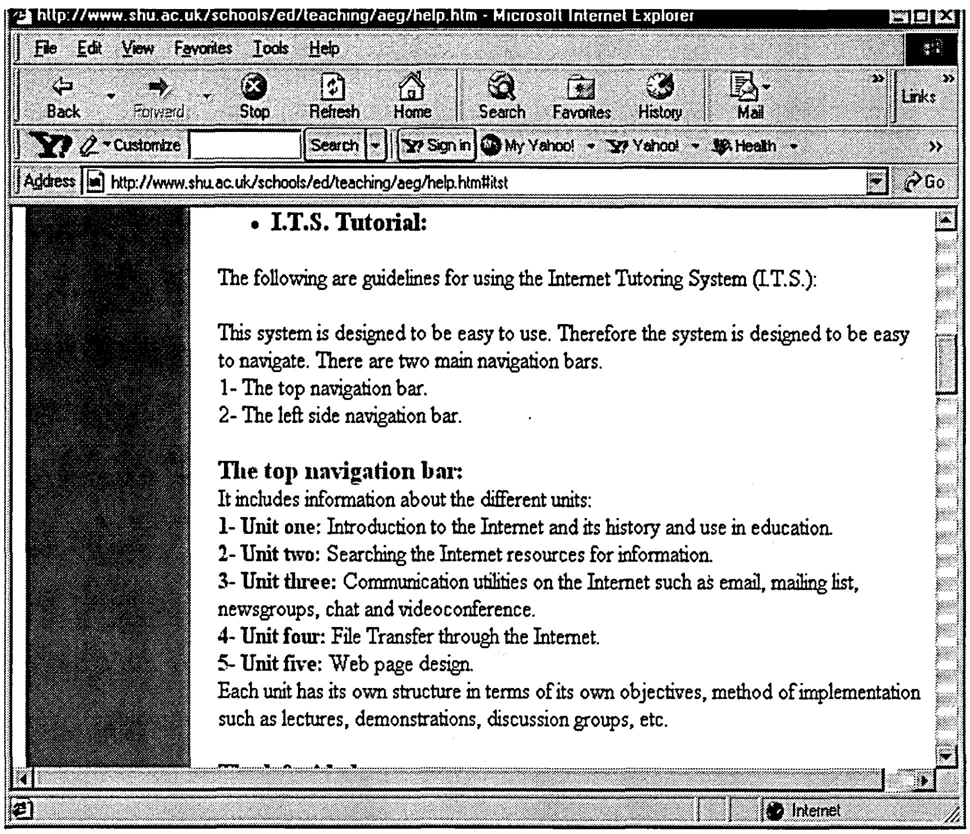

Figure 43. The tutorial for using the internet Tutoring System.

After the demonstration session, a peer support session was held. The students worked on the Internet and the 'Internet Tutoring System' in pairs in order to assist each other, particularly those students who were using the Internet for the first time. The role of the tutor at this point was to guide the students and assist them in learning how to use the Internet. Most of the tutor guidance in this session was in the form of face to face interactions with the students. The students were asked to implement a number of activities (see figure 44) such as being asked to create a 'favourite' folder and add links that he/she thought would be interesting and relevant to the course (see appendix F (b) ITS activities).

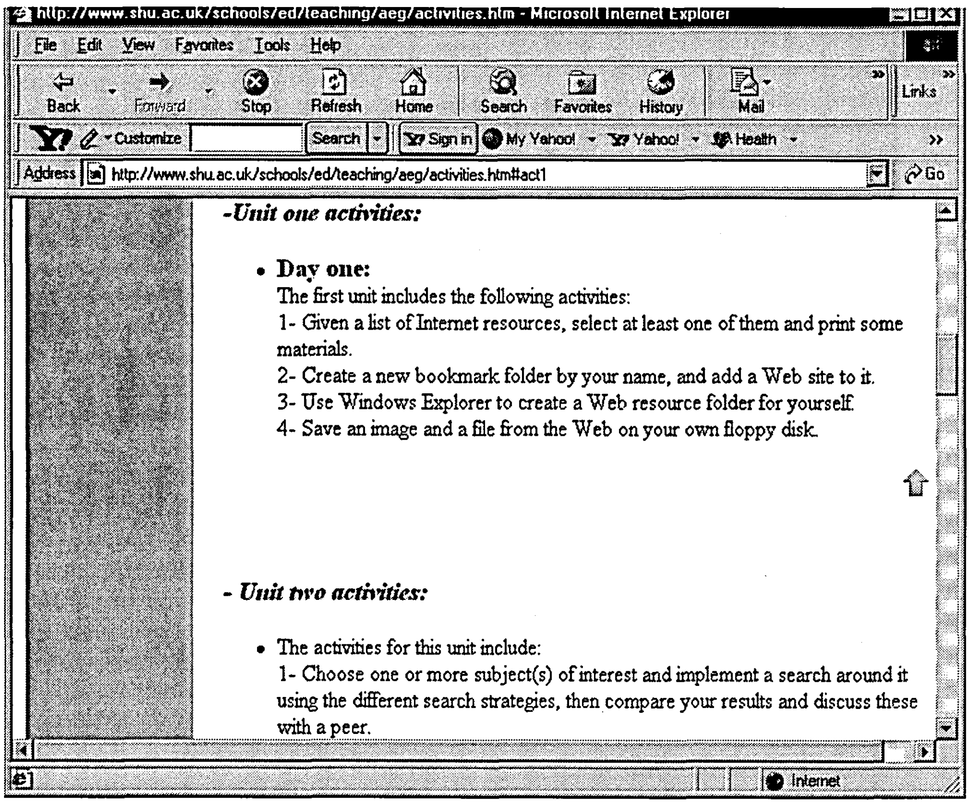

Figure 44. The different course activities.

At the end of the first day, a session was held with the students in the form of in-classroom discussion. This discussion aimed to elaborate the different potential usages of the Internet in education in Egypt. Several issues were raised by the students during the session such as the Egyptian Ministry of Education plan to use the Internet in schools and its influence on the school curriculum and teachers' practices in schools.

At the beginning of the second day, a demonstration was given to the students in order to highlight some technical aspects such as setting up the browser preferences etc. This demonstration also aimed to introduce the students to the different search strategies on the Internet such as the use of 'search engines' and Web 'Crawlers', using related links and bookmarks etc.

Following this demonstration, the students spent some time working in pairs on the aspects that were covered. Accordingly, they were searching the Web for information and it was left to the students to agree between themselves on the information that they wanted to search for. Moreover, it was noticed that the students were helping each others in searching the different resources of information on the Web. The search strategies were seen to differ from one student to another, e.g. some students preferred to use search engines while others preferred to use Web 'Crawlers' for finding information on the Internet. During this peer support session the students were asked to complete the activities which are part of unit two, e.g. the students were asked to search the Web for information resources that are related to a topic of their interest.

After this peer support session, a brief demonstration of the different facilities that are offered by the Internet was given to the students. These facilities include online databases and libraries, online banking etc. In addition, a brief introduction to the use of the online discussion forum was provided.

As highlighted earlier in the design chapter, three main discussion areas were designed for student discussions during the course. These discussion areas included a general discussion area about the use of the Internet, a discussion area for the educational use of the Internet and an area for course announcements. Subsequently, the students began to use the online discussion forum 'Discuss' in order to discuss the different issues that are related to the use of the Internet in education especially in Egypt. Different issues were highlighted by the students in relation to the use of the Internet in education and its influence on teachers' practices in schools in Egypt such as the lack of facilities etc. (see figure 45).

The teacher's role during the discussion was seen to be best described as a mentor who used different strategies in order to make sure that the students' discussions were within the course context. According to Wang (2001), mentoring strategies are the discourse techniques and other facilitating strategies that mentors use in facilitating individual online activities and teamwork, such as providing support and guidance, mediating negotiation, and reflection.

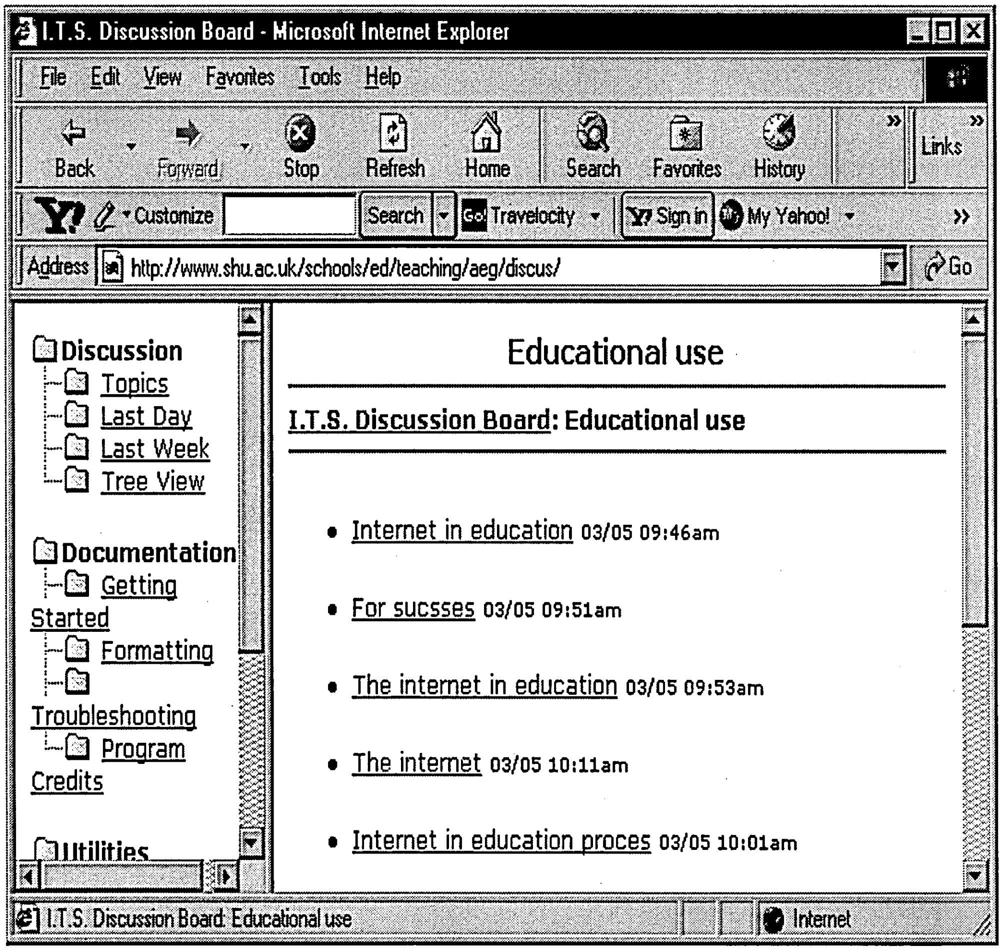

Figure 45. The different students' views about the use of the Internet in education.

Although some students had difficultly in using the English language for the online discussion, it was noticed that the students were helping each other in contributing to the discussions using this language. Having an online discussion in English seemed to be a challenging task for the students. However, most of the students were motivated and preferred to use the online discussion, particularly those students who did not prefer having in-classroom discussions. A major factor for the students' preference of using online discussion is that it gave them the opportunity to express their own views, and they were able to read and comment on the other students' views at any time they wanted. Moreover, some students preferred to write their own messages using 'MS Word' software in order to assist them in checking any spelling mistakes.

During the third day of the trial, the course aimed to introduce the students to a range of communication tools and utilities that are available on the Internet. These tools included the use of email, instant messaging and videoconferencing.

At the beginning of the third day, a workshop was organised in order to guide the students to use email for exchanging messages. Accordingly, the students were guided to establish an email account for themselves. Some guidelines were given in order to enable them to create their own email accounts. These guidelines were also available online. The tutor assisted the students in solving the technical problems that they faced during this process. Then, the students began to exchange email addresses and wrote emails to each other. Some of the students were working on this task individually while others were working in pairs in order to accomplish the task. The students also were given the ability to access their own email accounts through the 'Internet Tutoring System' (see figure 46).

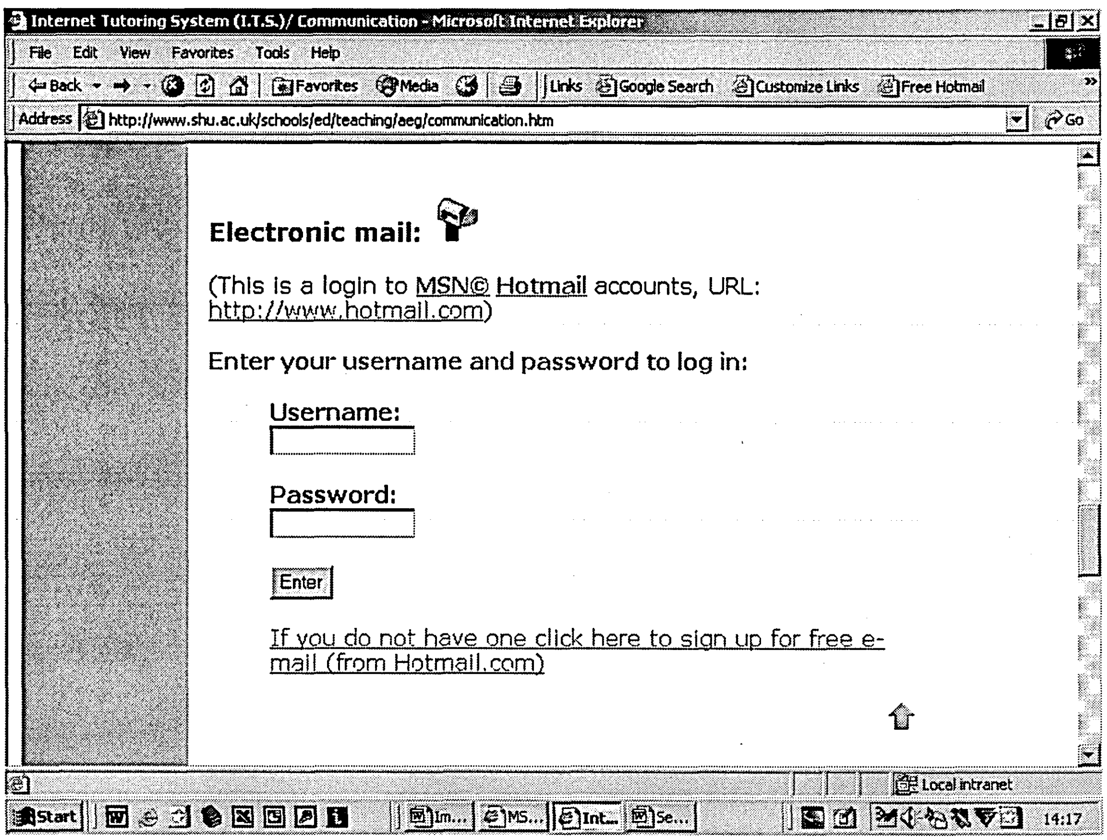

Figure 46. The area for accessing the email accounts in the Internet Tutoring System.

The students were then guided to use the instant messaging tool 'MSN Messenger©'. They used this tool in order to have synchronous text-based and chatting discussions. This kind of text-based discussion, according to Whittle et al. (2000), provides teachers with a powerful strategy to support students' active engagement with content and facilitates high levels of conceptual understanding. The tool used in this research enabled the students to have synchronous text and voice chatting. Therefore, the students used it to exchange ideas about the potential usages of synchronous discussion tools in education. It was noticed that this tool particularly motivated the students' active participation in the discussions during the course.

After introducing the students to instant messaging, a demonstration was given to the students on the use of desktop videoconferencing via the Internet. A Web camera and the software 'Netmeeting©' were used in order to enable the students to use videoconferencing. Most students were seen to be enthusiastic about the use of videoconferencing and most of them found it to be a very useful tool for education.

As a result of using these communication tools for the first time, the students were collaborating in learning more about the different features of both 'MSN Messenger©' and 'Netmeeting©'. Accordingly, a discussion was held for the students in order to discuss the potential usages of both synchronous and asynchronous discussion tools in education. In addition, they discussed the influence of these tools on the teaching and learning processes.

At the end of the third day, an orientation to Web design was given to the students. This orientation aimed to give the students some guidelines that are related to the design of Web pages. Furthermore it aimed to enable the students to design a paper prototype for an educational Website. In this research, the design of a paper prototype is considered to be the first step for designing a Website, which was the main focus of the final day of the trial.

At the beginning of the fourth day, the students discussed their paper prototypes for their proposed Websites with the tutor and with each other in order to have feedback from multiple perspectives. Subsequently, the students started to write the text for each Web page in the form of a 'Word' document. Different ideas were proposed by the students for their own Web design, such as a Website for the different components of the computer, a Website for the Faculty of Specific Education, a Website for the Faculty library etc.

A brief demonstration was given to the students on the different technical aspects that are related to the design of Web pages such as creating internal links between the Web pages etc. The students were also introduced to different ways for linking external Web pages which are relevant to their Website such as text links and image links. Moreover, the demonstration introduced the students to the different ways of formatting Web pages such as font type, font size, using colours etc.
Following the demonstration, the students started to search the Web for information and images relevant to their own Websites in order to incorporate this information and these images into their design. Since Web design is seen to be a long and cyclical process, most of the students needed more time in order to finish their own Web design. The students, who finished the initial design of their Websites, uploaded their Web pages in the 'Portfolio' section in the 'Internet Tutoring System'. This section provides the students with a space on the 'Internet Server' onto which their work can be uploaded.

The students linked their Web pages to the learning environment 'Internet Tutoring System' using a section called 'Link files' (see figure 47). This section aims to create links to the different files that are already uploaded on the 'Internet Server'. The linkage of these files helped the other students to view their peers' Web pages. Since the students had the ability to view their peers' work, they were able to comment on that work.

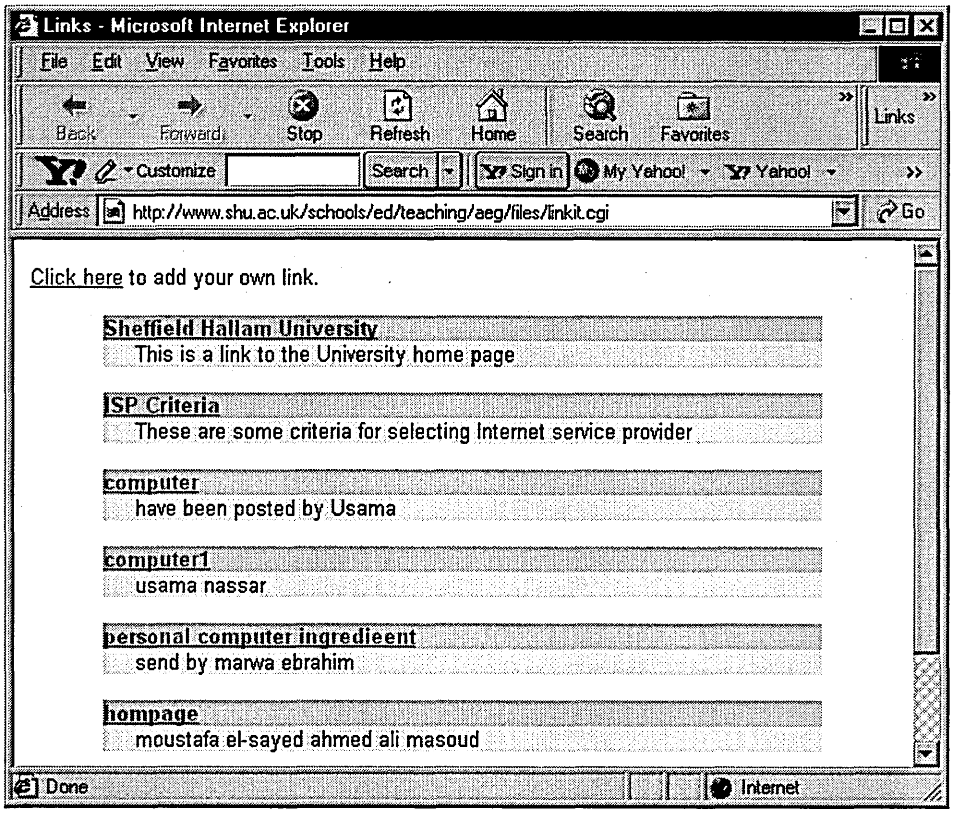

Figure 47. The section for linking files and Web sites.

At the end of the final day, an evaluation session was organised in order to have the students' 'self-evaluation' - or 'self-reflection' as described by Bergre (1997) - on the overall course. Accordingly, a focus group was held with the students in order to have their feedback in terms of the advantages and disadvantages of the whole course. This focus group also gave the students the opportunity to express their own views about the Web-based learning environment and the difficulties that they faced during the process. Furthermore, it aimed to capture the students' suggestions for the future development of the learning environment. Several issues emerged during this evaluation session such as the lack of facilities for using the Internet, the amount of time devoted for the course etc. which are described in the discussion chapter.

Following the focus group, the students were given the course evaluation form in order to reflect individually on the course according to the evaluation criteria that had been set.

Chapter eight: Discussion

8.1. Introduction

This chapter includes a discussion of the findings resulting from this study. It includes five main sections with each section focussing on a specific aspect.

The first section includes a discussion of the aspects that are related to the objectives and content of the Internet curriculum. For example, this section discusses the clarity of the course objectives and activities for the students, the content organisation and the relevancy of the learning resources to the course context.

The second section reveals the issues that are related to the learning process within a Web-based learning environment. It focuses on the issues of students' motivation, cognitive overload, peer interaction and the learning difficulties that the students encountered during the process.

The third section discusses the various roles of the teachers within a Web-based learning environment and highlights the various key roles of the teacher such as those of mentor, facilitator, guide and manager.

The fourth section includes an evaluation of the Web-based learning environment namely 'Internet Tutoring System'. It discusses the various aspects to emerge from the data analysis that are related to the use of the learning environment such as the different characteristics of the learning environment e.g. the clarity of user interface, the ease of use, useful information resources, reliable speed and information organisation. Furthermore, this section reveals the different technical issues that were encountered such as the technical difficulties experienced by the students and the technical support provided.

The final section includes a discussion of the students' progress in developing their use of the Internet. It illuminates the students' progress levels in each unit of the course. In addition, it discusses the relationship between the students' progress in using the Internet and the students' learning styles. Furthermore, it brings to light the students' feedback on the course.

8.2. Section one: Objectives and content of the Internet curriculum

As highlighted earlier, the content and the objectives of the Internet curriculum were developed in the light of the various constructivist principles and guidelines for teaching and learning, which are outlined by Jonassen (1999); Spiro et al. (1991); Hannafin et al. (1999) and Mayer (1999a). Subsequently, the content of the Internet curriculum was based on three different content structures. These three structures are well-structured, semi-structured and ill-structured content. The use and integration of these three content structures was intended to take into consideration the entry level of the students, especially those students who were lacking prerequisite knowledge and skills for using the Internet. Furthermore, the integration of the different content structures takes into account the different degrees of complexity in the content that were provided to the students during the course. Accordingly, the degree of complexity in the content is gradually increased according to the students' progress in the course. As highlighted in chapter five on constructivist learning environments, the development of three content structures brought to light three different forms of control over the learning process, i.e. predominantly teacher control, teacher-learner control and learner control.

Several issues that are related to the Internet curriculum are discussed in this section including the clarity of the course objectives and activities to the students, content organisation and the relevance of learning resources to the course context.

8.2.1. Course objectives

As highlighted earlier, the degree of complexity of the content is gradually increased from one unit to the next. As a consequence, the objectives in the first unit were made very explicit to the students, while the objectives become more implicit in the more advanced units. For example, in unit five 'designing Web pages', most of the objectives related to the design of Web pages were made implicit. Subsequently, no detailed guidelines were provided to the students such as the different procedures for designing a Web site. Rather, the students were given the freedom to decide upon the degree of complexity of the different aspects that are related to Web design that they wanted to highlight in their own design. Furthermore, the students were given the opportunity to identify the different objectives that they needed to achieve in order to design their own Web sites. As a result of using different types of content structures and different degrees of complexity of the course objectives, it was seen to be important to find out whether the students had a clear idea about the course objectives or not. Subsequently, the students were asked to highlight whether they found the course objectives clear or not and whether they were relevant to the course context or not. The analysis of the data shows that the majority of the students found the course objectives clear and relevant. The results show that 56% of the students agreed that the course objectives are clear and relevant and 44% of the students strongly agreed on the same aspect. Although the students found the course objectives clear and relevant, the observation of the students' learning especially in the final unit 'Web design' revealed a major issue. This issue is related to the fact that the students needed more time in order to work with ill-structured content. This could be related to the Egyptian educational settings that the students are used to, which depends on providing the students with explicit and pre-defined objectives. For example, the students needed more time in order to be able to accomplish their own Web sites. Furthermore, the students needed to publish their own Web sites on the Internet, which requires a space for them either on the Ministry of Education 'server' or on the Ministry of Higher Education server. At the current time, the students do not have their own spaces on these two servers. As a result, the policy of these two Ministries needs to be changed in order to take into consideration the students' need to have their own Web spaces that enable them to publish their work.

8.2.2. Content organisation

This course relies on integrating a range of teaching methods and a range of resources and tools. Therefore, the organisation of the content is seen to be a crucial element that might influence the whole course. Subsequently, the students were asked to identify whether they thought that the content was well-organised or not. The results reveal that all the students (100%) either agreed or strongly agreed that the content was well-organised. The students' positive responses for the content organisation could be due to the integration of the different content structures that were presented in a coherent manner. Moreover, presenting the content of the Internet curriculum to the students in the Web-based learning environment gave them the opportunity to see the whole picture about the content as well as the detailed information about each unit.

The content organisation is considered to be relevant to some extent to the course organisation. A major issue that is related to the course organisation which emerged during the trial was the course timetable. Several students indicated their need for more time for the course, because they found the course timetable demanding. Some students commented on the timetable of the course in relation to the facilities available and the slow connection of the Internet. For example, Mohamed and Tarek linked the need to extend the course timetable with the facilities that are currently available to them. Mohamed commented on this relationship saying:

> *"I hope that the time devoted for the course can be extended and providing faster PCs with a fast Internet connection in order to reduce the time needed for downloading files"*

The issue of connection speed highlights a general issue that confronts the development of the effective use of the Internet in education in developing countries, particularly Egypt. Since the schools have only recently been connected to the Internet in Egypt, many issues related to the infrastructure of the information and communication technologies have emerged. Accordingly, the Internet infrastructure in Egypt is considered to be still immature and under development. This issue might be solved when the Ministry of Education begins to increase the use of 'broad-band' Internet connections.

8.2.3. Course activities

As highlighted earlier in chapter six on the design, the use of authentic activities is considered to be essential element in constructivist learning environments as highlighted by Henze and Nejdl (1997) and Jonassen (1999). Consequently, the activities in this course were designed to be related to the real-world situations. They were also designed to be flexible i.e. they were not strictly structured activities rather the students were given the opportunity to interpret those activities in order to reflect on their learning.

The activities were divided according to the different units in the course. Subsequently, the degree of complexity in the activities varied from unit to another. Accordingly, it is seen to be important to find out whether the course activities are sufficient and clear to the students or not. A large percentage of the students (78% of them) either agreed or strongly agreed that the course activities are sufficient and clear (see figure 48), while only 22% of the students were not sure whether the course activities are sufficient and clear.

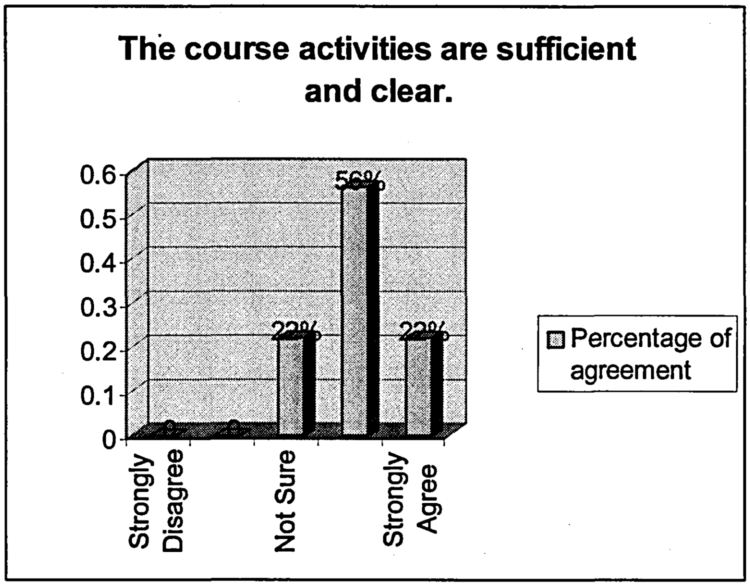

Figure 48. The students' feedback toward the course activities.

The small percentage of students who were not sure about the clarity of the course activities might need more explicit guidelines especially in relation to the complex activities towards the end of the course. However, it is believed that a degree of complexity should be presented to the students to avoid the over-simplification of the content as highlighted by Spiro et al. (1991).

8.2.4. Learning resources

As emphasised earlier in the design chapter, a wide range of information and learning resources were integrated and used in this course such as Web resources and course documents. Since the relevance to the context is considered to be a key characteristic of learning resources, it was seen to be important to identify the students' different views about whether the learning resources were relevant to the course objectives or not.

As illustrated in figure (49), the majority of the students found learning resources in this course relevant to the course objectives. While 94% of the students found that the learning resources were relevant to the course objectives, only 6% of them were not sure about their relevance. Furthermore, none of the students found that learning resources to be irrelevant.

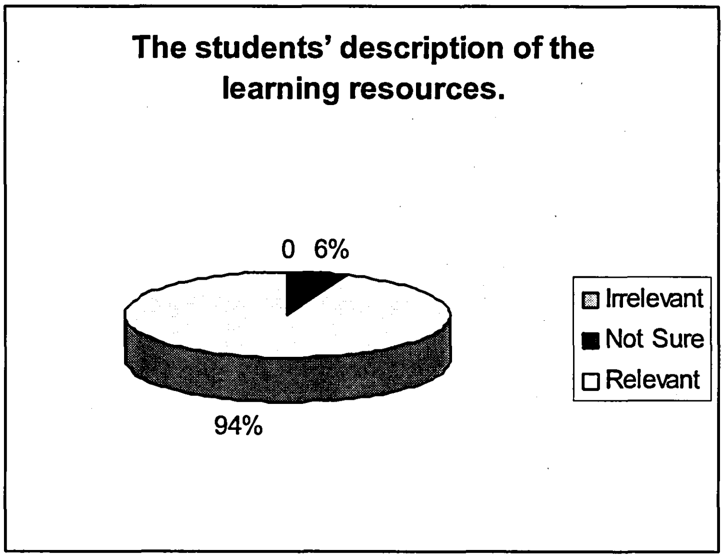

Figure 49. The students' description of the learning resources.

The relevance of the learning resources helped the students to focus their learning efforts on the course context and motivated them to explore these resources. As a result, providing a wide range of learning resources gave the students various alternatives that enabled them to construct their knowledge about the use of the Internet. The use of various learning resources also accommodate the preferred learning styles of the students.

In brief, this section illuminates the different issues that are related to the course objectives, content organisation, course activities and learning resources.

This study reveals a relationship between learning ill-structured content and learning facilities i.e. sufficient facilities should be provided to the students in order to enable them to learn ill-structured content such as Web pages design. Consequently, it is found to be important to provide the students with clear and relevant objectives especially for those students who approached the course with some fears and who were lacking prerequisite knowledge. Furthermore, providing clear objectives enabled the students to cope with the course and orient themselves with the course.

The results also illuminate that the Web is an effective tool for the effective organisation of learning content, because it provided the students with the whole picture of the course content. However, course organisation was influenced by the limited facilities which increased the amount of time needed by students to accomplish a particular task. The results also reveal that authentic activities and relevant learning resources are important to maintain the students' active participation. Moreover, providing a range of information resources helped the students to learn according to their own preferred learning styles.

8.3. Section two: Student learning within a Web-based learning environment

This section focuses on those issues related to student learning processes that emerged from this study. A particular consideration is given to the role of the Web-based learning environment namely 'Internet Tutoring System' in motivating student learning. This section also illuminates the role of Web-based learning environments in minimising student's cognitive load. Furthermore, this section emphasises the role of the peer interactions on students' learning. Moreover, it reveals the different learning difficulties that the students encountered during their learning of the use of the Internet. These difficulties include the limitations of the facilities for using the Internet, the difficulties in using English language on the Internet and time limitations.

8.3.1. Students' motivation

As highlighted earlier in chapter seven on implementation, a few students in Menofia group during the main trial approached the course with fears of not being able to cope with and/or benefit from the course. However, it was observed that most of the students who participated in this course were very enthusiastic to learn about the use of the Internet. As a consequence, the students were self-motivated toward learning the use of the Internet. The students' motivation is mainly seen to be because of their self-commitment and enthusiasm. However, it is seen to be important to maintain the students' motivation throughout the course. According to Richardson (1997), the traditional approach to teaching 'the transmission model' promotes neither the interaction between prior and new knowledge nor the conversations that are necessary for deep understanding. Accordingly, the Web-based learning environment was used in order to give the students the opportunity to construct their own knowledge about the use of the Internet. Since the students were unfamiliar with the use of the Web-based learning environment, it was seen to be important to investigate the implications of the use of the Web-based learning environment in terms of motivating the students to learn about the use of the Internet.

Based on the findings from the course evaluation form (see figure 50), 89% of the students either agreed or strongly agreed that the Web-based learning environment namely 'Internet Tutoring System' motivated them to learn about the use of the Internet. On the other hand, only 11% of the students were either not sure or strongly disagreed that the 'Internet Tutoring System' motivated them to learn about the use of the Internet.

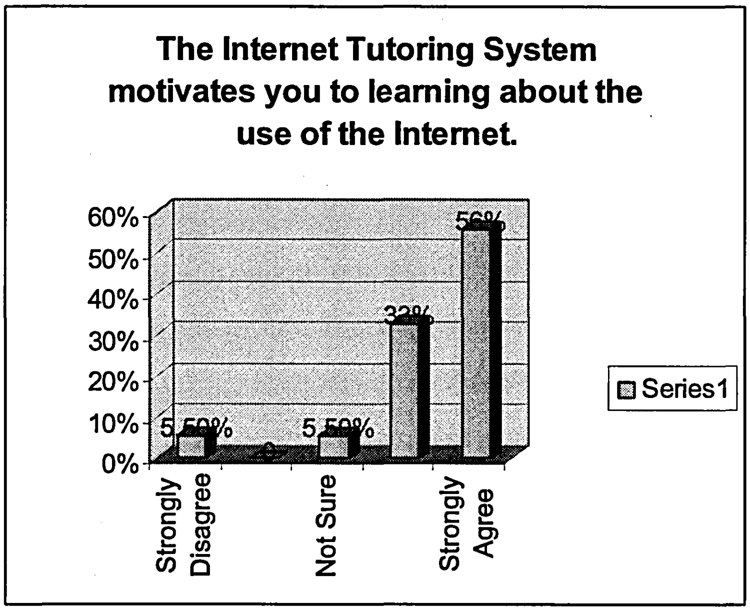

Figure 50. The percentage of students who were motivated by using the learning environment.

Although a small percentage of the students were not motivated by the Web-based learning environment, their views should be taken into consideration. These views can be interpreted in the light of the user interface of the learning environment, because a few students did not find the user interface of the learning environment interesting and motivating to them. For example, Ahmed (a student) made this comment:

> *"I suggest adding some images and coloured background in order to make the 'Internet Tutoring System' more interesting for the students"*

On the other hand, those students who felt motivated by using the 'Internet Tutoring System' were influenced by the richness of the Web-based learning environment and by the richness of the Web itself in terms of having different types of resources and tools that they can use in their own learning. For example, one of the students, Hussein commented used a metaphor for describing the 'Internet Tutoring System', as he considered it to be an *"electronic educational institution"*

8.3.2. Cognitive overload

As highlighted in chapter six on the design, cognitive load theory (Sweller, 1988) was taken into consideration during the design of the Web-based learning environment in order to minimise the cognitive load that the students might face during learning in the Web-based learning environment. Accordingly, the principles and guidelines for reducing cognitive overload which are highlighted by Mayer and Moreno (2002); Wilson (1996) and Mandel (1997) were taken into account. Subsequently, in the course evaluation form, a number of questions were given to the students concerning any cognitive overload that they might have experienced during the course. Accordingly, the issue of cognitive overload was investigated by focusing on two main factors. These two factors included the students' feeling of disorientation or "getting lost" during the course and their feeling of being overloaded because of the amount of information they had during the course.

As shown in figure (51), 11% of the students felt disoriented during the course. Furthermore, 28% of the students were not sure if they felt disoriented or not. On the other hand, 61% of the students did not feel disoriented at any time during the course.

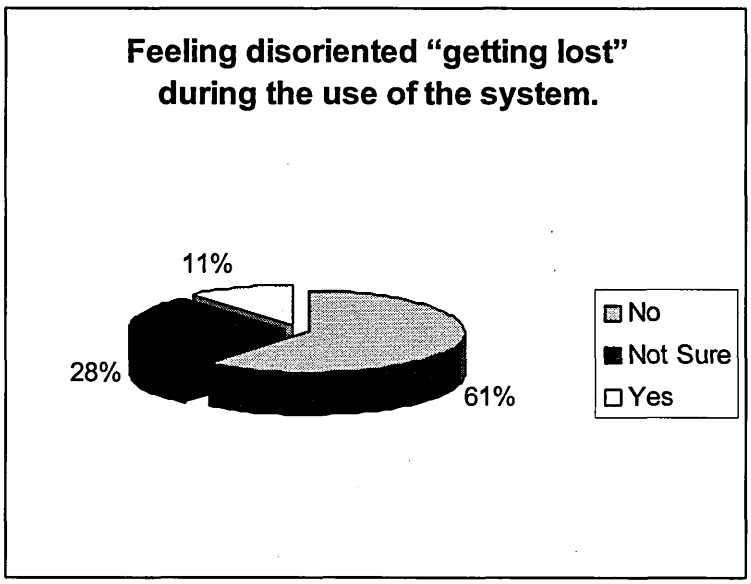

Figure 51. The percentage of students who felt disoriented during the course.

Those students who felt disoriented during the course were asked to indicate when they had this feeling. Accordingly, they were asked whether they have this feeling in the beginning of the course, in the middle or at the end of the course. As a consequence, the 11% of the students who felt disoriented indicated that they had this feeling only at the beginning of the course.

Asmaa commented on her feelings at the beginning of the course saying:

> *"At the start of the course, although I read some background information about the Internet, I felt some difficulties in following up the amount of information regarding the Internet. Therefore, I felt some frustration and boredom at the beginning of the course. Then, I started to feel relief by having the tutor's assistance and engaging with the other students in the different years of the course."*

During the focus group at the end of the course, Azaa also commented on her feelings by saying:

> *"I started this course with only theoretical background. So the beginning was to some extent difficult for me, especially with some students who have already seen the Internet working, which sometimes causes some frustration for me. But this feeling of frustration started to diminish once I started to work on the Internet."*

In her comment, Azaa emphasised on the role of the more experienced peers in causing frustration and increasing the sense of cognitive overload for those students who are less experienced. It is important to indicate that these two students were in Year Two during the course which highlights the gap between the students' existing knowledge and skills. The students' feeling of frustration and disorientation especially at the beginning of the course was due to many reasons. As discussed earlier, some students approached the course with some fears. These fears might influence their own learning especially at the beginning of the course before coping themselves with the associated demands. Furthermore, those students might lack and/or felt lacking competence in using the computer and/or the Internet in comparison with their older peers. Moreover, the amount of information related to the use of the Internet might be great for the students especially at the beginning of the course. Consequently, it was seen to be important to find out whether the students felt overloaded in the course or not. As illustrated in figure (52), 50% of the students did not feel overloaded in the course. On the other hand, 17% of the students felt that the course included a large amount of information which caused them to feel overloaded. Moreover, 33% of the students were not sure about their feeling on this aspect.

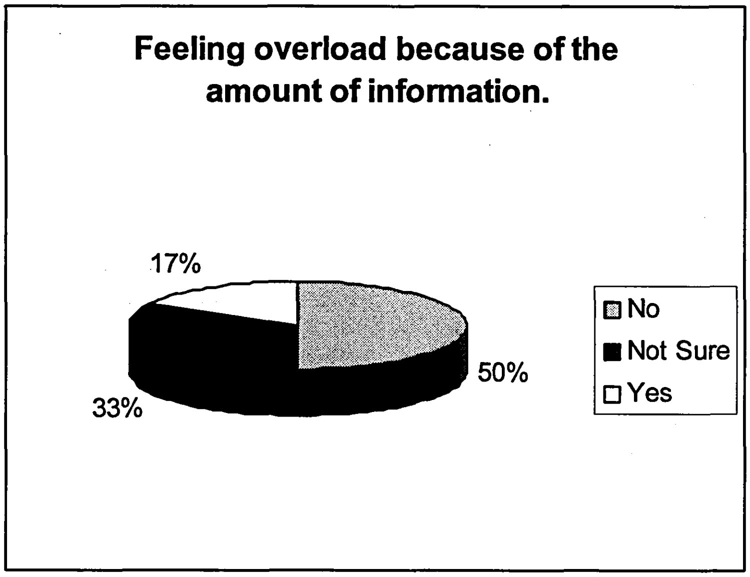

Figure 52. The students' feeling toward the amount of information.

Another factor that led to the students' feeling of frustration and disorientation was the slow Internet connection that the students experienced especially during the first day. This was noticed and highlighted by the observer in the following words:

> *"When the students were asked to take part in this course, they were keen to work on the Internet. Therefore, when the students found the Internet connection in the Technological Development Centre very slow, a few of them felt frustrated. However, on the second day, when they started on the school computers, the feeling of frustration changed to a feeling of satisfaction. This satisfaction was a result of the improvement that they notice in the Internet connection speed in the school."*

The comparison of the results indicated that not all the students who felt disoriented during the course found that the amount of information caused them the feeling of being overloaded. As a result, the use of the Web-based learning environment did not overload the students. This result is seen to be consistent with the findings of Mayer (1999b) and Van Gerven et al. (2002) studies that the use of hypermedia and multimedia in teaching and learning can reduce the cognitive load that the students experience.

8.3.3. Peer interaction

As highlighted earlier in chapter six on the design, the interaction between the students themselves is an important element of the interaction processes in a learning environment according to Tuovinen's (2000) model of interaction. Therefore, it was seen to be important to investigate the effect of the interaction with peers on the students' learning during the course. Accordingly the students were asked about the effect of the interaction with their peers on their own learning experience. All the students found that the interaction with their peers enriched their learning experience. As illustrated in figure (53), 56% of the students strongly agreed and 44% of them agreed on the valuable learning experience that they had because of the interaction with their peers.

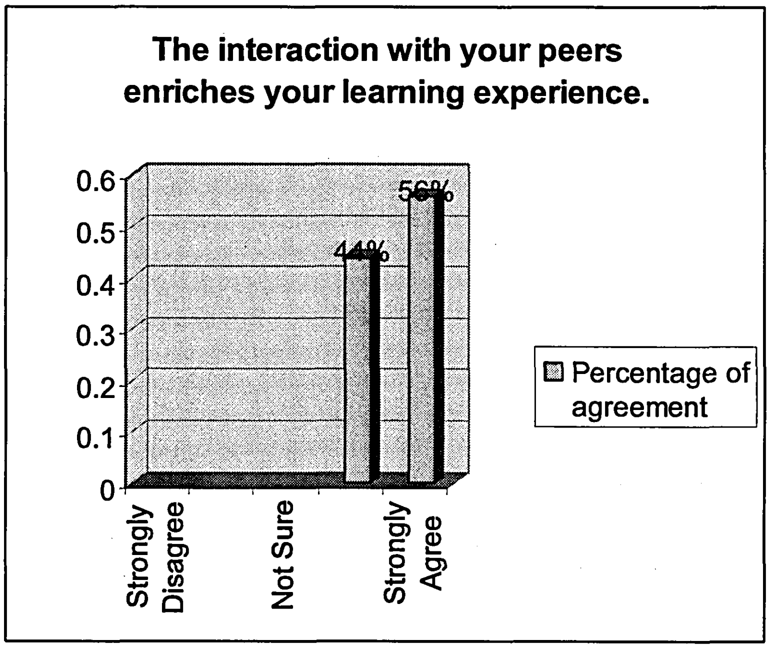

Figure 53. The effect of the interaction with the peers on the students' learning.

Furthermore, high levels of interaction and support among the students were observed during the course. For example, they were collaborating in conducting Internet searches, translating difficult English words into Arabic, moderating synchronous discussions with each others etc. Furthermore, the students' comments on the interaction and collaboration with their peers were very positive. This interaction assisted the students in learning the use of the Internet. The students' comments and the observations on peers support, discussions and collaboration during the course are discussed in detail in section three in this chapter.

8.3.4. Learning difficulties

The students in Menofia group encountered a number of difficulties in their learning. Subsequently, this section illuminates the learning difficulties that emerged during the students' learning of the use of the Internet. The students during the focus group discussion elaborated these learning difficulties. Furthermore, the observations aimed to highlight the learning difficulties that faced the students during the course. These difficulties related to the limitations of facilities for using the Internet, the difficulties in using the English language on the Internet and the time limitations. These difficulties are discussed in detail in the following sections.

8.3.4.1. The limitations of facilities for using the Internet

As highlighted earlier in chapter one on the introduction, the Ministry of Education in Egypt launched the project for connecting the schools to the Internet several years ago. However, the infrastructure for using the Internet in Egyptian schools is still incomplete and insufficient at the current time. As a result, the students encountered many problems related the Internet connection during the course such as the slow speed of the connection, the connection being down etc. The problem of losing the Internet connection was observed particularly during the first day while working in the Technological Development Centre in Menofia. This problem led to a change of location of the training to 'Susan Mubark' prep-school.

The majority of the students who participated in the course in the final trial phase in Egypt commented on the facilities provided for using the Internet. During the focus group they commented on the lack of facilities for the effective use of the Internet. Furthermore, they highlighted these problems in the course evaluation. Azaa commented on this problem saying:

> *"The computers are major factors for causing some annoying and sometimes frustration for us. Therefore, if the computers and the Internet connection were fast enough, we would achieve much more in this course."*

The problems that are related to the facilities and the infrastructure for information technologies are not only facing Egypt, but also are facing many developing countries. These problems include a lack of resources for developing and maintaining the infrastructure for using information and communication technologies. Grey (1999); Chee (1997) and Wilson (2000) note that the problems that are related to Internet connectivity are considered to be a major barrier in using Web-based learning in developing countries.

8.3.4.2. The difficulty of using the English language on the Internet

It can be seen that the majority of the Websites on the Internet are based on the English language. This arises from the fact that the Internet itself was invented in an English language speaking country (USA). Therefore, Internet users from Arabic-speaking countries including Egypt are faced with a small number of Websites which use the Arabic language. Subsequently, the students in this course had to browse through a number of Websites using the English language. The main language of the group of students who participated in this course in Egypt was Arabic. In addition, the students had not studied English since they left the secondary school. For all these reasons, a software application called 'Easylingo' was used during this course in order to assist the students in translating the difficult words from English to Arabic. However, it was noticed that a few students found difficulty in browsing Websites that use the English language. For example, one of the students (Mostafa) commented on the difficulty to translate some English words into Arabic saying:

> *"I did not know the translation of some English words into Arabic. I suggest adding part in the Internet Tutoring System in Arabic"*

It was observed that the majority of the students were working collaboratively with each other in order to browse the different Websites in English.

These observations indicate the need to increase the number of Arabic language Websites for the students to work with whilst learning to use the Internet. This may occur when the use of the Internet increases in the Arabic-speaking countries especially by increasing the number of public Internet 'domains' that offer a range of services for users.

8.3.4.3. Time limitations

Based on the data analysis obtained from the evaluation form, 27% of the students either disagreed or were not sure that the course timetable was manageable for them (see figure 54). On the other hand, 56% of the students agreed and 17% of them strongly agreed that the course timetable was manageable for them.

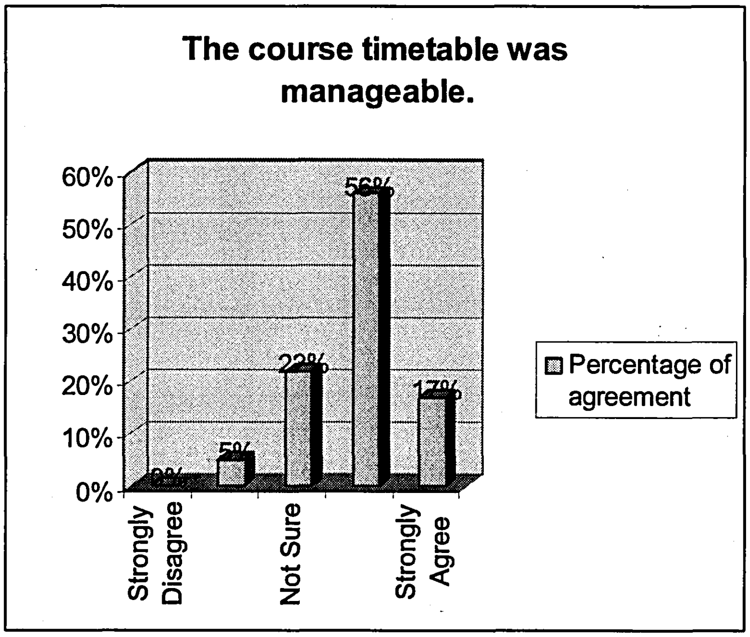

Figure 54. The students' feedback on the course timetable.

These results indicate that some students encountered difficulties because of the course timetable. These students felt that the amount of time devoted to the course was limited compared to the amount of information included i.e. some students found the course timetable very intensive.

The students' feeling of time pressure during the course is seen to be not only because of the amount of information included in the course, but also because of the students' lack of facilities for studying. According to Hudson (2002), the studying process is considered to be an essential element of the teaching-studying-learning process. This essential element of studying was seen to be missed in this course because the majority of the students in Menofia group did not possess Internet connections and computers to study with, neither at their own homes nor at their educational institution. Subsequently, the students were not able to study and practice the use of the Internet at their own pace. In contrast, the students in Sheffield group did not encounter this difficulty because all of the students had access to computers and the Internet either at their own homes or at their educational institution.

8.4. Section three: The roles of the teacher within a Web-based learning environment

8.4.1. Introduction

According to Clay (1999), there are some primary factors that might inhibit teachers from teaching at a distance. These factors are: increased workload, the altered role of the instructor and lack of technical and administrative support. Moreover, although there are many advantages for the students to participate in Internet courses, frequently they experience some frustration with the technology e.g. slow Internet connection, lack of skills and experiences in using the Internet etc. (the students within this course quoted these problems). Therefore, for some students Internet technology might be frightening at some stages, especially at the course beginning. Therefore, to calm the fears of many anxious students Perrin and Mayhew (2000) note that:

> *"The instructor plays a vital role of serving as both a mentor and humaniser. By drawing out personal commitment, participant interaction, and enthusiasm, the instructor is seen as a humaniser working to personalize what is often feared to be an impersonal experience"*

The role of "humaniser" is considered to be crucial especially at the start of any online course, as the students need to be oriented to the new Web-based learning environment.

This section highlights the different roles of the teacher within the Web-based learning environment in relation to the different content structures and also in relation to the control over the learning process (which was discussed in chapter five on the impact of constructivist learning environments).

8.4.2. Mentor role

The mentor role of the teacher within a Web-Based learning environment is highlighted by Wang (2001) who defines mentoring in his study as the discourse techniques and other facilitating strategies that mentors used in facilitating individual online activities and teamwork, such as providing support and guidance, mediating negotiation, and reflection. An essential mentoring activity is seen to be mentoring the online discussion. Moreover, the teacher needs to facilitate the students' discussions by encouraging them to participate in the discussions, questioning and identifying their own needs and opening new discussion forums for them in order to meet their needs. Shotsberger (2000) notes that both instructors and developers should be willing to question their design of web courses and decide for themselves whether current communication methods have been adopted out of convenience or out of desire to optimise interaction. Within this course, the aim was to ensure that all participants have access to a wide range of communications options, both synchronous and asynchronous, that can be used in large-group, small-group, and one-to-one settings. For example, videoconferencing and instant messages were used for synchronous discussions and email and discussion board were used for asynchronous discussions. Shotsberger (2000) also notes that with synchronous communication in an online learning environment, a facilitator or leader role is needed in order to set the conversational tone and pace.

During this course, the majority of the students (94% of them) found that both synchronous and asynchronous discussions were constructive and valuable (see figure 55). Only 6% of the students were not sure whether the discussions were constructive and valuable or not.

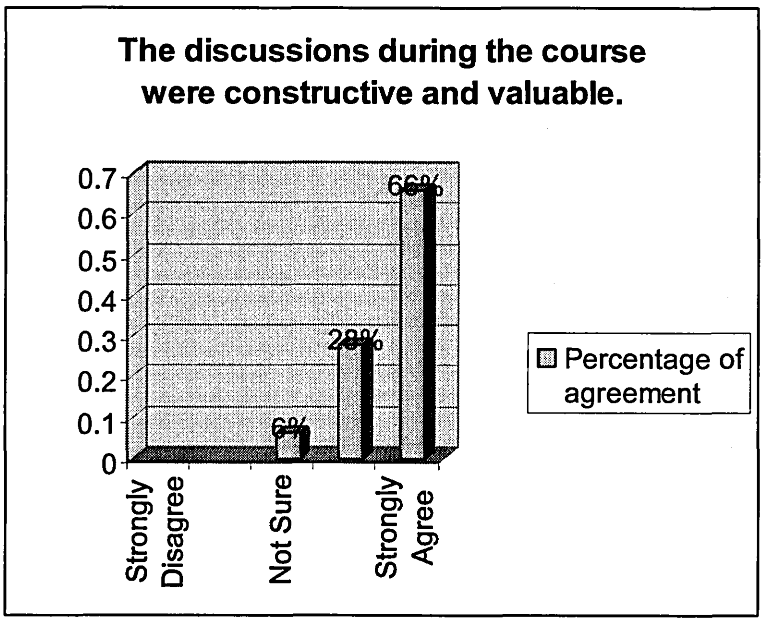

Figure 55. The students' comments on the course discussions.

Consistent with the students' feedback, the observations of the students' discussions highlighted the importance of their use during the course. The observer described the students' discussions during the course in the following:

> *"The students were very active during the discussions, as the discussions focused on the use of the Internet in education. Therefore, most of the students were keen to contribute to the discussions, because*

they wanted to share their own impressions and their expectations about the current and the future use of the Internet in education Therefore, the discussions were valuable and constructive."

It is important to highlight that the discussions during this course included two types of discussions. The first type of discussion was in-classroom face to face discussion, while the second type was online virtual discussion through using a discussion forum. The findings of this study indicate that there are some differences between the two groups of students in terms of their preferences for particular type of discussion. Some students in Sheffield group indicated that they were in favour of in-classroom discussions. In contrast, the students in Menofia group were in favour of using online discussions. A comment was made by Fouad as he briefly distinguished between the in-classroom discussions and online discussions as follows:

"I think the discussion using the Internet is better, because I can freely talk at any time I want."

Similarly, Ahmed elaborated the differences between in-classroom discussions and online discussions:

"In the traditional lecture, if we want to ask a question, and this question was silly, we might feel embarrassment. On the other hand, when we are using the Internet in discussion, we do not know the direct reaction of the whole group about the question."

Mercer (1995) notes that it is difficult to make free interpretations of the role of teacher and learner because teaching and learning are shaped by cultural traditions and take place in particular social and institutional settings. Accordingly, the differences between the two groups of students in terms of their own preferences of certain type of discussion can be interpreted in the light of the cultural differences between the two groups. For example, while the students in Sheffield group were used to use in-classroom discussions in their educational settings, the students in Menofia group had rarely experienced in-classroom discussions with the teacher because of the large numbers of students per classroom which influenced the teacher and the students interaction in the classrooms. Mentoring online discussion was found to be very important in terms of guiding the students' discussions in order to maintain it within the course objectives. Moreover, mentoring online discussion helped the students to remain active in the discussion.

8.4.3. Facilitator role

In this course, individual study sessions were planned to give the students the opportunity to develop their own skills and knowledge about the use of the Internet. However, due to the limitations of facilities for using the Internet, a few students were unable to use the Internet individually all the time. As shown in figure (56), 23% of the students either disagreed or were not sure that the individual study sessions gave them the opportunity to develop their own skills and knowledge. This indicates that the students needed more facilities to enable them to work individually on the Internet.

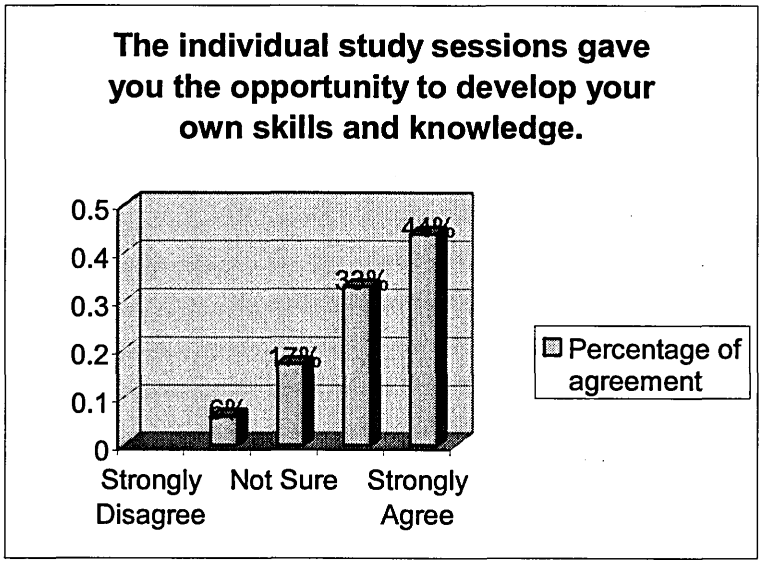

Figure 56. The students' feedback on the individual study during the course.

Although some students did not find the individual study developed their skills and knowledge, all the students found that the tutors gave them enough support. The whole group of students either agreed or strongly agreed that the tutor gave them enough support. The students' feedback on the tutor's support is seen to be very important especially when learning takes place online because the students need to feel that the tutor is still supporting them even when they are online so that they are not left behind. Therefore, teachers serve as guides and coaches, facilitating instead of directing learning (Javid, 2000). Subsequently, the facilitating role is seen to be one of the key roles for teachers while teaching using a Web-based learning environment. This role is seen to be crucial especially during the students' individual hands-on experience on the Internet. For example, the teacher should be available for the students in order to facilitate the students' learning of the use of the Internet by helping the students to solve any problems that they might encounter.

8.4.4. Mature partner role

Two types of partner support took place in this course. The first type was the peer support which took place between the students' themselves. The second type was the mature partner support which is described by Vygotsky (1962) that took place between the learner and the teacher.

Peer support was considered to be an essential part within the Web-based learning environment, and it was used in order to give the students the opportunity to share their own experiences and to promote their own learning. In this course, most of students found that their peers were cooperative and supportive during the course (see figure 57).

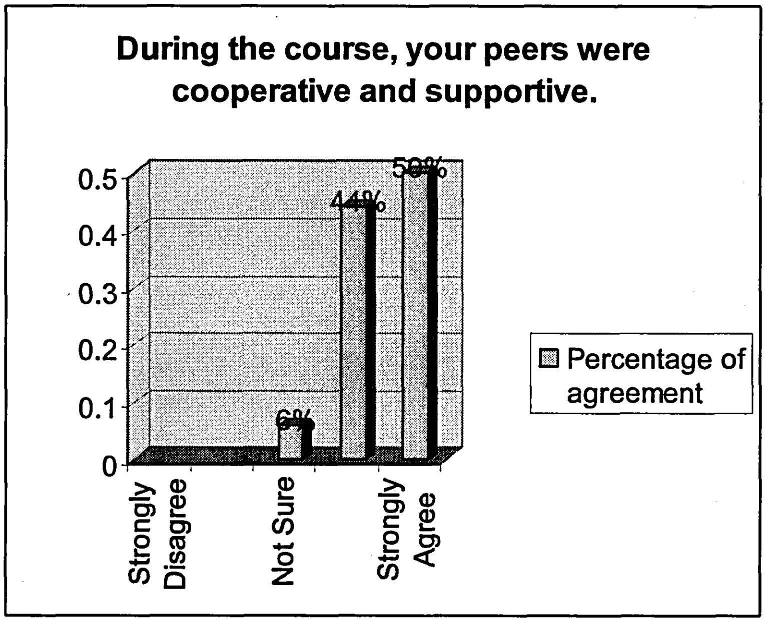

Figure 57. The students' feedback on their peers cooperation and support.

Moreover, the students during the course found that their peers were very supportive to their learning. For example, during the focus group, Ahmed stated that:

> *"Learning by using discussion increased my retention of information, especially when I had this discussion with my peers. This leads to retaining the information better than when I read it. Therefore, the conversation with my peer is better for me than reading."*

Furthermore, the observer in this course elaborated the different aspects which are related to the students' collaboration in the following:

> *"Most of the students were collaborating in terms of:*
>
> *- Exchanging Web addresses and information about searching the Internet,*

- Explaining some difficult words and icons to each other while they are browsing the Internet.

- Guiding each other to the search engines and how to use it,

- Taking turns in browsing and searching the Internet etc."

The second type of partner support highlighted in this study was the mature partner support which was provided by the teacher. This support was in the form of one-to-one interaction with the students. This type of interaction is seen to be a key element in the teaching and learning processes using Web-based learning environments. One-to-one interaction, according to Javid (2000), allows the students to seek solutions to their specific issues and design their learning projects in close collaboration with the instructors. Face to face interactions between the teacher and the students were used in this course in order to support their learning. This type of interaction was provided on the basis of the students' needs e.g. the teacher's was interacting face-to-face with the students when they had any learning difficulty.

Based on the students' observations, in contrast to the students in the Sheffield group, the students in Menofia group needed more face-to-face interaction with the tutor. Furthermore, the majority of the students in the second group indicated that they need more face-to-face interaction with the tutor. As shown in figure (58), 44% of the students needed more face-to-face sessions to be added to the course and 28% of the students were not sure whether they needed more face-to-face sessions or not. Only 28% of the students did not need more face-to-face sessions with the tutor.

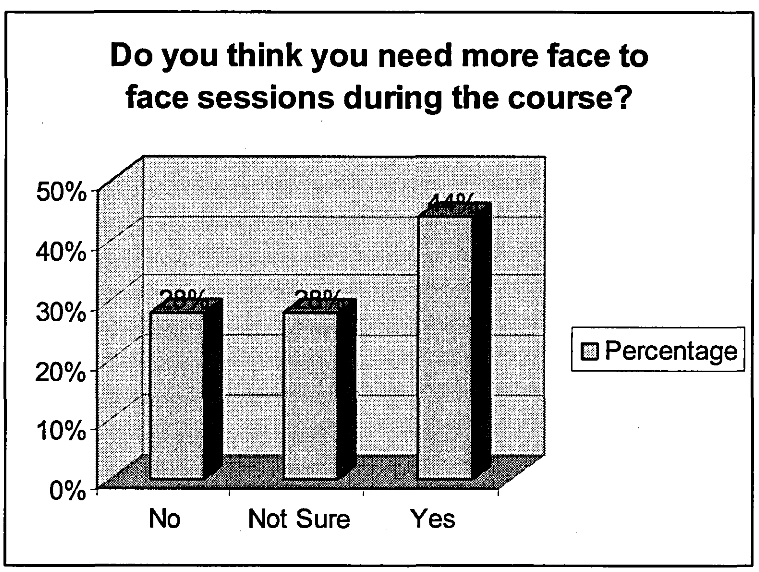

Figure 58. The students' need for more face-to-face sessions.

This result is consistent with the results of a study of interactivity by Shaw and Marlow (1999). They found that some students prefer a more traditional learning environment dominated by teacher-led exercises and are not comfortable interacting with computers. The students' need for more face-to-face interaction is seen to be as a result of the teaching and learning settings that the students are used to have in the educational institutions in Egypt. Since the Egyptian educational system is based on behaviourist assumptions, the students are used to learn in teacher-led situations. As a result, the students expect the teacher to be the main source of information and they expect him/her to lead them step-by-step particularly during workshops. In contrast, the British educational system is more influenced by constructivist assumptions. Accordingly, the students have more autonomy for learning and they take more responsibility for their learning. As a result the students in Sheffield group needed less face-to-face interaction with the teacher.

Based on these results, the teacher role should be transformed at some stages from the authority role to "a more mature partner" role which is based on the notion of the "Zone of Proximal Development" (Vygotsky, 1962). Accordingly, the teacher should provide the students with scaffolding tasks and activities (Hudson, 1998). These scaffolding activities aim to help learners bridge the gap between their actual and potential levels of development in association with their peers and/or tutors. Moreover, Lefoe (1998) stresses that students should have more control in the constructivist learning environment and that the teacher takes on the role of 'coach and facilitator', which in many situations is better described as "co-learner". In this research, this role is seen as a shared control over the learning process between both the teacher and the student. Berge (1999) refers to this as 'shared authority' between the students and the teacher and he also describes this process using the notion of 'guided learner control'.

8.4.5. Guide and advisor roles

In this research, some demonstrations were used in order to guide the students to learn to use the Internet. These demonstrations were seen to be an essential part of teaching and learning using a Web-based learning environment in order to orient the students to the use of the Internet and the learning environment. As a result of using these demonstrations, the majority of the students (94% of them) in this course found that the demonstrations guided their learning in the course (see figure 59). On the other hand, only 6% of the students were not sure whether the demonstrations guided their learning or not.

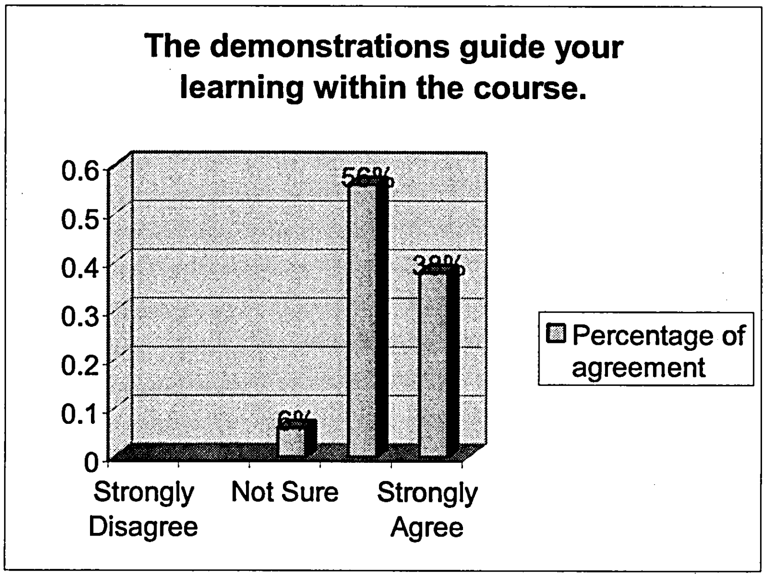

Figure 59. The students' comments on the use of the demonstrations.

Guidance and support were provided to the students by guiding them through the system explaining to them the essential parts that they will need during the course. As a consequence, the teacher devoted some time to supporting the students while they were online. For example, he provided advice when needed by the students especially the use of the learning environment such as uploading the assignments, downloading learning resources etc.

8.4.6. Orchestrating and managing roles as “key roles”

This study illuminated two key roles of the teacher when he/she is teaching in a Web-based learning environment. These roles were those of manager and orchestrator. Analoui (1995) described the role of the teacher in light of the fact that people at all levels of the organization are entitled to be described as "managers", because they “manage” their work situations, with colleagues, peers, clients, and their family relationships. Therefore, he proposed that teachers ought to be viewed as what they really are – managers in their own right. Like all managers, lecturers and trainers have to manage the resources which are made available to them in the best way they can. Teachers have to fulfil many managerial roles such as conveying knowledge, skills, types of behaviour and attitude to students. The role of the teacher is also described by Lefoe (1998) as a "task manager" which is also shared in a constructivist learning environment between student and teacher.

In this study, the role of manager was seen to be not only managing learning resources, but also managing the different roles and responsibilities within the Web-based learning environments. Hudson (1995) also refers to this idea when he highlights the notion of “orchestrating” teachers. They are described as those who used a variety of instructional modes…integrated the content of microcomputer-based instruction with the ongoing curriculum, and coordinated microcomputing activities with other instructional activities.

The orchestrating role was seen to be a challenging role for teachers who are using a Web-based learning environment, as they need to “orchestrate”, coordinate and manage their responsibilities and their different roles.

The results that emerged from this study reveal that the role of orchestrator allowed the teacher to integrate different teaching strategies in order to accommodate the preferred learning styles of students. Moreover, the integration of a range of teaching strategies enabled the teacher to provide different content structures. Furthermore, this integration enabled the teacher to maximise the use of the different tools and resources offered by the Web. A similar approach to this is described by Okamoto et al. (2001) as a cooperative strategy contexts which is a method that switches among pedagogical strategies in order to adapt to the learners

The integration of a range of teaching strategies in this study led to describing the various roles of the teacher as "multiple roles" when he/she is teaching using a Web-based learning environment (see figure 60). It also focuses on the "manager" and “orchestrating” roles as key roles.

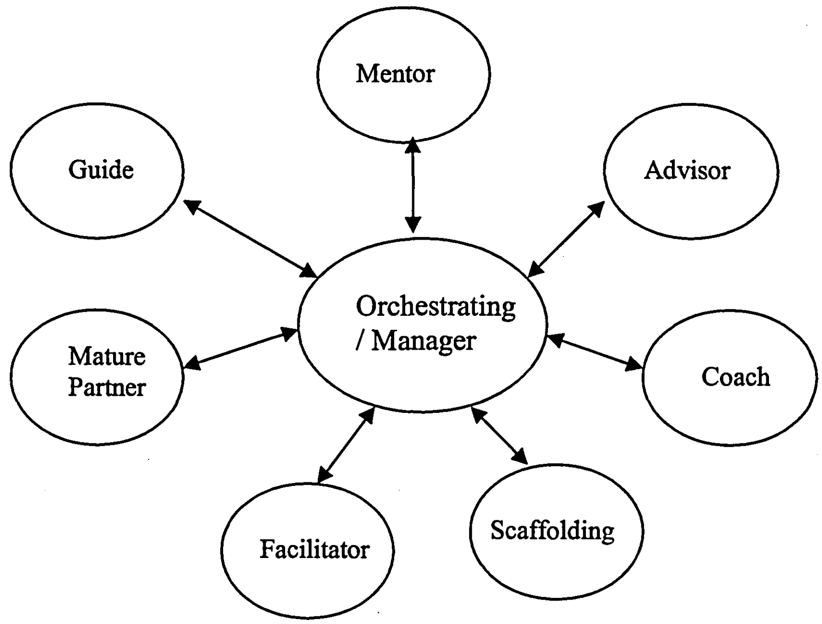

Figure 60. Teacher’s multiple roles within the Web-based learning environments.

The multiple roles of the teacher are seen to be key characteristic of teaching in Web-based learning environments. Accordingly, these roles should be taken into account by teachers who are aiming to develop a Web-based learning environment. As a result, there is a need to integrate a range of teaching methods that make use of the different tools and resources available on the Web.

8.5. Section four: An evaluation of the Web-based learning environment 'Internet Tutoring System'

This section provides an evaluation of the different aspects that are related to the use of the Web-based learning environment namely 'Internet Tutoring System'. This includes the guidance that was provided by the learning environment for the students' learning. It also includes an evaluation of the different characteristics of the 'Internet Tutoring System' such as the clarity of user interface; ease of use; usefulness of the links and information resources; reliability of connection speed and information organisation. Furthermore, this section evaluates the level of technical support that was provided to the students during the course. Finally, it highlights students' suggestions for the future development of the 'Internet Tutoring System'.

8.5.1. Internet Tutoring System guidance

As highlighted earlier in section three on the roles of the teacher, the guidance role is considered to be an essential one when using a Web-based learning environment. In this research, an essential part of guiding the students when using a Web-based learning environment is seen to be the design of the learning environment itself. As highlighted in chapter five, the teacher should create a learning environment in which the learning process is 'remotely directed' through the technology. As a consequence, the learning process is not fully directed by the teacher or even fully self-directed by the learner; rather the learning process is shared and 'remotely' directed using a technology-based environment. This type of guidance can be provided for students in a form of wide range of resources and tools that assist them during studying online e.g. online tutorial, help or troubleshooting and providing a channel for contacting with the technical support team.

According to the analysis of the data obtained from the course evaluation form, the students' comments about the 'Internet Tutoring System' were very positive (see figure 61). A large percentage of the students (89% of them) found that the 'Internet Tutoring System' guided them through their learning process. This guidance was given to the students by providing them with the necessary course information, by providing them with online tutorials and by providing them with contact details such as technical contact. Only 11% of the students were not sure that the 'Internet Tutoring System' guided them through their own learning.

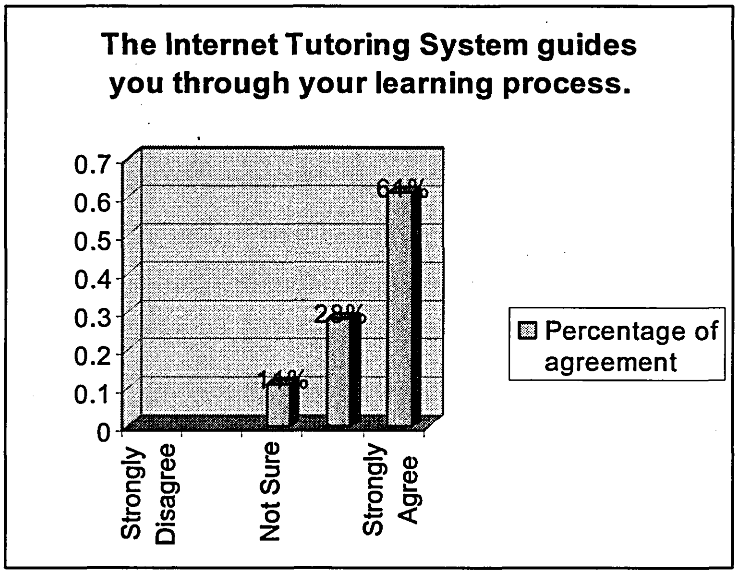

Figure 61. The students' comments on the Internet Tutoring System.

8.5.2. Internet Tutoring System characteristics

The students' comments regarding the key characteristics of the 'Internet Tutoring System' are highlighted in this section. These characteristics include the clarity of the user interface; the ease of use; usefulness of the links and information resources; reliability of connection speed and information organisation.

8.5.2.1. The clarity of the user interface

As highlighted earlier in chapter six on the design, Harper (1997) identifies the user interface as a key design issue. Subsequently, the clarity of the user interface is seen to be a major criterion for any successful Website. The findings of this study show that the majority of the students found that the use interface of the 'Internet Tutoring System' was clear for them. The results indicate that 72% of the students agreed and 28% of them strongly agreed that the use interface of the 'Internet Tutoring System' is clear.

The students' comments on the design of the 'Internet Tutoring System' confirm these results. For example, Mohamed commented on the user interface in the following:

> *"The user interface is very clear and easy to use. Moreover, the information within the system is very useful and it has relevant information resources."*

Efficient navigation is seen to be a key element in the design of the user interface as identified by Harper (1997) and Marcus (1992). Subsequently, the aspect of navigation is considered to be the key element that led to the students' positive feedback on the user interface of the 'Internet Tutoring System'. This is seen to be as a result of using simple navigation in the form of single-frame Web pages. This result is consistent with the findings of a study by Hsiang et al. (2000) which emphasised students' preferences for using single-frame Web pages.

Although the students found the user interface clear, one of the students (Ahmed) indicated a need to add more interesting items to the user interface such as adding more images, coloured backgrounds etc. Although the use of a simple user interface seemed to be appropriate for the age group of the students, it was found that a few students still needed more visual representations in the system. As a result, adding more visual representation should be taken into consideration in any future development in the 'Internet Tutoring System'.

8.5.2.2. The ease of use

As highlighted earlier in the design chapter, Shih and Chen (2000) emphasise that the learning environment should be easy to use. Since a large number of the students did not use the Internet before the course, it was seen to be important to provide them with an easy to use Web-based learning environment. Accordingly, the ease of use was considered to be a major criterion for the evaluation of the design of the Web-based learning environment. As a result, it was seen to be important to investigate the extent to which the students found the Web-based learning environment easy to use.

The results show that 95% of the students either agreed or strongly agreed that the Web-based learning environment namely was easy to use. Only 5% of the students were not sure whether the learning environment was easy to use.

The students' positive comments on the ease of use of the 'Internet Tutoring System' are considered to be as a result of the simple design of the learning environment. Furthermore, the learning environment was designed in order to relieve short-term memory and to rely on recognition of information which minimises the "cognitive load" (Mandel, 1997). This result is also seen to consistent with the findings of Starr (1997) that hypertext enables the user to easily access information.

8.5.2.3. Usefulness of the links and information resources

According to Shih and Chen (2000), any learning environment should be capable of providing an environment for dynamically exploring information. For this purpose, links to relevant information resources were provided in the Web-based learning environment. According to Wilkinson et al. (1997), the quality of links is considered to be one of the major criteria for assessing a Website. Subsequently, it is found to be important to find out the students' views about the quality of the links and information resources provided in the Web-based learning environment. The analysis of research data shows that 72% of the students strongly agreed and 28% of them agreed that the 'Internet Tutoring System' has relevant links and useful information resources. The usefulness of information resources is seen to be due to the careful selection process of these resources because they were selected according to a number of criteria such as those described by Jolliffe et al. (2001).

8.5.2.4. Reliability of connection speed

The speed of downloading information from a Web-based learning environment is considered to be a crucial element that could affect student learning. Subsequently, having a reliable speed of downloading information is an important factor in the teaching and learning processes using a Web-based learning environment. Within this framework, it is important to highlight two main factors that affect the speed of downloading information from the Web:

- The first factor is related to the design of the Website itself. In relation to this factor, the amount of time that is needed for downloading data files, images, video clips, etc. is influenced by the design of the Website itself. For example, some Websites include large files that take longer time to download. In addition, the amount of time needed to process information differs from one Website to another according to the number of operations involved in this process.
- The second factor that could influence the speed of downloading information from the Web is the speed of the Internet connection. This factor includes the amount of time needed to transfer information from the Web e.g. the amount of information 'bytes' that can be transferred per second. The connection speed relies upon the connection type such as 'dial-up' and 'broad band' connections.

As illustrated in figure (62), 61% of the students found that the speed of downloading information from the Web-based learning environment was not reliable. Among these students, 28% of them either disagreed or strongly disagreed and 33% of them were not sure that the speed of downloading information was reliable. While only 39% of the students found the speed for downloading information reliable.

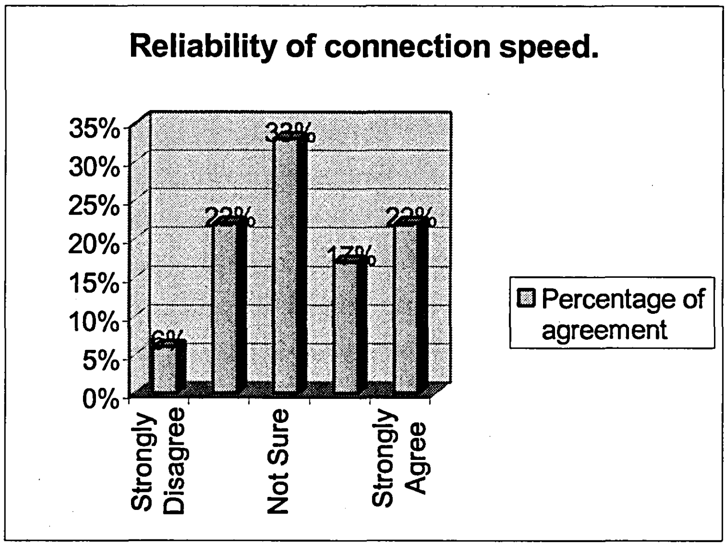

Figure 62. The students' comments on the reliability of connection speed.

On the other hand, the students in the initial trial did not comment and/or complain about the speed of downloading information from the Web-based learning environment. The complaints that were raised by the students in Menofia group were due to the speed of the Internet connection. Accordingly, the differences between the two groups of students can be interpreted in the light of the differences in the infrastructure particularly the type of connections used in both places.

8.5.2.5. Information organisation

Appropriate organisation of data and information is identified by Marcus (1992) as one of the key components for well-designed user interfaces. Mandel (1997) also highlights that organising information is considered to be one of the principles for reducing users' memory load in a computer interface. Accordingly, the information organisation is seen to be an important characteristic of the Web-based learning environment. As a result, the students were asked to indicate the extent to which they found the information in the Web-based learning environment to be well organised. All the students found that the information provided in the Web-based learning environment was well organised. The results show that 67% of the students strongly agreed and 33% of them agreed that the information in the learning environment was well organised.

8.5.3. Technical issues

8.5.3.1. Level of technical support

According to Rankin (2000), the technical assistance contact is considered to be crucial information in an online course which should be provided for the students. Clay (1999) also found that the lack of technical support is considered to be one of the primary factors that might inhibit teachers from teaching at a distance. Accordingly, in this research, the provision of technical support for the students was considered to be an essential element for teaching and learning using the Web. Accordingly, as highlighted earlier in chapter six on the design, a technical assistance form was provided for the students to submit in case they had any technical enquiries. In addition, a contact email address was also provided to enable the students to contact the technical assistant in case of any technical problems. A large percentage of the students in this research found that the technical support for the 'Internet Tutoring System' was sufficient and fast. According to figure (63), 39% of the students strongly agreed and 44% of them agreed that technical support was sufficient and fast. Only 17% of the students were not sure about the technical support of the system.

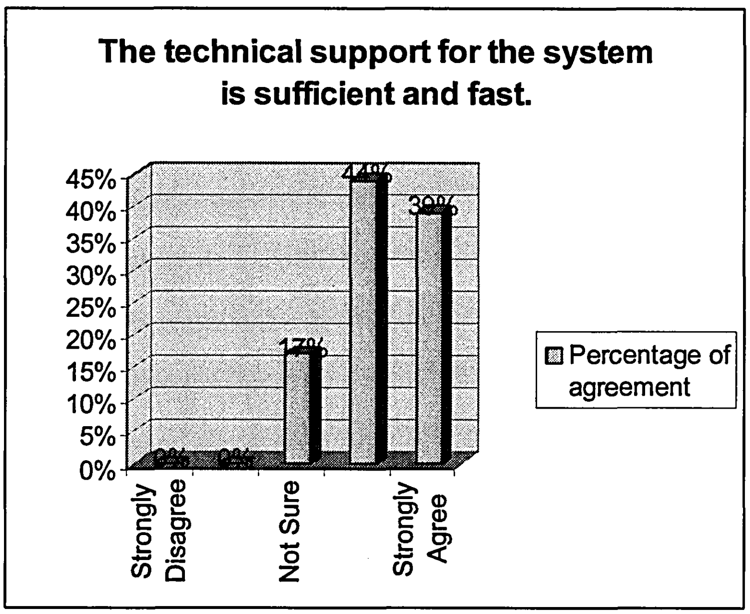

Figure 63. The students' feedback on the technical support.

These results are seen to be due to the use of various ways for providing technical support such as the use of technical form and email contact. Moreover, the technical support included face to face support during the course between the tutor and the students.

8.5.3.2. Technical difficulties

The provision of technical support does not necessarily prevent technical problems when using any kind of technology. As a result, it was seen to be important to highlight the technical difficulties that the students faced whilst using the Web-based learning environment.

Although a large number of the students (61%) indicated that they did not have any technical difficulties during the course, some students had some technical difficulties. As shown in figure (64), 28% of the students indicated that they have technical difficulties and 11% of them were not sure if they had technical difficulties or not.

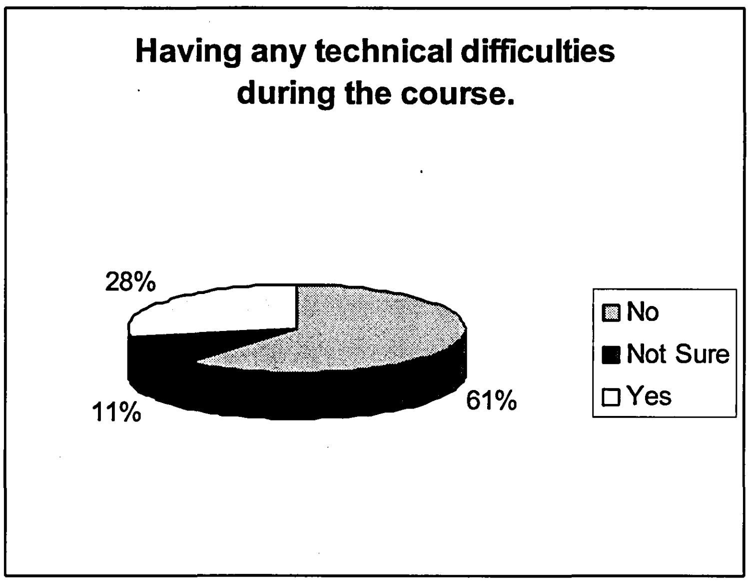

Figure 64. The students who have technical difficulties during the course.

The students' comments on the technical difficulties indicate that most of these difficulties were related to the Internet connection speed. One of the students (Tarek) commented on this saying:

> *"The connection was to some extent slow, and sometimes some locations did not work efficiently because of the connection speed."*

8.5.4. Students' Suggestions for future development of the 'Internet Tutoring System'

The design of any technology including Web-based learning environments is seen to be as a continuous process. Therefore, it is important to highlight some implications of this study for the future development of the 'Internet Tutoring System'. Many students who participated in this course made suggestions for the future development of the 'Internet Tutoring System'. These suggestions are discussed in this section.

One suggestion made by the students for the future development of the system is the addition of the Arabic language to the system. This suggestion was made by Mostafa and Noor. For example, Noor made this suggestion by saying:

> *"I suggest developing a part in the Arabic language in order to facilitate reading the site"*

Although this suggestion might seem easy to accomplish, it is important to highlight the fact that the use of the Arabic language on the Web is still difficult. In a study made by Al-Badr (1998), it was found that a major obstacle that faces the use of the Arabic language on the Internet is the lack of standards, particularly in the field of character sets. He also summarises the problems that are facing Arabic-speaking Internet users which are weak telecommunication infrastructure, lack of Arabic content on the Internet and lack of Arabic Internet access software for the Web and for e-mail. Due to these problems, it is still difficult to design an effective Website using the Arabic language. However, it is still important to design some parts in the Arabic language alongside the use of the English language Website in order to facilitate the students' learning on the learning environment i.e. developing a dual language Website.

Another suggestion made by the students is related to the organisation of the course timetable. Some students suggested increasing the period of the course. For example Tarek suggested that:

> *"The amount of time specified for this course needs to be increased. Therefore, we can have the opportunity to acquire more knowledge about the use of the Internet."*

The students' suggestion for increasing the time for the course might result from the fact that the course was very intensive. Moreover, the students needed more time for the course because they found difficulty in studying which is an essential process for the students' learning. At the moment, the difficulty to study is due to the lack of studying facilities such as students' personal computers and Internet connections, in addition to the lack of facilities in their academic institution.

A further suggestion made by the students concerned the amount of information included in the Web-based learning environment. Some students suggested adding to the information included in the course. For example, Hussein suggested the addition of information related to the design of Web pages. This suggestion needs to be taken into consideration and in relation to the existing facilities. For example, the students need more facilities in order to practice and study the different aspects that are related to the design of Web pages. Moreover, the students should be given the opportunity to search the different resources for information rather than giving them pre-defined and oversimplified content (Spiro et al., 1991).

The final suggestion for the future development of the system concerns the facilities for using the Internet. Accordingly, some students made suggestions about increasing the number of Internet connections in schools in Egypt in order to use the Internet effectively. Nadeen suggested that:

> *"I wish to increase the number of Internet connections in schools in order to promote the students to learn. It will also deepen the student experiences in different fields and establish communication between them and their peers elsewhere."*

Despite the difficulties that the students faced during using the 'Internet Tutoring System', the students and the observer made very positive comments about the system. For example, during the focus group, Hussein commented saying:

> *"The 'Internet Tutoring System' for myself is considered to be an 'electronic educational institution', because by using it, I can learn individually and in a group which is one of the major advantages of the system."*

8.6. Section five: Students' progress in the use of the Internet

This section discusses the findings that are related to the students' progress in learning the use of the Internet in this course. As highlighted earlier in chapter seven on the implementation, four units were trialled with the students in Egypt. These units were unit one, two, three and five. Accordingly, the results that are related to the students' progress in these four units are discussed in this section. Furthermore, the students' progress in the overall course is discussed in relation to the students' levels in using the Internet before the course and also to their preferred learning styles. Additionally, the students' suggestions for the future development of the overall course are highlighted in this section.

8.6.1. Students' progress levels in unit one

As indicated earlier in chapter seven on the implementation, 67% of the students had used the Internet before the course. Although the majority of these students only used the Internet superficially, their progress in unit one was influenced. As a result, all the students rated their own progress levels in unit one as high or very high. As shown in figure (65), 78% of the students rated their own progress levels in unit one as very high and 22% of them rated their own progress levels as high.

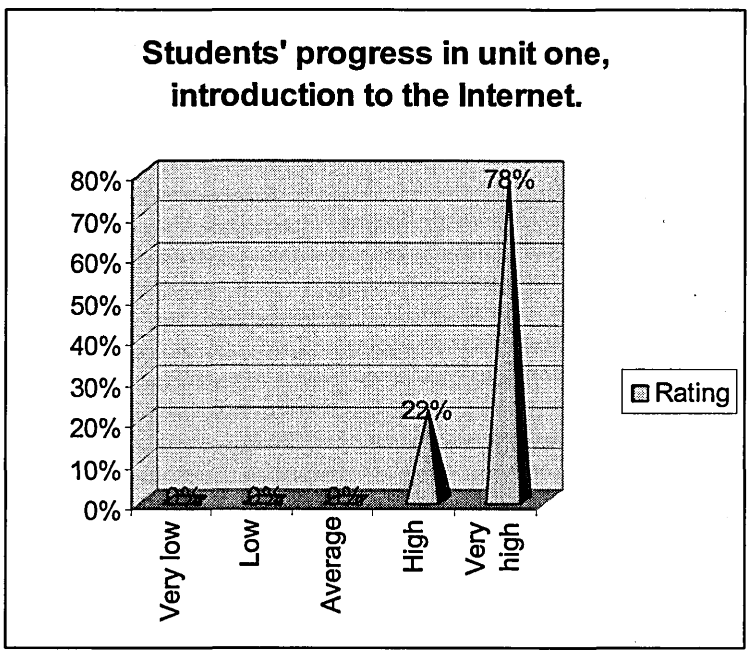

Figure 65. The students' progress levels in unit one.

8.6.2. Students' progress levels in unit two

In unit two, the students learned to search the Internet for information by using different searching techniques such as using search 'engines', Web 'crawlers' etc. The analysis of data shows that the majority of the students (89% of them) rated their own progress levels in unit two as either high or very high. As illustrated in figure (66), 56% of the students rated their own progress levels in unit two as very high and 33% of the students rated their own progress in this unit as high.

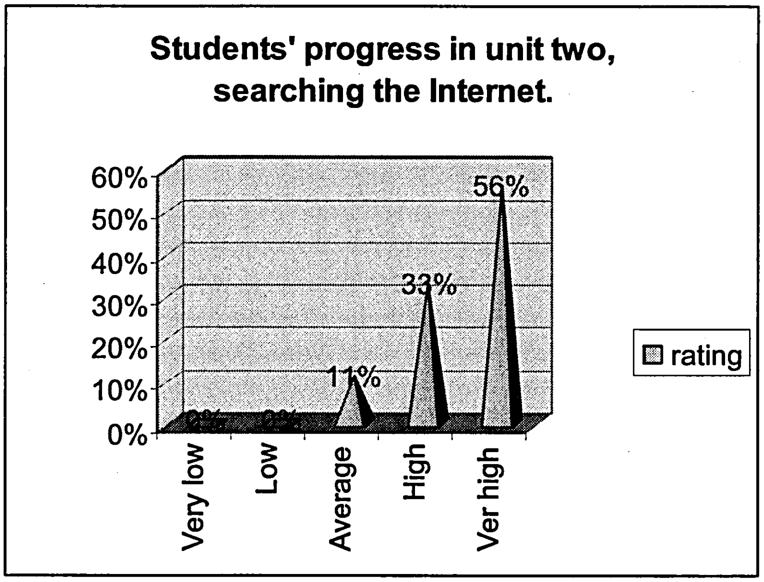

Figure 66. The students' progress levels in unit two.

These results indicate that the majority of the students felt confident about their ability to search the Internet for information after the course. On the other hand, only 11% of the students rated their own progress levels in unit two as average. This indicates that a few students were unsure about their own ability to search the Internet for information. This could be as a consequence of the fact that these students needed to spend more time on searching the Internet for information in order to gain their self-confidence in this aspect.

8.6.3. Students' progress levels in unit three

As highlighted in chapter four on the curriculum development, unit three aims to introduce the students to the different communication utilities that are available on the Internet. These communication utilities include email, instant messaging and videoconferencing. Although 6% of the students rated their own progress levels in unit three as low levels and 6% of them rated their own progress levels as average levels in this unit, the majority of students' progress rates in unit three is considered to be high (see figure 67). This is seen to be because of the fact that 88% of the students rated their own progress levels in unit three as either high (22% of them) or very high levels (66% of them).

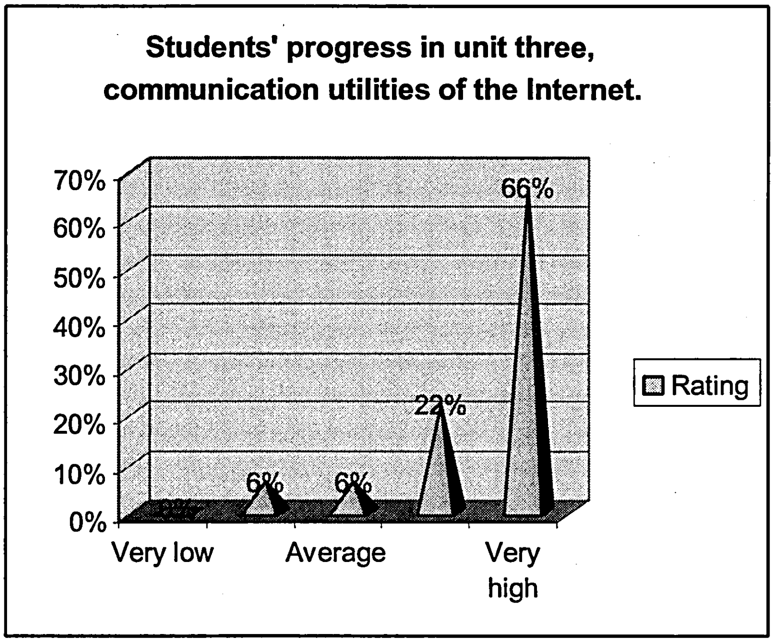

Figure 67. The students' progress levels in unit three.

This small percentage of the students who had low or average levels in unit three could be as a result of being unfamiliar with these communication tools before the course.

8.6.4. Students' progress levels in unit five

In unit five, the students were introduced to the design of Web pages. The findings of this study indicate that there was a higher percentage of the students who rated their progress levels in unit five as low or average. As shown in figure (68), 23% of the student either rated their own progress levels in unit five as low (6%) or average levels (17%). These low progress rates were expected in the final unit because of several reasons:

First of all, the design of Web pages needs a relatively long time especially for individual work on ones' own design and the course had its time limits. Secondly, the different facilities required for the design of Web pages were not available for the students to use e.g. the students did not have access to a computer at home or at their academic institution to work on their own design. Finally, there was a lack of software required for Web design such as 'Dreamweaver', because the students during the course used very simple tools in order to design Web pages e.g. 'MS Word' and 'Netscape Composer'.

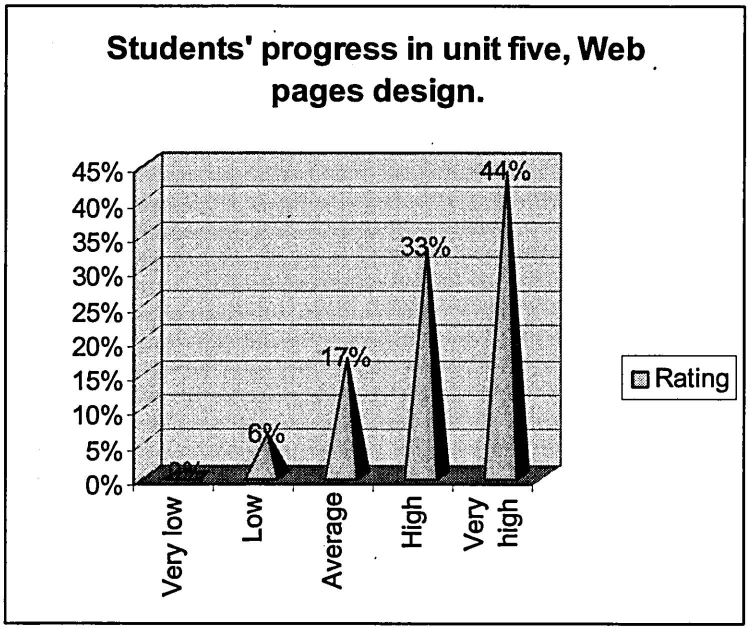

Figure 68. The students' progress rates in unit five.

Despite of the various difficulties that faced the students in the final unit, 77% of the students rated their own progress levels in unit five as high or very high. These results indicate that the course was successful in terms of introducing the students to the basic knowledge and skills for designing Web pages. One of the students (Nadeen) commented on that saying:

> *"Although I did not have any previous idea about designing Web pages, I found it easy to design a Web site. And I'm anxious to learn more about Web design."*

Ahmed also commented on learning the design of Web pages saying:

> *"I have now the basic knowledge and skills for designing Web pages and I intend to follow up these with more reading and work on designing Web pages."*

These comments also indicate that the course gave the students the motivation to learn more about designing Web pages which is seen to be an ongoing process that requires a continuous learning.

8.6.5. Students' progress levels in the course

8.6.5.1. Students' expectations

It was seen to be important to find out the extent to which the overall course met the students' expectations. Based on the results shown in figure (69), 95% of the students found that the course met their own expectations. While only 5% of the students were not sure whether the overall course met their expectations or not.

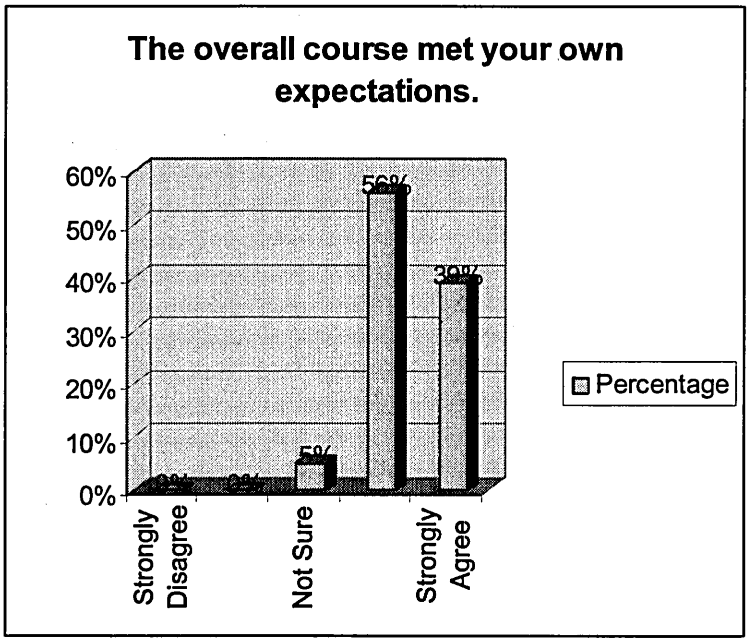

Figure 69. The course fulfilment to the students' expectations.

These results indicate that the majority of the students were satisfied with the course. This is seen to be as a result of the students' learning experiences during the course e.g. the students used a Web-based learning environment for the first time and they were enthusiastic about using the different tools and resources that were available on the Web.

8.6.5.2. Students' progress levels in the course

At the end of the course, the students were asked to describe their progress levels in the course in relation to the course objectives. As illustrated in figure (70), 72% of the students rated their own levels in using the Internet after the course as high or very high levels. For example, 33% of the students rated their levels in using the Internet as very high levels and 39% of them rated their levels as high. Only 28% of the students rated their levels in using the Internet as average levels.

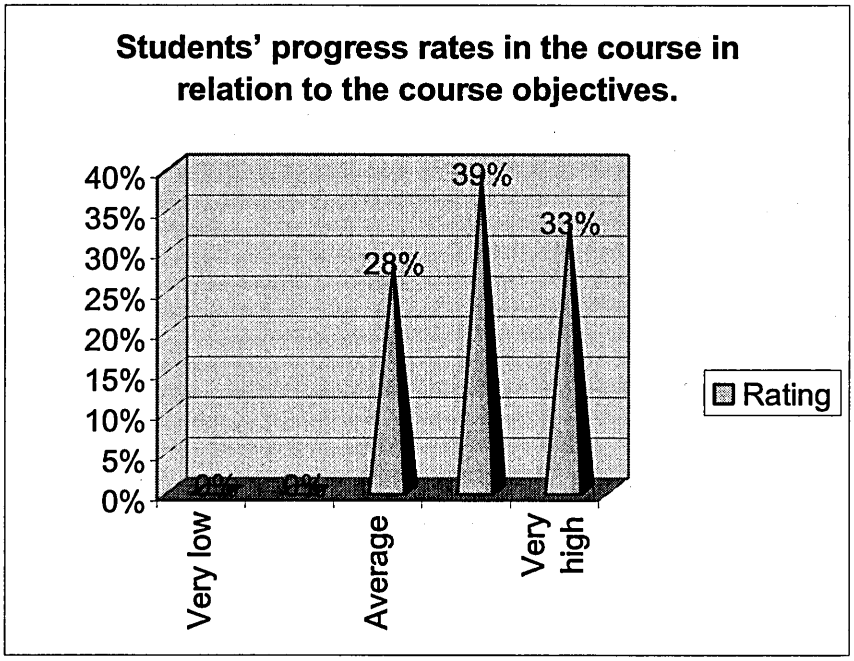

Figure 70. The students' progress rates in the overall course.

None of the students rated their levels in using the Internet after the course below the average level. These results reflect the students' perceptions of their levels of use of the Internet after the course in relation to the course objectives and in the light of their levels before the course. Moreover, the students' comments on the course during the focus group were very positive in relation to their own progress in the course. For example, Amer commented on the course saying:

> *"It is really an outstanding course, and it is a new style of teaching which this is our first time to see. Frankly, I think this course gave us good opportunity to know how to use the Internet. Moreover, the information is really valuable, especially that it was in a short period, and I felt that everyone benefited from this course."*

Table (22) compares the students' levels in using the Internet before and after the course. Moreover, this table (22) summarises the students' progress rates in each unit of the course. It can be concluded from table (22) that there is a significant change between the students' levels in using the Internet before the course and after the course. The students' levels in using the Internet before the course were average levels or below, while the majority of the students' levels after the course were above the average levels. For example, while 56% of the students had low or very low levels in using the Internet before the course, only 6% of the students had low levels in unit three and five after the course.

Table 22. The students' progress levels in using the Internet before the course and after the course

	Internet level rates before the course	Internet Progress rates after the course	Progress rates in Unit1	Progress rates in Unit2	Progress rates in Unit3	Progress rates in Unit5
Very low	50%	0	0	0	0	0
Low	6%	0	0	0	6%	6%
Average	11%	28%	0	11%	6%	17%
High	0	39%	22%	33%	22%	33%
Very high	0	33%	78%	56%	66%	44%

Furthermore, table (22) shows differences between the students' levels across the different units particularly the very high levels of progress which are highlighted in the table. However, the total percentages of the students' high and very high levels of progress decline across the different units. As illustrated in figure (71), there is only a very slight decrease between the combined total percentages of the students' high and very high levels in using the Internet.

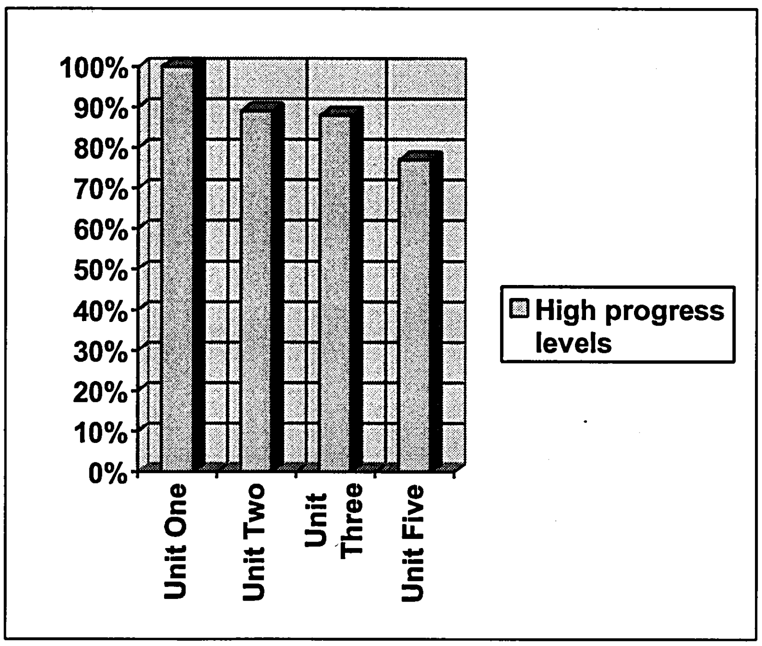

Figure 71. The total percentages of the students' high and very high progress levels.

This might be interpreted in light of the level of content structure for these units and the level of teacher and students control over these units. For example, the percentage of students who described their progress levels in unit one (which is well-structured and mainly teacher-controlled) as above the average level is 100%, while the students who described their progress level in unit five (which is ill-structured and mainly learner-controlled) as above the average level is 77%. These results indicate that the students' perception of the teaching and learning process and the teacher role are considered to be important factors in the students' learning. Students' perceptions are influenced by the Egyptian culture and educational settings. The Egyptian students consider the teacher to be mainly responsible for the teaching and learning process. Subsequently, the students are used to learning through teacher-led experiences and pre-specified content and objectives. Since the advanced units in this course were ill-structured, the students' progress levels were influenced.

In addition, it is seen to be important to find out the relationship between the students' levels in using the Internet before and after the course. The analysis of data show that the correlation coefficient between the students' levels in using the Internet before the course and the students' levels in using the Internet after the course is 0.553078. This correlation coefficient indicates that there is a weak relationship between the students' levels of using the Internet before the course and after the course. Subsequently, the use of the Internet curriculum and the Web-based learning environment are considered to be the major factors that influenced the students' learning of the use of the internet.

8.6.5.3. The students' progress levels in relation to their learning styles

In order to investigate the relationship between the students' progress levels and their preferred learning styles, the correlation coefficient between the students' progress levels in each unit and their preferred learning styles were calculated. Table (23) shows the correlation coefficient between the students' progress levels in the course and their preferred learning styles. Moreover, it shows the correlation coefficients between the students' progress levels in each unit and their preferred learning styles.

Table 23. The relationship between the students' preferred learning styles and their progress levels.

Progress levels	**Correlation coefficient with learning styles**
Overall course	0.208881
Unit 1	0.083356
Unit 2	0.172025
Unit 3	0.261989
Unit 4	0.080309
Unit 5	0.196917

The small values of these correlation coefficients indicate that there is no relationship between the students' progress levels in the different units of the course and the students' learning styles. Accordingly, the design of the Internet curriculum and the design of the Web-based learning environment are seen to be accommodating the preferred learning styles of the students.

In order to investigate the relationship between the students' preferred learning styles and their learning of the use of the Internet, the correlation coefficient between the students' progress levels in the overall course and their preferred learning styles was calculated. The "Pearson" correlation coefficient between the students' progress levels in the overall course and students preferred learning styles is (0.208881). This indicates that there is a no relationship between the students' progress in this course and their preferred learning styles. This result confirms that the course provides a variety of opportunities and provides a variety of teaching methods that accommodate the preferred learning styles of students. These findings are seen to be consistent with the findings by Ellis et al. (1993); Stanton and Baber (1992); Ross and Schulz (1999) and Kraus et al. (2001)

8.6.5.4. Course implications for the students

Since this course aims to enable the students to use the Internet effectively, it has implications for the students. The major implication of this course is seen to be in motivating the students to follow it up by continuing their own efforts in developing their knowledge and skills for using the Internet, especially the Web design. For example, one of the students (Azaa) stated that:

> *"This course is considered to be a starting point for us and I'm willing and also I think my colleagues are willing to follow up this work. One of my colleagues (Mona) told me the same thing and she insisted that we should follow up learning about the Internet which means she loved the course subject and she is keen to do so."*

Furthermore, during the interview the observer highlighted some implications of the course on the students by saying:

> *"I think the students did benefit from this course, as they were thinking what to do next after the course, e.g. two or three of them decided to design their own personal homepages and to upload it on a free server on the Web."*

8.6.6. Suggestions for future development of the course

A number of suggestions were made by the students for the future development of the whole course. Some of these suggestions were made by the students during the focus group and some other suggestions were made in the course evaluation form. Monir commented on the facilities during the focus group saying:

> *"The connection speed of the Internet is considered to be a barrier especially when downloading large files. Although the facilities are not satisfactory, the design of the course itself is excellent and it covers all that is expected about the Internet."*

The majority of the students suggested extending the period of time for the course in order to enable them to have longer time for discussions and more hands-on workshops. For example, Ahmed suggested that:

> *"I suggest increasing the number of hours per day to become at least six hours per day, and to increase the period for the course to about two weeks."*

Asmaa also suggested the following:

> *"Increase the time for the course in order to give us the opportunity to have more hands-on experiences on the Internet."*

Hussein suggested giving more emphasis and time for learning the design of Web pages within the course. This could be as a result of the fact that Web design needs a significant amount of time of individual study. This time for individual study was not available for the students because they did not have enough computing facilities in order to work on the design of Web pages neither at their own home nor at their own academic institution.

Some important comments were also made by the observer concerning the future integration of the course as a unit in the Faculty of Specific Education:

"The course is well-designed and well-prepared and it can be integrated as a unit in the Faculty of Specific Education. However, the facilities available in the faculty need to be developed first in order to fulfil the technical requirements for the course. This course is considered to be essential for any pre-service or in-service teacher, as the Internet usage grows everyday and becomes an important part of the teaching and learning process."

Chapter nine: Conclusions and recommendations

9.1. Conclusions

9.1.1. Objectives and content of the Internet curriculum

To conclude, it has been found that most of the studies concerning constructivist learning environments mainly focus on the design of the learning environment itself such as Jonassen (1997a, 1997b, 1994 & 1999), and Mayer (1999). Furthermore, it has been found that there is a lack of studies concerning the development of curricula that are appropriate for constructivist learning environments. This could be as a result of the extreme constructivist assumption that the content cannot be prespecified for the constructivist learning environments (Tobin et al., 1990; Jonassen, 1997a and Honebein et al., 1993). Although there are a few studies that considered the content structure such as Hannafin et al. (1999) and Jonassen (1997c), there is still a need for structuring content and developing curricula that are appropriate for constructivist learning environments, especially if the learners do not possess prerequisite knowledge and skills (Spiro, et al., 1991 and Dick, 1991).

In this study, a model has been developed for structuring the Internet curriculum in terms of well-structured, semi-structured and ill-structured content. The objectives vary from one stage to another and the more advanced the stage of knowledge acquisition, the more ill-structured the content, which increases the degree of complexity. The use and the integration of these content structures in this study takes into consideration the entry level of the students especially those students who are lacking prerequisite knowledge and skills for using the Internet. Furthermore, the integration of the different content structures provides the students with a variety of contexts that have different degrees of complexity i.e. support the students' cognitive flexibility as highlighted by Spiro et al (1991).

This model is considered to be appropriate for many subjects especially if they are flexible and changeable like the Internet. This flexibility should not have a major influence on this structure because the semi-structured content and the ill-structured content are also flexible, and they give the learners the space and the opportunity to select and construct knowledge according to their learning styles.

It can also be concluded that it is important to provide the students with clear and relevant objectives. It is also equally important to provide the students with opportunities to encourage their ownership over the learning objectives (Jonassen, 1999; Honebein et al., 1993). Subsequently, the students should be given the opportunity to actively engage in the identification of the course objectives particularly when acquiring knowledge at advanced levels which require them to work independently with ill-structured content. Since learning using ill-structured content takes a relatively long time, the students should be given enough time when learning using this type of content. The students' learning using ill-structured content is seen to be influenced by the educational and cultural settings. For example, the existing Egyptian educational and cultural settings focus on providing the students with explicit and pre-defined objectives which do not encourage them to develop their autonomy for learning.

The organisation of the content is seen to be a crucial element that might influence the whole course. Subsequently, the content was organised in order to give the students the whole picture about the course as well as the detailed information about it. This was accomplished using the Web by using anchors and links to the different aspects that are related to the content. As a result, the information resources became interconnected rather than compartmentalised (Wilson et al., 1993).

The results of this study confirm that authentic activities are an essential element in constructivist learning environments as highlighted by Henze and Nejdl (1997) and Jonassen (1999). Course activities were designed to be clear and sufficient in relation to the course objectives. Moreover, the activities were developed in the light of the different content structures. Subsequently, different degrees of complexity in the activities were provided to the students and these were associated with the levels of complexity in the content. As a result, the activities were used in order to promote and maintain the students' active participation during the course.

A wide range of information and learning resources were integrated and used in the Web-based learning environment 'Internet Tutoring System' such as Web resources and course documents. The relevance of the learning resources to the context is considered to be a key characteristic of the learning environment. Furthermore, providing a wide range of learning resources gave the students different opportunities to construct their own knowledge about the use of the Internet according to their own learning styles.

The content was considered to be a key element in the design and the use of Web-based learning environments in this study.

The main aims of the design process were to develop the Internet curriculum with the following characteristics:

- Clarity and the relevance of the course objectives.
- Well-organised content and course timetable.
- The use of authentic activities that encourage and maintain the students' active participation.
- The integration and the use of a wide range of useful and relevant information and learning resources with the Web-based learning environment.

9.1.2. Student learning within Web-based learning environments

The results of this study confirm the importance of the learning process as well as the learning product (Jonassen, 1999). This study illuminated a number of issues that are related to the learning process within a Web-based learning environment.

The results show that some students approached the Web-based course with enthusiasm while others approached it with fears (Hackbarth, 1997). As a consequence, it is important to take into account the students' attitudes in order to promote their learning by orienting them to the learning environment and engaging them in learner-centred activities. Furthermore, it can be concluded that Web-based learning environments can promote students' learning and motivate the students to actively construct their own knowledge. This motivation is seen to be as a result of the richness of the Web, because the Web provides the students with different types of tools and resources that encourage them to search for information.

This study also highlights important issues in relation to "cognitive overload" that students might experience during online learning. It can be concluded that cognitive overload is likely to occur particularly at the beginning of an online course when the students do not have prerequisite knowledge and skills. The results revealed two main factors that can influence the cognitive load of the students. These two factors are the students' feeling of disorientation i.e. "getting lost" and the students' feeling of being overloaded as a result of the amount of information presented to them. Accordingly, it is seen to be important to orient the students to the Web-based learning environment as well as considering the amount of information given to them.

This study emphasises that the use of Web-based learning environments reduces the cognitive load, because these environments provide the students with a range of resources and tools that can accommodate the different entry levels of the students, which is consistent with the findings of Mayer (1999) and Van Gerven et al. (2002).

This study emphasises the importance of students' interaction in relation to their learning (Tuovinen, 2000). Peer interaction plays an essential role in enriching the students' learning experience. Furthermore, collaboration between the students is considered to be a necessary element for the process of knowledge construction. The students' interaction can be facilitated by using collaboration tools that can be integrated in the learning environment such as discussion forums, videoconference and instant messaging. These tools enable the students to collaboratively create shared knowledge and negotiate meaning. Moreover, these tools encourage the students to establish a learning community wherein teachers and students support one another in learning through the exchange of ideas (Kinnucan-Welsch and Jenlink, 1998).

When teaching and learning using the Web, some learning difficulties might emerge due to unexpected technical problems such as power cut, Internet disconnection, low connection speed, software bugs etc. Three main learning difficulties emerge from this study. These include the lack of facilities for using the Internet, the difficulties associated with the use of the English language on the Web and the amount of time needed by the students to implement some "ill-structured" tasks such as Web design. Similar obstacles to the successful use of the Internet in education are highlighted by Kim and Kim (2001) such as the lack of computers available to use the Internet and the additional time needed by the instructor and the students.

Some of these problems might be as a result of the lack of facilities and the weak infrastructure (Grey, 1999; Chee, 1997 and Wilson, 2000). Accordingly, flexibility is considered to be an important factor when teaching and learning using technology (Pierce, 1998). Therefore, the teacher needs to have back-up plans in case he/she encounters any technical problems. Subsequently, the integration of a range of teaching strategies is seen to be a necessary element when teaching and learning using the Web.

9.1.3. The multiple roles of the teacher within a Web-based learning environment

A constructivist approach requires the teacher to relinquish his/her role as sole information-dispenser and instead to continually analyse his/her curriculum planning and instructional methodologies (Hanley, 1994).

This study illuminated the important roles of the teacher when teaching using a Web-based learning environment such as mentor, facilitator and mature partner roles.

The results of this study reveal that the "mentor" role is considered to be an essential role for the teacher when teaching using the Web. This role is particularly important when the students are using an online discussion forum. At this time, the teacher's role focuses on ensuring and promoting the students' active participation. The results also illuminate that the students' preferences to a certain type of discussion is influenced by their cultural and educational settings. For example, while the students in the Menofia group preferred online discussion, the students in Sheffield group preferred in-classroom discussion. Accordingly, attention should be given to the students' cultures and preferences toward a certain type of discussion. As a result, the teacher needs to provide the students with various types of discussions in order to cope with the students' preferences.

The results also show that the "facilitator" role of the teacher is also considered to be an important factor especially when supporting the students during individual hands-on workshops. The results emphasise that face-to-face interaction is still to be a key element in teaching (even when using the Web) in order to provide the students with direct support for any immediate problems that might emerge.

The findings of this study are considered to be consistent with the Vygotskian (1962) view of the teacher as a "mature partner" to the students. Accordingly, the teacher needs to provide the students with assistance and encourage collaboration between the students in order to enable them to bridge the gap between their actual and potential levels of development. The results also emphasised that the students' needs are influenced by their cultural and educational settings. For example, while the students in Sheffield group were autonomous and did not need more face-to-face support, the students in Menofia group were less-autonomous and needed to have more face-to-face support from the teacher. This confirms a fact that there are key differences in the students' preferences, attitudes and adaptations with the various types of teaching methods.

This study also emphasises the teachers' role as a "guide" and "advisor" to the students. Subsequently, the teacher is expected to provide guidance and advice to the students particularly at the beginning of an online course. Accordingly, orienting the students to the learning environment enables them to cope with it.

The roles of "manager" and "orchestrator" are seen to be key roles that enable the teacher to coordinate and integrate a range of teaching strategies. The integration of teaching methods enables the teacher to cope with the different learning styles of the students. This is also described by Okamoto et al. (2001) as a cooperative strategy which is a method that switches among pedagogical strategies in order to adapt to the learners. In this study, the notion of 'multiple roles' is used in order to describe the teacher's various roles that he/she needs to play when teaching using a Web-based learning environment.

9.1.4. Web-based learning environment

Several conclusions can be drawn from the results related to the evaluation of the Web-based learning environment 'Internet Tutoring System'.

The findings of this study reveal that the learning environment plays an essential role in guiding the students' learning. Furthermore, the learning environment facilitates the sharing of control over the learning process between the teacher and the students which Berge (1999) referred to using the notion 'guided learner control'. This guidance can be provided to the students by using a variety of resources and tools such as online tutorials and 'troubleshooting'. Moreover, this guidance can be facilitated by giving the students the necessary course information and the essential contact details such as the technician and teacher contact emails (Hsiang et al., 2000).

The findings of this study illuminate a number of characteristics that should be taken into consideration during the design of a Web-based learning environment. These characteristics can be summarised in the following:

- The user interface should be clear and simple to the students. This can be conducted through the use of simple, efficient and interesting navigation.
- The learning environment should be designed to be easy to use and enable the users to easily access information (Starr, 1997). Furthermore, the learning environment should be designed in order to relieve short term memory and rely on recognition of information which reduces the cognitive load (Mandel, 1997).
- The learning environment should provide the students with relevant links and useful information resources. Accordingly, attention should be given to the quality of information resources (Wilkinson et al., 1997) by considering a range of criteria for selecting these resources (Jolliffe et al., 2001).
- A reliable connection speed for processing and downloading information should be maintained when using a Web-based learning environment. Subsequently, this speed can be influenced by the size of downloaded information from the Web and by the speed of the Internet connection.
- The information included in the Web-based learning environment should be organised in order to facilitate the user interaction (Marcus, 1992) and to reduce the students' cognitive load (Mandel, 1997).

In addition to these characteristics, the technical difficulties that the students might encounter during the use of the learning environment should be taken into account. Therefore, fast and reliable technical support should be provided to the students when needed. This can be provided in different types such as enabling contact with the technical assistant and providing a technical inquiry form. However, it is important to highlight that the provision of technical support does not prevent technical problems occurring especially when using high technology such as the Web. Accordingly, the teacher should expect and accept that the students might encounter technical problems such as Internet disconnection, software bugs, hardware malfunction etc. As a result, he/she should prepare back-up plans in case he/she is faced with any serious technical problem (Montelpare and Williams, 2000).

9.1.5. Students' progress in the use of the Internet

Based on the discussion of the various results related to the students' progress, several conclusions can be drawn. The results indicate that there are slight differences between the students' progress rates in each unit in the course. However, it can be concluded that a majority of the students rated their own progress levels in unit five (Web design) as average or below. This was for a number of reasons such as the students' need for more time for Web design and the lack of facilities required for it in terms of the hardware and the software needed to design a Website.

In terms of the students' progress in the overall course, the majority of the students progressed above the average levels and none of them were below the average. Subsequently, the use of the Web-based learning environment influenced the students' learning of the use of the Internet. Furthermore, the course led to a dramatic change in the students' levels of use of the Internet compared with their levels before the course.

Based on the students' progress in each unit, it can be concluded that the students' learning is influenced by the different structures of the content and hence the type of control over the learning process. For example, the students needed more time in order to learn ill-structured content. This is because of the fact that the Egyptian students are used to learning using well-structured content with teacher-led learning experiences. Transforming the students' perception about the teaching and learning process takes a relatively long time. In addition, the students needed more time in order to familiarise themselves with the nature of ill-structured tasks and to take responsibility for their learning.

The results of this study show that there is no relationship between the students' progress and their preferred learning styles. Subsequently, it can be concluded that the use of Web-based learning environments accommodate the different learning styles of the students. This is done through the integration of a range of tools and resources and the provision of a variety of contexts that accommodate the students' preferred learning styles (Ellis et al., 1993; Stanton and Baber, 1992; Ross and Schulz, 1999 and Kraus et al., 2001).

9.2. Recommendations

The following recommendations are made in the light of the current educational system in Egypt. This system is seen to be mainly relying on the behaviourist approach to teaching and learning. Accordingly, the educational system is based on a teacher-centred approach rather than a student-centred approach. As a result, training teachers on the use of the Internet is influenced by the behaviourist approach. For example, the existing teaching and learning of the use of the Internet are mainly led by the teacher and the students do not have the opportunity to construct their own knowledge. Furthermore, the current approach does not promote students' collaboration and their shared building of knowledge. The existing system also focuses on the learning products. As a result, the students are mainly passive throughout the learning process and dependent on the teacher. Accordingly, the recommendations in this thesis mainly focus on the need to transform the policy and practice in the Egyptian education system.

9.2.1. Objectives and content of the Internet curriculum

Within the framework of constructivist learning environments, the content is considered to be an important issue that should be taken into consideration. A Web-based curriculum should provide a variety of types of content structure for the learners such as well-structured, semi-structured and ill-structured content. These content structures should be integrated in order to provide the learners with different degrees of complexity. A number of issues are seen to be related to the development of a curriculum for a Web-based learning environment. These issues include the clarity of the course objectives, content organisation, course activities and learning resources. Attention should be given to the importance of presenting clear objectives at the beginning of the course especially for those students who approach the course with some fears and who are lacking prerequisite knowledge. The provision of clear objectives enables the students to cope with the course and orient themselves with it. Furthermore, the students should be given enough time in order to enable them to acquire advanced knowledge using ill-structured content. Moreover, curricula should be developed and learning environments should be designed in order to encourage the students' ownership of the learning process. This ownership should be developed gradually by transforming from a teacher controlled environment into a learner controlled one through a transition using shared teacher-learner control.

The content organisation should be regarded as an important factor especially when using a Web-based learning environment. Subsequently, the content should be organised in order to provide the students with a variety of integrated content structures that gradually help the students in constructing their own knowledge and skills. Furthermore, the content and the course should be organised in the light of the available ICT facilities because these facilities can have a major influence on the organisation of the different activities e.g. are there sufficient facilities for the students in order to be able to implement a particular activity such as Web design?

When using a Web-based learning environment, the students should be provided with a range of information resources that give them the opportunity to construct their own knowledge according to their preferred learning styles. Accordingly, these information resources should be relevant to the learning objectives and should be available for the students in different forms and formats. The Web is a rich source of information and it enables the effective organisation of information. For example, links, anchors and mapping can be used on the Web in order to organise and interconnect the information resources in order to meet the different learning styles of the students (Liu and Ginther, 1999).

Constructivist learning environments which are based on the Web should provide the students with authentic activities that are based on real-world situations. Accordingly, these activities should be designed to be clear and sufficient in relation to the learning objectives. Moreover, the activities should provide different levels of complexity that accommodate the different learning styles of the students. Furthermore, the activities should be designed in order to promote and maintain the students' active participation.

Since the nature of the Internet is dynamic and subject to constant change, the Internet curriculum should be flexible in order to cope with the development that might occur in the Internet. As a consequence, the Internet curriculum should be reviewed continuously in order to address any future issues and aspects that are related to the Internet.

9.2.2. Student learning within Web-based learning environments

In order to effectively implement a Web-based course, several issues related to the learning process should be taken into consideration.

Students' motivation is considered to be an important issue that should be taken into consideration when using a Web-based learning environment. It is important to highlight that in order to promote constructivist learning, learning environments should include rich resources and tool that encourage the students to search for information. Accordingly, a Web-based learning environment should have a well-designed user interface that promotes the students' learning. In addition, the teacher should consider the students' attitudes toward Web-based learning. Subsequently, the students should be helped to orientate to the learning environment and they should be given enough time in order to become familiar with it. Furthermore, the students' learning can be promoted by engaging them in authentic activities.

Constructivist learning environments should aim to foster different cognitive processes in the learner such as selecting relevant information, organising incoming information, and integrating incoming information with existing knowledge (Mayer, 1999a). Subsequently, any learning environment should take into account the students' cognitive load (Sweller, 1988). As a result, two key issues should be considered during the design of web-based learning environments. These include the students' potential disorientation and the amount of information given to the students. Accordingly, the students should be well-oriented to the learning environment. Moreover, the learning environment should be designed in order to reduce the students' cognitive load by taking into account the amount of information given to the students. Furthermore, the learning environment should be designed to be simple, easy to use and provide the students with information resources in a range of formats such as text, audio, video etc. (Mayer and Moreno, 2002).

Any Web-based learning environment should aim to encourage and maintain the students' interaction in order to enable the students to collaboratively construct knowledge. As a result, a learning environment should provide the students with the necessary collaboration tools such as discussion forums, videoconference and instant messaging. These tools should facilitate and support different types of communication among the students such as synchronous and asynchronous communication. Accordingly, these collaboration tools should be regarded as an integrated part of the learning environment rather than as simply supplementary.

Furthermore, a learning environment should support collaboration among learners and with the teacher, whose role is more of a coach or mentor. Moreover, it should engage and facilitate social negotiation and provide tools to facilitate an internal negotiation (Jonassen, 1994b).

When using a web-based learning environment, a number of learning difficulties are likely to appear. These learning difficulties are mostly due to technical problems such as software bugs and hardware malfunction. Subsequently, a sufficient level of technical support should be maintained throughout an online course. Furthermore, the teacher should be willing and trained to take some technical responsibility especially to solve the minor technical problems that might emerge during an online course. In addition, the teacher needs to prepare back-up plans in case the students encounter any unexpected problems.

9.2.3. The multiple roles of the teacher within a Web-based learning environment

The results of this study emphasise that learning environments should not impose any particular pedagogical strategy or instructional sequence, but guide learners in invoking their own strategies and generating their own learning sequences (Hannafin, 1996). Furthermore, instruction should emphasise knowledge construction, not transmission of information (Wilson et al., 1993).

When teaching using a Web-based learning environment, a teacher needs to play multiple roles. Accordingly, the teacher needs to integrate multiple roles in order to effectively use a Web-based learning environment such as the roles of mentor, guide, facilitator and mature partner. As a consequence, the teacher needs to facilitate, encourage and maintain the students' active participation in discussions during an online course. Furthermore, the teacher should integrate different types of discussions such as online, in-classroom, synchronous and asynchronous discussions in order to consider the students' attitudes and preferences. Moreover, the teacher needs to provide face-to-face support and constructive feedback to the students when needed whether online and/or offline. In addition, the teacher needs to work closely and collaboratively with the students in order to assist them in seeking solutions to specific issues that might emerge (Javid, 2000). Therefore, the teacher needs to encourage the students to take responsibility for their own learning e.g. by involving them in facilitating online discussion. Accordingly, he/she needs to guide the students throughout the learning environment and orient them to the different parts of it in order to enable them to cope with it. There is also a need for the teacher to integrate a range of teaching methods in order to cope with the preferred learning styles of the students.

In the light of the findings of this study, teacher education programmes in Egypt need to be revised and developed in order to take into consideration the different roles of the teacher. Accordingly, these programmes need to encourage the teacher's creativity and self-initiative to be able to critically develop, adapt and/or adopt new practices for the effective use of the Web in education. Moreover, teachers need to be trained to be able to identify, select and evaluate appropriate pedagogies for teaching and learning using the Web. Furthermore, the teacher needs to give an increased attention to the role of orchestrator in order to be able to coordinate and incorporate these roles sufficiently. Finally, teachers need to be well-organised and prepare back-up plans in order to integrate the Internet successfully in teaching and learning, which in line with recommendations made by Montelpare and Williams (2000).

9.2.4. Web-based learning environment

The use of Web-based learning environments is considered to be a transformation of education because it is a new approach to the design, development, and implementation of both curricula and education; a re-engineering of the instructional design process (Kirschner, 2001). Accordingly, a Web-based learning environment should be seen as an integral part of the teaching and learning process not as a supplementary part. As a consequence, a good Web-based learning environment should be designed in order to integrate a range of resources and tools that are available on the Web. Furthermore, several teaching strategies should be integrated with the learning environment in order to accommodate the different learning styles of the students.

This study has a number of implications for the educational policy in Egypt. Accordingly, an increased attention should be given to the use of Web-based learning environments in developing countries and particularly in Egypt. As a consequence, the Egyptian government should continue its development of the information technology infrastructure in order to enable the educational institutions to effectively use the Web. Furthermore, a strategic plan should be developed in order to provide the educational institutions especially the teacher education institutions (such as the Faculty of Specific Education in Menofia, Egypt) with the necessary facilities that are needed to use the Internet sufficiently. These necessary facilities include hardware, such as reliable Internet connections and reliable computers, and software such as Web design software. The facilities should also have reliable and continuous technical support.

The findings of this study also emphasise on the need to have a continuous evaluation of the Web-based learning environment in the light of the ongoing development of the Internet and in the light of the students and teachers' needs. This evaluation should ensure that the learning environment is regularly updated, easy to use and reliable. Furthermore, the user interface should be developed in order to provide the students with more interesting and motivating elements such as graphics video clips etc. In addition, the Arabic language should be integrated into the design in order to facilitate the students' learning. Accordingly, the content and the interface of the learning environment should be presented to the students in Arabic in order to give them the opportunity to freely interact with the learning environment. Moreover, the course timetable should be flexible and take into consideration the number of participants and the available facilities for them. Technical support should also be available and accessible for the students as well as the teacher. Accordingly, fast and reliable technical support should be provided for both the students and the teacher when needed.

The findings of this study reveal some major phases that are necessary for the design of Web-based learning environments. Accordingly, instructional designers should take into account eight key design phases, which are:

1. Plan to the learning environment in the light of the users' needs and learning objectives.
2. Develop a prototype for the Web-based learning environment that provides an easily changeable draft and simulation of the learning environment.
3. Design an easy to use, simple and clear user interface in order to encourage and facilitate the students' interaction with the learning environment.
4. Select and organise useful and relevant information resources that encourage the students to search them for information.

5. Enable and provide communication tools that facilitate both synchronous (videoconference) and asynchronous (discussion forum) communication. These tools also promote and maintain collaboration between the students and support the formation of learners' community.
6. Design and integrate authentic activities to support and maintain the students' active participation.
7. Design and enable the use of digital portfolios to enable the students to reflect upon the learning process.
8. Evaluate the design of the Web-based learning environment which includes formative and summative evaluation to ensure that it meets the users' needs and the learning objectives.

9.2.5. Students' progress in the use of the Internet

The Egyptian educational system needs to be developed in order to support and encourage the students to be become autonomous and hence enable them to have the ownership over their own learning. Subsequently, in order to develop learner's ownership, the learner should be provided with a variety of contexts (such as well, semi and ill-structured contexts). Furthermore, the Egyptian national curriculum should provide the students with authentic activities that lead the student to develop higher cognitive skills such as selection, organisation and integration skills, rather than memorisation skills. As a consequence, the evaluation methods used in the Egyptian education system should be developed in order to assess the students' ability to construct knowledge not the ability to memorise it. Accordingly, evaluation criteria should be developed in order to take into account the use of multiple perspectives, the emphasis on the evaluation of the learning process rather than the product, the evaluation of a portfolio of products rather than a single product etc. This is considered to be consistent with the recommendations made by Jonassen (1991).

In relation to the future development of the course, it is suggested that this course should be incorporated as a unit in the teacher education institutions in Egypt particularly the Faculty of Specific Education. This can lead to a sufficient preparation of the future teachers that enables them to face the challenges that are related to the use of the Internet in schools. Therefore, attention should be given to

the development of the information technology facilities that are required for the effective use of the Internet. This can be done by allocating sources for funding the establishment of these facilities by the Egyptian government and the private sector.
In addition, staff should be trained in the use of the Internet and the use of the Web-based learning environments in order to be able to use the Web effectively in teaching and learning. Furthermore, technical staff should be trained in order to enable them to undertake their responsibility in solving any technical problems that might face the teachers and the students during the use of the Internet.

The traditional approaches to teaching and learning in Egypt should be reviewed in order to integrate more learner-centred approaches that can make use of the tools and resources offered by the Web. As a consequence, teachers need to improve, modify and/or alter their existing practices in order to effectively integrate the Web in teaching and learning.
In this research, the notion of integration is considered to be a key element in the design and the use of the Web-based learning environment. On this basis, an integrated Web-based learning environment could be defined as an environment that integrates a range of resources, tools and utilities that are available on the Web alongside a range of pedagogical practices such as peer support, discussion groups, etc. in order to facilitate and support the students in constructing knowledge, building a learning community, creating shared meaning and to accommodating the preferred learning styles of the students.

9.3. Further research

The findings of this study illuminated several aspects that need further research. Several issues are related to the use of a Web-based learning environment in teaching and learning. For example, university staff in Egypt need to be trained in the use of both the Internet and the use of Web-based learning environments. Furthermore, the teaching staff attitudes toward the use of the Internet in teaching and learning across different subjects need to be investigated.

This study also highlighted the need to develop a new integrated perspective on the teaching and learning process using the Web. The view takes into consideration the different elements that are involved in the teaching and learning process e.g. the integration of a number of teaching strategies, the accommodation of the students' preferred learning styles and the integration of new technologies such as the Web with its own tools and resources. Accordingly, this perspective of integration needs to be investigated across different subjects and with a diversity of students in order to explore its impact on the teaching and learning processes.

This study also highlights the need for investigation of the use of digital portfolios in assessing students' learning. Accordingly, the design requirements of digital portfolios need to be researched in the light of the students' needs.

Teacher education programmes in the teacher education institutions in Egypt need to be reviewed in the light of the findings of this research. Accordingly, a strategy for teacher education needs to be developed in order to enable teachers to take up their responsibilities in facilitating and supporting students' learning. Subsequently, this development needs to highlight the different approaches that teachers can use in order to assist the students in the knowledge construction process.

9.4. Summary reflections

As indicated earlier in this thesis, the Didaktik triangle (Kansanen and Meri, 1999; Hudson, 2002) can be used as a key tool for the analysis of the complex relations between teacher, student and content in the teaching/studying/learning process. The didaktik relation is seen as a "dual" relation i.e. a relation to a relation, which represents the teacher's relation as guide, advisor, mentor etc. to the pedagogical relation between the student/learner and the content. This model developed below in Figure (72) is considered to be a development of this concept applied to a complex technologically-based learning context. Accordingly, this model emphasises the use of technology as an important and necessary integrated element in the teaching/studying/learning process. According to this model, the starting point is the *design relation* between the content and the technology and the way in which the teacher guides this relation. The teacher integrates the different tools and resources offered by the technology in his/her pedagogical practices with the students. The teacher also guides, mentors and facilitates the *interaction relation* between the student and the technology and also guides the students' learning in relation to the content via the *didaktik relation.*

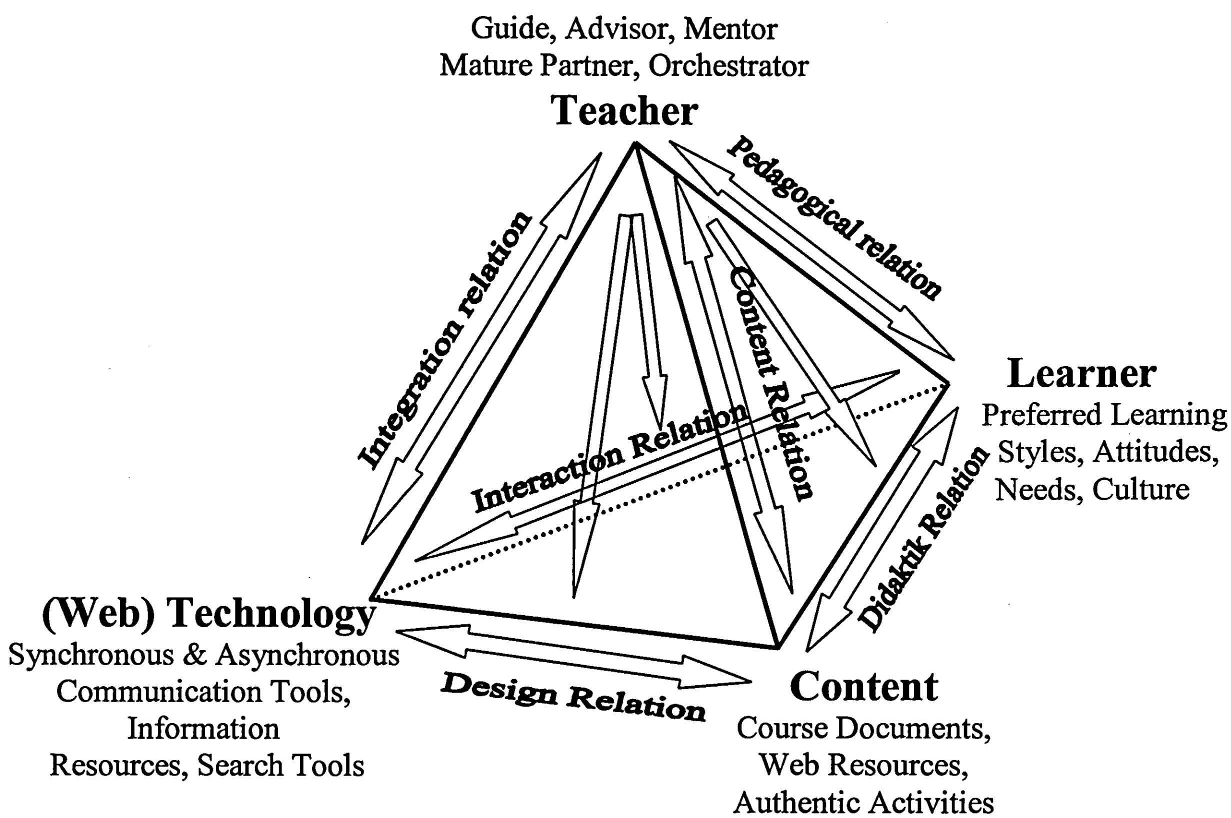

Figure 72. Integrated Learning and Teaching Environments (ILTE): A Holistic Relational Approach.

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Appendix (A): The content analysis of the users' guides and teachers' guides

1- " Wingate, P.: 1997, The Internet for Beginners, England, Usborne, 1997 "

Total number of pages: 48 pages. It is not divided into chapters.

Target Audience:

It is suitable for beginners of different ages but specifically for young people.

Objectives:

To have some knowledge about the Internet and its nature.

- To know how the Internet works.
- To be able to find information on the Internet.

To know how to get connected to the Internet.

To know the software and hardware needed to be connected to the Internet.

- To know the main facilities offered by the Internet.
- To use Netscape Navigator for exploring the Internet.

Main topics:

- What are the Internet and the history of the Internet?
- How does the Internet work?
- The essential software and hardware for using the Internet.
- Connecting to and disconnecting from the Internet.

Exploring the World Wide Web.

Introduction to newsgroups.

- Using electronic mail (e-mail).
- Using the file transfer protocol (FTP) to download files.
- Introduction to chatting using the Internet (Cyber-chat).

Introduction to online games.

Some guidelines on using the Internet safely.

Skills to be taught:

Connecting to and disconnecting from the Internet by using the connection software.

Some Navigation skills to explore the World Wide Web.

- Using search engines e.g. ALTAVISTA and YAHOO.
- Saving web pages and pictures to the computer.
- Skills for using newsgroups.
- Sending and receiving e-mail.
- Downloading files using FTP.

Software and hardware:

- An IBM compatible PC.
- Using Netscape Navigator ver 2.01.
- Dial-up connection program: Pipex Dial.

Internet resources:

This book contains the following resources:

- Some sites that have information on and links to a variety of Internet software.
- Some hot sites that have been specially set up for young people.
- A selection of sites for information about games and links to games software.

Evaluation:

This book contains a lot of illustrations and example screens which help a user in understanding the different software related to the Internet.

Also its style of writing is very simple and easy to follow especially for beginners and non-specialists users.

It concentrates on the basic information that a user needs to use the Internet. It contains some advice on "trouble shooting" by providing some problems and solutions. It also includes some instructions for safety on the Internet.

Checklist of overall contents of this publication:

- Glossary of terms.
- Index.
- Problems and solutions.
- Safety on the Internet.
- A list of some Internet service providers.

2- "Pitter, K. et. al.: 1995, Every Student's Guide to the Internet, New York, McGraw-Hill, 1995".

Total number of pages: 183 pages. It contains 8 chapters.

Target Audience:

College and high school students in any field of study.

Objectives:

- To be able to search the World Wide Web efficiently for information.
- To be able to communicate with individuals of widely divergent backgrounds.
- To learn how to access the Internet and to understand the underlying concepts and strategies.
- To have a sense of excitement about the Internet.
- To have the skills to use the Internet effectively.
- To know some strategies for finding and using resources on the Internet.
- To know the basic concepts behind each tool so students can adapt to any platform and any tool that will be available in the future. It is recognised that available resources and the popularity of tools on the Internet change constantly.

Main topics:

- Introduction to the Internet and the history of the Internet.
- Introduction to electronic mail and its use.
- Using the Usenet newsgroups.
- Using Gopher to search for information.
- Using the Telnet program to connect and search remote resources.
- Using the File Transfer Protocol (FTP) to download files from the Internet.
- Using the Wide Area Information System (WAIS) to access and explore information on the Internet.
- Browsing the World Wide Web.

Skills to be taught:

- Using electronic mail (e-mail) for the UNIX "mail" environment.
- Finding newsgroups and using a news reader program.
- Using the gopher client program.
- Using the TELNET program.
- Using the File Transfer Protocol (FTP) to download files and software from the Internet.
- Using the Wide Area Information System (WAIS) program.
- Using the Lynx as a text-based browser for the UNIX platform.

Software and hardware:

- Unix computers connected to the Internet.
- The software includes TELNET, UNIX "mail" and FTP.
- Gopher client program.
- The "RN" as a news reader program for the UNIX platform.
- Wide Area Information System (WAIS) program.
- The text-based browser Lynx for UNIX platform.

Internet resources:

- General resources that contain different topics.
- E-mail resources.
- Usenet resources that contain information on newsgroups.
- Gopher resources that contain information about gopher clients, servers and utilities.
- World wide web resources that contain information about the World Wide Web.
- WAIS resources containing additional Gopher servers that allow access to WAIS.

Evaluation:

This book could be used for short courses or training workshops on the Internet. It is organised to be used for teaching in the classroom or as a self-paced course.

There are many educational examples used so students can relate concepts easily to their immediate environment.

It is written for beginners, but it doesn't provide users with sufficient information to actually use the Internet.

It provides access to online resources at Willamette University created specifically for use with the book, in order to train students on using email and discussion groups. It also provides Internet online support for students.

Each chapter contains a list of objectives at the beginning, list of key terms, review questions, discussion topics and a chapter summary at the end.

The style of writing is easy to follow but it doesn't include enough illustrations, although a few example screens have been presented in this book.

Checklist of overall contents of this publication:

- A series of projects.
- List of useful Internet resources.
- Further reading list.
- A glossary of key terms.
- A summary of the UNIX commands.

3- " Kalbag, A.: 1997, World Wide Web for Beginners, England, Usborne, 1997 "

Total number of pages: 48 pages. It is not divided into chapters.

Target audience:

It is suitable for beginners of different ages specifically for young people.

Objectives:

- To have some knowledge about the World Wide Web.
- To learn how to use the World Wide Web effectively and efficiently.
- To become familiar with the hardware and software needed to use the World Wide Web.
- To know the different strategies for finding information on the Internet.
- To be able to use search engines to search for information on the Internet.
- To be able to download files and programs from the Internet.
- To have some knowledge about online shopping on the Internet.
- To be able to use some plug-in programs.
- To be able set up the browser preferences.
- To have some knowledge about designing web pages using HTML.
- To know some examples of virtual reality on web pages.

Main topics:

- Introduction to Web pages.
- The hardware and software that is needed to be connected to the Internet.
- How does the Web work?
- Browsing the Web and gathering information.
- Some strategies for searching the Web.
- Downloading files and programs using FTP and the Web.
- Using the plug-in programs that include animation, video and sound.
- Setting up the preferences in the browser.
- Introduction to online shopping and how to buy and sell online.

- Introduction to the design of Web pages.
- Introduction to virtual reality on the Web.
- Future developments related to the Internet.
- Guidelines for choosing an Internet service provider.

Skills to be taught:

- The skills for using a browser.
- Using the browser to navigate through the Web.
- Saving texts, pictures and links.
- How to use a directory and categories in search engines to search the Web.
- Using the simple and expert search to search for a word or phrase.
- How to send message as a comment or feedback from a Web page.
- How to download files or programs using FTP and from the Web.
- How to download "plug in" software for animation, video and sound.
- Setting up preferences on the Web browser.
- Some hints for online shopping.
- Some skills for creating users' own Web page.

Software and hardware:

- It concentrates on IBM compatible computers.
- It also gives some information for users of Macintosh computers.
- The book explains the use of Netscape Navigator and Internet Explorer as browsers but it concentrates on Netscape Navigator.
- It uses the TCP/IP as connection software.

Internet resources:

- There is a list of sites that contains further information about some topics in the book e.g. about digital money, safety issues, virtual world ...etc.
- Some sites about software e.g. sites about shareware, programs for compressing and inflating files ...etc.
- Some sites about entertainment.

Evaluation:

This book contains a lot of illustrations, figures and print screens that demonstrate the use of the World Wide Web. Its style of writing is very simple and easy to follow especially for beginners and non-specialists users.

It concentrates on the basic information that any user needs to use explore the World Wide Web. So it tries to cover the main features of the World Wide Web e.g. the use of sound, video, virtual reality ...etc. However it doesn't explain each point in detail.

It covers also the connection to the Internet, because it is necessary to know how to be connected before starting exploring the World Wide Web.

At the end, it presents some of the future issues that relate to the World Wide Web, which could be good material for discussion groups.

Checklist of overall contents of this publication:

- A list of some Web words and their meanings.
- A list of some useful sites.
- Index.
- Some hints about safety when using the Internet.

4- " Wiggins, R. W.: 1995, The Internet for Everyone: A Guide for Users and Providers, New York, McGraw-Hill, 1995 "

Total number of pages: 655 pages. It contains 26 chapters.

Target Audience:

This book is suitable for experts who seek detailed information about the Internet, and it is also suitable for new adult users who can cope with its style of writing.

Objectives:

- To be aware of some online resources on the Internet.
- To be able to obtain the most current information from the Internet.
- To have some knowledge about the nature of the Internet
- To use some strategies and tactics for finding resources, people and places on the Internet.
- To be able to get connected to the Internet.
- To be able to use the index tools like Veronica and WAIS.
- To have some knowledge about Internet access providers.
- To be able to install Internet browsing tools such as Gopher and World Wide Web.
- To be able to use Internet browsing tools such as Gopher and World Wide Web.
- To have some knowledge about electronic publishing and digital libraries.
- To be able to use mailing lists.
- To be able to use Usenet news groups.
- To know how to transfer files using File Transfer Protocol (FTP).
- To be able to use the Internet for real-time communication.
- To know the different uses of the Internet in libraries.
- To have some knowledge about electronic publishing and virtual libraries.
- To consider some issues related to security and privacy on the Internet.
- To establish Internet information services in a UNIX and non-UNIX system.
- To know how to build a Campus-wide information system.

Main topics:

- An overview to the Internet and its history.
- The Client/Server model of the Internet.
- The Internet TCP/IP Protocol.
- Connecting to the Internet.
- Electronic mail, mailing list processors and e-mail servers.
- Usenet news.
- Transferring files with File Transfer Protocol (FTP).
- Real-time communication on the Internet.
- Networking and inter network file systems.
- Gopher: Internet browser and document delivery tool.
- Networked Hypermedia: the World Wide Web and NCSA Mosaic.
- Internet index tools: Archie, Veronica and Friends.
- WAIS: Wide Area Information Servers.
- Internet search strategies.
- Mining the Internet: a librarian's perspective, electronic publishing and virtual libraries.
- Security and privacy issues related to the Internet.
- Internet information provider and establishing Internet information services.
- Building a campus-wide information system.
- The future of the Internet and some resources.

Skills to be taught:

- To install and to use NCSA Mosaic for Microsoft Windows to browse the Internet.
- To log in to a host located elsewhere on the Internet using Telnet.
- To send and receive electronic mail (email).
- To use mailing lists.
- To install and use Internet browsing tools such as Gopher and World Wide Web.
- To use some index tools such as Veronica, Archie and WAIS.
- To use Usenet news groups.
- To transfer files using File Transfer Protocol (FTP).
- To use the Internet for real-time communication e.g. using IRC.

- To search the Internet using different search strategies e.g. searching subject catalogues and specialised catalogues.

Software and hardware:

- Uses computers with UNIX system.
- Uses Pine software for sending and receiving email.
- Uses the LISTSERV tool for using the mailing list.
- Uses PC/TCP software for using FTP.
- Uses the UNIX Talk program and IRC for real-time communication on the Internet.
- Uses NCSA Mosaic to browse the World Wide Web.
- Uses the Gopher client programme.
- Uses the WAIS client programme.

Internet resources:

- It has a complete chapter that contains different resources that relate to the following topics:
- Aerospace – Agriculture – Architecture – Arts – Astronomy – Biology – Bulletin Board System – Business – Cartography – Census Statistics – Chemistry – Communications – Computational Science – Computer Science – Computer – Crime – Culture – Directories – Disasters – Economics – Education – Employment – Environment – Ethnic Studies – Genealogy – Geography – Grants and Scholarships – Handicapper Information – Health – History – Internet – International Relations – Journalism – Law – Libraries and Library Science – Literature – Mathematics – Medicine and Life Science – Military – Movies – Music – News and Media – Patents – Personal Finance – Philosophy – Physics – Politics and Government – Privacy – Publishing – Religion – Scholarly and Professional Associations – Science (General) – Seismology – Space – Statistics – Systems Science – Travel – Vegetarianism – Video Archives – Weather – Zoology.
- Most of these resources are Gopher and FTP resources and just a few of these resources are World Wide Web resources.

Evaluation:

This book was published in 1995, so most of the software mentioned in this book is old and no longer in use. The style of writing is very difficult to follow especially for new users, because it contains a lot of theoretical information.

The book doesn't contain a lot of illustrations and example screens to demonstrate the use of the Internet.

Also it doesn't explain the skills for using the Internet in detail, so this creates a lot of difficulties for any new user of the Internet.

The system that has been used in this book (UNIX) is not widely used especially among personal computer users.

It attempts to cover most aspects that are related to the Internet, which make it a good general reference. It is also very extensive and very difficult for any new user.

Checklist of overall contents of this publication:

- Dial-up connection: TCP/IP software (with DOS and Windows).
- An appendix for installing Mosaic for Microsoft Windows.
- An appendix of Internet service providers.
- An appendix of the Internet country codes.
- Glossary.
- Index.

5- " Winship, I. and McNab, A.: 1998, The Student's Guide to the Internet 1998/99, London, Library Association Publishing, ed. 2, 1998 "

Total number of pages: 155 pages. It contains 14 chapters.

Target Audience:

This book is written especially for university and college students, and also for others in higher and further education.

Objectives:

- To have some knowledge about the Internet and its features.
- To be able to begin using the Internet.
- To know the main procedures and resources that help a user in exploring the Internet in his/her studies.
- To know some resources on the Internet concerning research papers, bibliographies, electronic journals...etc.
- To be aware of some Internet resources concerning overseas study, loans, counselling, support...etc.
- To know how to search the World Wide Web.
- To know some of UK information resources on the Internet on many topics.
- To develop some communication skills on the Internet including email, discussion groups and Usenet.
- To have some knowledge about the Internet techniques such as World Wide Web, Telnet, Gopher and FTP.
- To be able to search for a specific subject using the Internet.
- To be able to create a simple Web page.
- To be able to use Internet resources in writing essays, dissertations or other pieces of written work and to write Internet references in the correct format.

Main topics:

- Introduction to the Internet and the academic use of the Internet.
- Understanding and using Internet addresses.
- Introducing some communication skills on the Internet including email, discussion groups and Usenet.
- Some of the Internet techniques such as the World Wide Web, Telnet, Gopher and FTP.
- Information and data bases systems in UK that are used online on the Internet.
- Some resources to help students in their course work e.g. research papers, bibliographies, electronic journals, library catalogues...etc.
- Some information for students about finding jobs, studying overseas, grants, loans, travelling and accommodation.
- Tips on browsing for subject information on the Internet using directories with an academic focus.
- Tips on searching for information using World Wide Web tools.
- Keeping up to date with the new resources and changes in the current resources on the Internet.
- Creating a simple home page using HTML.
- Using the Internet resources in writing essays, dissertations or other pieces of written work and writing the references in the correct format.
- Some information about Internet guides and training resources and also some online guides.

Skills to be taught:

- Using some of the Telnet resources, by connecting to another computer on the Internet.
- Downloading some FTP files by using a graphical browser and by using a command line interface.
- Accessing the information and data base systems in UK e.g. BIDS, EDINA, FIRST SEARCH and MIDAS.
- Finding and using research papers, bibliographies, electronic journals, library catalogues...etc.

- Using directories and search tools for searching and browsing for subject information on the Internet.
- Using some HTML commands to design a simple Web page.
- Writing Internet references in the correct format.

Software and hardware:

- This book concentrates on Netscape as a browser, and also it uses Internet Explorer as alternative software that could be used instead of Netscape.

Internet resources:

- Provides many sites and resources that give information for students to help them in their course work, these resources include: complete text of some books – some research papers – bibliographies and databases – subject dictionaries and encyclopaedias – general, scientific, medical, moving, historical and artistic images – sounds/audio – maps – numerical data(related to science, economic and statistic) – archives catalogues – institutional servers – company web sites – interactive and simulation – software – computer documentation – newspapers and news services – reference – government – library catalogues – teaching and learning materials.
- Sites and resources for some information services in the UK e.g.: BIDS (Bath Information and Data Services) – EDINA (Edinburgh University Data Library) – OCLC First Search – MIDAS (Manchester Information Data sets and Associated Services) – AHD (Arts and Humanities Data Service) – NISS-hosted services.
- Some sites and resources that relate to students e.g.: grants and loans for students – placement and studying overseas – information about travelling – information about finding a job – information about counselling and support for students – information about the accommodation.
- Some sites and resources that relate to subject information in UK and non-UK directories with academic focus.
- Some resources that give any changes to the main Internet resources and some selective resources for education.

Evaluation:

This book doesn't discuss how to connect to the Internet, which means that it assumes that the user already knows how to connect to the Internet.

It concentrates on the use of different resources, especially for students who use these resources in their course work. It also concentrates on resources in the UK. Therefore most of the sites and resources mentioned in this book are updated and could be visited and used by users at the present time.

It doesn't provide sufficient practical information to enable users to use the Internet.

It doesn't contain many example screens, which makes it difficult for users to understand the use of the Internet.

It gives a lot of information about searching the World Wide Web and finding information on the Internet.

Checklist of overall contents of this publication:

- There is no separate list for resources.
- Glossary.
- Index.

6- " Steele, H.: 1996, How to Use the Internet, California, Macmillan Computer Publishing, ed. 3, 1996 "

Total number of pages: 241 pages. It contains 21 chapters.

Target Audience:

This book is written to be suitable for many users because it contains many illustrations so it is useful for young-aged users and because it contains a sufficient amount of information it is also useful for adult users.

Objectives:

- To have some knowledge about the Internet.
- To understand how the Internet, World Wide Web and email work.
- To be able to get connected to the Internet.
- To be able to set up and install the software needed to use the Internet.
- To browse and search the Internet using the browser.
- To download a file or a program from the Internet.
- To know how to use some plug-ins and help applications.
- To know how to use the electronic mail and its main features.
- To know how to use newsgroups.
- To know how to use electronic mailing lists.
- To be able to transfer files using File Transfer Protocol (FTP).
- To know how to use Telnet.
- To know how to search Gopher sites for information.
- To be aware of safety and security issues on the Internet.
- To search for Internet resources using search engines.
- To know how to design a simple web page.

Main topics:

- Introduction to the Internet and the World Wide Web.
- How to get connected to the Internet.
- Browsing and searching the World Wide Web for information.
- Installing and setting up the software needed to use the Internet.

- Using "Plug-ins" and helper applications.
- Using electronic mail to send, receive, reply, attach and save messages.
- Using News groups.
- Using mailing lists.
- Transferring files with File Transfer Protocol (FTP).
- Using Telnet.
- Visiting and searching Gopher sites.
- Tips on safety and security on the Internet.
- Searching information resources using search engines.
- Designing a simple web page.

Skills to be taught:

- To be able to create a new connection to the Internet by using the Dial-Up Networking software, and to set up the information you obtain from your Internet Service Provider.
- To be able to install and configure Netscape Navigator to one's personal details in order to be able to use it.
- To use Dial-Up Networking software to get connected to the Internet.
- To use Netscape Navigator to browse for information on the Internet.
- To develop the main skills to be able to browse for information on the Internet.
- To download file or software from the Internet, and also to know how to install the software that you download it to your computer.
- To have the ability to use some plug-ins and help applications.
- To know how to send, receive, reply, and attach files to the electronic mail (e-mail).
- To be able to use the Win-Zip software to decompress zip files that are downloaded from the Internet.
- To be able to use the main features of the newsgroups.
- To be able to find, join and use electronic mailing lists.
- To be able to download and upload files using File Transfer Protocol (FTP).
- To know how to set up, connect and use Telnet.
- To be able to use a Gopher site.
- To be able to search resources using search engines e.g. Yahoo, Infoseek...etc.
- To be able to design a simple web page.

Software and hardware:

- Using IBM compatible computers.
- Using the operating system Windows 95.
- Using the browser program Netscape Navigator ver 3.0.
- Using Dial-Up Networking for connecting to the Internet.
- Using the "Cool Talk" software for the use of the phone feature through the Internet.
- Using the Win-Zip software to decompress Zip files.

Internet resources:

- This book doesn't contain a specific chapter on Internet sites and resources. There are many sites and resources mentioned within the text to refer users to supporting resources that relate to the topic.

Evaluation:

It explains in detail each screen, and it uses colour pictures to demonstrate how to be connected to the Internet step by step using Dial-Up Networking, and also it shows how to browse the Internet using Netscape Navigator.

There is a section that contains hints for troubleshooting and provides practical advice for Internet users.

It gives a brief introduction to the organisation of the book. Each chapter contains a series of related topics that span two facing pages, i.e. everything the user needs to know about a subject is in front of him/her at one time. Each two-page spread is arranged in a series of numbered steps that revolve around a central graphic image, which reinforces the concepts at hand.

Tip sheets in each topic also provide valuable shortcuts, additional explanations and otherwise explanatory materials.

There are also three "Try It" sections at strategic points in this book. A "Try It" section is a hands-on exercise that lets the user practice the skills that he/she has acquired so far.

The style of writing is very easy to follow because it uses the step-by-step style which explains the use of the Internet in an easy way.

Checklist of overall contents of this publication:

- Index.
- It doesn't contain a glossary of terms.
- It doesn't contain a list of sites and resources.

7- "Willams, B.: 1995, The Internet for Teachers, Chicago, IDG, 1995"

Total number of pages: 350 pages. It contains 28 chapters.

Target Audience:

This book is written especially for teachers who want to know how to access the Internet and how to bring the Internet into their schools.

Objectives:

- To have some knowledge about the nature of the Internet and its history.
- To be aware of the effect of the Internet on schools and its uses in education.
- To know the hardware and the software needed to connect to the Internet.
- To send and receive messages using electronic mail.
- To know how to use mailing lists.
- To know how to use newsgroups.
- To be able to use Gopher, Veronica and WAIS to search for information.
- To be able to search for information using World Wide Web.
- To download files using File Transfer Protocol (FTP).
- To be aware of logging in to other computers on the Internet using Telnet.
- To be able to use Internet Relay Chat (IRC) to talk with other people on the Internet.
- To know how to use the Internet to enhance teaching.
- To be aware of some useful educational resources for students and teachers e.g. email exchanges, educational mailing lists, educational Newsgroups, educational Gopher sites, educational FTP sites, educational Telnet targets and educational Web sites.

Main topics:

- Introduction to the Internet and its uses in education.
- How to connect to the Internet and the main tools for using the Internet.
- Using electronic mail (email).
- Using mailing lists and newsgroups.
- Searching for information using Gopher sites.

- Searching for information using the World Wide Web.
- Transferring files using File Transfer Protocol (FTP).
- Using Telnet to contact other people on the Internet.
- Talking to other people using Internet Relay Chat (IRC).
- Using the Internet in the classroom.
- The educational uses of the Internet and some educational resources on Gopher, World Wide Web, Newsgroups...etc.

Skills to be taught:

- To connect to the Internet using dial up programme (Mac TCP).
- To set up your email account information.
- To send and receive email.
- To attach files to your email.
- To know the use of mailing lists and newsgroups.
- To use the Gopher tool (Turbo Gopher 2.0) to be able to search Gopher sites on the Internet.
- To use Netscape Navigator to search for information on the World Wide Web.
- To use File Transfer Protocol to download files from the Internet using the Fetch programme.
- To use the NCSA Telnet programme to contact another computer on the Internet.
- To talk to other people on the Internet using Internet Relay Chat (IRC).

Software and hardware:

- Uses Apple Macintosh computer with system 7.5.
- Uses Mac TCP and Mac PPP to connect to the Internet.
- Uses Netscape Navigator to search for information resources on the Internet.
- Uses the Eudora programme for sending and receiving electronic messages and files.
- Uses the Stuffit Expander programme to expand downloaded and compressed files.
- Uses NCSA Telnet to log in to other computers on the Internet.
- Uses Fetch (an FTP programme) to send and receive files easily.
- Uses Turbo Gopher 2.0 program for searching databases.
- Uses Internet Relay Chat (IRC) to talk with other people on the Internet.

Internet resources:

This book contains a lot of educational resources on the following topics:

- Elementary and secondary schools that have web pages on the Internet.
- Some resources and sites for higher education and educational organisations on the Internet.
- Some mailing lists and newsgroups related to education.
- Some educational Gopher sites.
- Some educational FTP sites.
- Some educational Telnet targets that users can contact them through the Internet.
- Some educational sites on the World Wide Web.
- Some entertainment and interesting sites for students.

Evaluation:

This book is designed for teachers and students in different educational stages. Therefore, this book contains a variety of educational resources to be used on the Internet. However, it doesn't contain enough information for the practical use of the Internet such as navigation skills.

In the introduction, it presents guidelines for the main topics in this book, i.e. how to read it, how it is organised and the intended audience.

The organisation of the book is very good and it includes some useful icons to facilitate the use of this book e.g. disk icons that mean use the disk, arrows for tips…etc. It also includes at the beginning of each chapter some brief information about the main topics included.

This book also includes some activities for users to practice using the Internet. It contains a few example screens to explain the use of the Internet and some related software. It explains the main features of the Internet e.g. email, mailing lists, newsgroup, FTP, Gopher…etc. and some of its educational uses.

It provides information about some elementary and secondary schools on the Internet. It also provides information about higher education and some educational organisations on the Internet.

It provides most of the software that supports the use of the Internet e.g. NCSA Telnet Turbo Gopher2.0…etc. on a separate disk. It also includes instruction for using this disk and how to install these programmes. It also has a section that describes all the software needed to use the Internet on both Macintosh and IBM platforms.

Checklist of overall contents of this publication:

- There are three appendices:
  1- Appendix A contains some advice on troubleshooting when using the Internet.
  2- Appendix B contains a glossary of Internet terms mentioned in this book.
  3- Appendix C contains a list of schools that have web pages on the Internet.
- Index.
- A disk containing software for using the Internet.

8- "Cassutto, G.: 1999, Internet Pocket Guide for Teachers, New York, Genium Publication Corporation, 1999"Downloaded from the URL: <u>*http://www.genium.com/catalog/products/ipg/ipgonline.html*</u>***, Visited in December 1999."***

Total number of pages: 97 pages. It contains 10 chapters.

Target Audience:

This book is written especially for teachers to be able to use the Internet in their classrooms. Students can also benefit from this book

Objectives:

- To have some knowledge about the Internet and its usage in education for teachers.
- To know how to choose the Internet service provider.
- To be able to connect to the Internet.
- To be able to use the Internet on different platforms e.g. IBM, Macintosh.
- To know how to connect to the Internet in the classroom.
- To be aware of the different information services on the Internet e.g. email, FTP, Telnet…etc.
- To know how to use the World Wide Web especially in education.
- To use the email and its features to communicate with other teachers.
- To use mailing lists to discuss common topics with other teachers.
- To use Usenet newsgroups to exchange ideas and information with other teachers.
- To understand the use of File Transfer Protocol (FTP).
- To know how to use the Internet to conduct a research project.
- To be able to use search engines to search for information on the Internet.
- To know how to use the Internet into classroom.
- To use the Internet in lesson plan.
- To be able to encourage students to find information on the Internet.
- To know the different types of projects that can be based on the Internet e.g. correspondence, information gathering and exchange, problem solving, collaborative projects, teleconferencing.
- To be able to do a project based on the use of the Internet.

- To know some educational sites and resources on the Internet.

Main topics:

- Introduction to the Internet and its benefits for teachers.
- Information about Internet services and how to choose an Internet Service Provider.
- Choosing the hardware and software needed to connect to the Internet.
- How to connect to the Internet using different platforms.
- How to connect to the Internet from school.
- Using the World Wide Web especially to search for educational information.
- Using email especially to communicate with other teachers.
- Using mailing lists especially to discuss common topics with other teachers.
- Using Usenet newsgroups especially to exchange ideas and information with other teachers.
- Introduction to the use of File Transfer Protocol (FTP).
- Conducting research using the Internet.
- Using search engines to search for information.
- The issues related to using the Internet in the classroom.
- Integrating the Internet into a lesson plan.
- Doing an Internet-based project for education.

Skills to be taught:

- To connect to the Internet using a Dial up programme.
- To connect to the Internet using Mac TCP/IP programme.
- To be able to conduct research using the Internet.
- To be able to do a project using the Internet.
- To be able to use search engines to search for information.
- To be able to use Usenet newsgroups.

Software and hardware:

- Uses the operating system Windows 95/98 or Windows 3.1/3.11.
- Uses Dial Up Networking software to connect to the Internet using Windows 95/98.
- Uses Dial Trumpet Winsock software to connect to the Internet using Windows 3.1/3.11.

- Uses Macintosh computer and Mac TCP/IP software to connect to the Internet.
- Uses Netscape Navigator or Internet Explorer to browse for information on the Internet.

Internet resources:

This book contains many resources for teachers to use it on the Internet:

- Some sites for fine arts including galleries and museums.
- General teaching resources e.g. Ask Eric lesson plans database, classroom connect...etc.
- Some sites for language arts and social studies
- Some sites for mathematics and science.
- Some search engine sites on the Internet.
- Some sites and resources especially for students.
- Some sites related to Web page design.

P.S. these resources include World Wide Web resources and Gopher resources.

Evaluation:

This book concentrates on the educational use of the Internet and how teachers can use it in the classroom. Any teacher or user can download this book from the Internet and can read it using Acrobat Reader.

It could be also viewed online, therefor it contains different hyper links to the Internet. That means any teacher can check any site or resource immediately if he wants to do so.

The book is well organised. It contains a bookmark for the list of contents that enable teachers from reading any topic they want. It also contains thumbnails for each page in the book which enable teachers to go directly to any page.

The book contains some illustrations and some example screens to demonstrate the use of the Internet. However, it doesn't provide sufficient information for using the Internet e.g. Navigation skills, using email...etc.

It explains connecting to the Internet using different platforms e.g. IBM, Macintosh.

Checklist of overall contents of this publication:

- This book has a glossary of the Internet terms.
- The book also includes a complete chapter for some useful Internet resources for teachers. These resources have a hyper link to the Internet.

9- "Beginners' Central, created by Northern Webs, a Web design studio in Idaho, 1999"Downloaded from the URL: http://www.northernwebs.com/bc/, Visited in November 1999."

Total number of pages: it is around 120 pages if it is printed out on A4 size paper. It contains 8 chapters.

Target Audience:

This tutorial is written for any new user to the Internet.

Objectives:

- To have some knowledge about the Internet and its history.
- To be able to find and search resources on the Internet using search engines, bookmark, phrase and Boolean search.
- To be able to use Netscape Navigator and Internet Explorer for browsing for information on the Internet.
- To know how to save information and graphics.
- To know how to download programs and files.
- To be able to configure email and News- Reader on the computer.
- To know how to use news groups.
- To be able to send and receive electronic mail (email).
- To be able to download files using File Transfer Protocol (FTP).
- To be aware of logging on to another computer using Telnet.
- To know some of the Internet traps (e.g. email viruses, etc.) and to be able to avoid it.

Main topics:

- Introduction to the Internet and its history.
- Searching the Internet for information using different search techniques.
- Saving information, graphics and files from the Internet.
- Configuring electronic mail and the newsreader.

- Using newsgroups on the Internet.
- Sending and receiving electronic mail (email).
- Introduction to File Transfer Protocol (FTP).
- Using Telnet.
- Myths of the Internet.

Skills to be taught:

- To search the Internet using different search techniques e.g. search engines, bookmark, phrase and Boolean search.
- To save information and graphics from the Internet.
- To download files and programs from the Internet.
- To configure email and News- Reader on the computer.
- To send and receive electronic mail (email).
- To be able to use newsgroups.
- To download files and programs using File Transfer Protocol (FTP).
- To configure and use Telnet.

Software and hardware:

- It uses both Netscape Navigator and Internet Explorer for browsing the Internet.
- It uses the features in both Netscape Navigator and Internet Explorer to use email, newsgroups and Telnet.

Internet resources:

- It contains some sites for search engines e.g. YAHOO, IMFOSEEK, HOTBOT, ALTAVISTA…etc.
- It contains some sites that provide shareware.
- It contains sites and resources that provide FTP programs to be downloaded, and it also contains a list of public FTP servers.

Evaluation:

This tutorial is published online, so it could be printed out or used online. It is an interactive tutorial which means that users can interact with it using the different tools of

Navigation. The tutorial also has its own tools for Navigation and it introduces this at the beginning of the tutorial.

It concentrates on the basic information that any new user might need to use the Internet. Therefore, its style of writing is easy to follow and it contains a lot of illustrations and example screens to demonstrate the use of the Internet.

Each chapter ends with a chapter summary and chapter problems which contain some exercises for that chapter. These exercises are good for evaluating the user achievement in each chapter.

This tutorial doesn't discuss the most important topic for any new user which is how to get connected to the Internet. Maybe this is a result of the tutorial being online and reflects the assumption that all readers are already connected.

Checklist of overall contents of this publication:

- Appendix A contains glossary of the Internet terms.
- Appendix B contains a list of newsgroups.

10- "McLain, T.; Distefano, V. and Sturm, C.: 1998, Net Seminar: the comprehensive guide to teaching Internet basics, California, Classroom Connect, 1998."

Total number of pages: it is around 221 pages. It contains 12 chapters.

Target Audience:

This guide is written especially for K-12 teachers to use the Internet in their classrooms.

Objectives:

- To be able to use the guide's materials effectively.
- To have some knowledge about the Internet and its uses in schools.
- To know how to use email and mailing lists especially for education.
- To be able to use the World Wide Web.
- To know how to use FTP, Gopher, Telnet, and Usenet Newsgroups.
- To be able to communicate with others in real-time via audio and video conferencing.
- To be able to search for information on the Internet using different search techniques.
- To know how to integrate the use of the Internet into curriculum.
- To be aware of the different educational projects based on the Internet such as online correspondence, information gathering, problem solving and online conferencing.
- To know how plan lessons using the Internet.
- To know how to use the Internet safely.
- To be able to avoid inappropriate materials on the Internet.
- To become aware of some issues related to the use of a single computer connected to the Internet in the whole school.
- To be aware of some educational sites on the World Wide Web and on the mailing-lists.

Main topics:

- How to use this system (includes trainer guide, videocassette, CD and workbook).
- An overview of the Internet and its educational uses.

- The Internet Navigation tools such as WWW, Gopher, Telnet, FTP and Usenet Newsgroups.
- Different techniques for searching the Internet.
- Integrating the Internet into the curriculum.
- Safety and security on the Internet.
- Using one computer connected to the Internet in the entire school.
- Internet resources for K-12 teachers.

Skills to be taught:

- To be able search the Internet.
- To use electronic mail.
- To download files using File Transfer Protocol (FTP).
- To use different search techniques e.g. using search engines, bookmark…etc.
- To be able to establish Internet based educational projects.
- To plan a lesson using the Internet.
- To integrate the use of the Internet into the curriculum.

Software and hardware:

- Uses Power Point for the presentation.
- Uses a TV and video for the videotape.
- Uses a computer, LCD and overhead projector to introduce the presentation on the CD.
- Uses Netscape Navigator and Internet Explorer for browsing the Internet.
- Uses IRC and Real Player for communication on the Internet.
- Mentions some software for blocking inappropriate materials on the Internet such as Cyber patrol.

Internet resources:

- Some sites that include training resources on the Internet.
- Some sites for some U.S. Internet Service Providers.
- Some FTP, Gopher, Telnet, and Usenet Newsgroups sites.
- Some search engine sites on the Internet.

- Some resources related to Internet based educational projects.
- Some Internet lesson plan resources for Primary, Intermediate, Middle and High school in language arts, mathematics, science and social science.
- Some resources related to professional development for educators on the Internet.
- Some sites for software that block inappropriate sites on the Internet.

Evaluation:

This guide contains: Trainer's Guide which includes all the information needed for using the Internet, a CD which contains a presentation for this guide, a video cassette which include an introduction for the Internet and also 20 workbook for teachers.

Its style of writing is easy to follow and it also contains example screens for using the Internet. Each chapter begins with a summary of the topics to be learned. Also each chapter contains different Internet resources on each topic.

It doesn't include many skills for using the Internet e.g. the skills to connect to the Internet.

This guide has integrated materials for teaching the use of the Internet and it is designed especially for trainee teachers. As a result it contains many educational resources and many interesting topics for teachers such as establishing Internet based educational projects and lesson plan.

Checklist of overall contents of this publication:

- The trainer guide contains: a guide for the CD presentation, presentation masters, workbook masters and notes for the trainer.

<u>General notice:</u>

- None of these guides take into account new users who don't know how to use the computer.
- Most of the resources mentioned have become invalid or their locations have changed in the last few years.

Appendix (B): The content analysis of the Internet training materials in Egypt

1- " *Connecting to the Internet step by step*, Cairo, Ministry of Education – Technological Development Centre, 1998 " *

- **Papers published for schools for training teachers and students.**

Total number of pages: 29 pages. It is divided into two groups: group contains 12 papers and the other one contains 17 papers.

Target Audience:

These papers are written especially for educational technology specialists who are using the Internet for the first time, and it is also used for training teachers and students in different schools.

Objectives:

- To be able to use the Internet.
- To be able to connect to and disconnect from the Internet.
- To be able to configure the modem to the computer.
- To be able to add the programme for connecting with the Internet.
- To specify the protocol for using the Internet.
- To be able to configure a line for connecting to the Internet.
- To be able to configure Netscape Navigator preferences to use manual proxy.
- To be able to open location using Netscape Navigator.
- To be able to send messages using electronic mail.

Main topics:

- The steps for configuring modem to the computer.
- Adding Dial-up Networking programme.
- Specifying the protocol for using the Internet.
- Configuring new line for connecting to the Internet.
- The steps for connecting the Internet using Dial-up Networking programme.
- Configuring Netscape Navigator preferences to use manual proxy.

- Opening location on the Internet using Netscape Navigator.
- Sending messages using electronic mail.

Skills to be taught:

- To connect to the Internet step by step.
- To configure modem to the computer.
- To add Dial-up Networking programme to the computer.
- To specify the protocol for using the Internet.
- To configure new line for connecting to the Internet.
- To configure Netscape Navigator preferences to use manual proxy.
- To open location on the Internet using Netscape Navigator.
- To send messages using electronic mail.

Software and hardware:

- Uses IBM compatible PC.
- Uses Windows 95 as an operating system.
- Uses Netscape Navigator.
- Uses Dial up connection programme.

Internet sites and resources:

- There is only one resource has been mentioned in all the papers which is the site of the Egyptian Ministry of Education on the Internet.

Evaluation:

These papers were written especially to enable educational technology specialists in Egyptian schools from using the Internet. It is also used for training both teachers and students in these schools.

These papers were written in the step-by-step style. Therefor it concentrates on the basic skills for using the Internet. It is also concerning with configuring and establishing the connection for using the Internet for the first time. It contains a lot of example screens to demonstrate the use of the Internet.

However, it doesn't contain background information about the Internet and its main features. It doesn't also contain many resources or sites to be used on the schools. It doesn't include many skills especially the Navigation skills that are very important for finding information on the Internet.

2- "Farag, Y. A.; Naser El-Deen, A.: 1997, *Guide for using the Internet*, unpublished papers, Menofia, Technological Development Centre, 1997"

Total number of pages: 23 pages.

Target Audience:

These papers are written especially for educational technology specialists who are using the Internet and it is also used for training teachers and students in schools.

Objectives:

- To have some knowledge about the Internet and its history.
- To be able to connect to the Internet using IBM and/or Macintosh computer.
- To recognise the main menus in Netscape Navigator and its functions.
- To be able to configure modem to connect to the Internet.
- To be able to specify the Internet Service Provider information to the computer e.g. proxy, server name…etc.
- To be able to use browser for searching for information on the Internet.
- To be able to download files from the Internet using File Transfer Protocol.
- To be able to send and receive messages using electronic mail.
- To recognise some search strategies to search for information on the Internet.
- To identify some problems when using the Internet and to be able to solve it.
- To recognise some sites and resources on the Internet.

Main topics:

- Introduction to the Internet.
- Connecting to the Internet using IBM AND/OR Macintosh computer.
- The functions of the main menus in Netscape Navigator.
- Configuring modem to connect to the Internet.
- Specifying the Internet Service Provider information to the computer.
- Using Netscape Navigator to search for information on the Internet.
- Downloading files from the Internet using File Transfer Protocol.
- Using electronic mail to send and receive message on the Internet.

- Some search strategies to search for information on the Internet.
- Troubleshooting in using the Internet.
- Some sites and resources on the Internet.

Skills to be taught:

- To connect to the Internet using IBM AND/OR Macintosh computer.
- To configure modem to connect to the Internet.
- To specify the Internet Service Provider information to the computer.
- To use the main menus in Netscape Navigator and its functions.
- To use Netscape Navigator to search for information on the Internet.
- To download files from the Internet using File Transfer Protocol.
- To send and receive message on the Internet using electronic mail.
- To use some search strategies to search for information on the Internet.

Software and hardware:

- Uses both IBM compatible PC and Macintosh for connecting to the Internet.
- Uses Netscape Navigator.
- Uses TCP Man programme to connect to the Internet in IBM platform.
- Uses Mac TCP/IP programme to connect to the Internet in Macintosh platform.
- Uses FETCH programme for downloading FTP files.

Internet sites and resources:

- There are some sites and resources mentioned in this papers e.g. some search engines, some sites for computer companies and research organisation.

Evaluation:

These papers were written especially to enable educational technology specialists in schools in Menofia to use the Internet. It is also used for training both teachers and students in these schools. It is concentrated on connecting to the Internet and using the Netscape Navigator to browse the Internet. It contains a brief introduction to the different topics related to the Internet, therefor it could be easy to use. However, it contains a lot of Internet terms that are not defined to new users. It contains example screens to demonstrate the use of the Internet.
It also contains some resources and sites to be used when using the Internet.

Appendix (C): The questionnaire for the objectives of the Internet curriculum

Dear Sir/Madam

I am conducting a research project at Sheffield Hallam University in the School of Education. A major goal of this research project is to develop an Internet curriculum for teachers in Egyptian prep schools from a constructivist perspective.

Therefore this questionnaire has been produced to help inform the development of the main objectives of the new Internet curriculum. It is divided into two main parts:

1- General objectives.
2- Educational objectives.

I would be pleased if you would complete the attached questionnaire. This invites you to express your level of agreement with each item as an appropriate objective for such a curriculum. You will find a space at the end of each part to write any comments and/or any suggestions.
Thanks for your valuable time and if you need further information, you can contact me at any time.

My best regards.

Ahmed Ali Hussein El-Gamal
Research student, School of Education
Sheffield Hallam University
36 Collegiate Crescent
Sheffield S10 2BP, UK
elgamal125@hotmail.com

Name: ....

Position: .... Institution: ....

Address (Optional): ....

Tel (Optional): .... E-mail: ....

Background context to the study:

- This study aims to investigate the **essential knowledge and skills** for teachers to use the Internet effectively in their practice.

- The target group is **in-service English teachers in prep schools in Egypt**, from wide range of schools in Menofia-Egypt. Most of them don't have any prior experience in using the computer and the Internet.

- As part of the study a selection of Internet literature has been reviewed and

- a range of Internet users' guides and teachers' guides has been analysed.

- In the light of this a list of objectives has been developed for the Internet curriculum.

- This study is adapting a **constructivist learning environment**, so it aims to provide interesting, relevant, and engaging topics. Therefore, the topics **should not** be overly prescribed so that some aspects of the curriculum are emergent and definable by the learner.

- Based on this context a list of **General Objectives** and **Educational Objectives** have been developed.

- Accordingly this questionnaire has been produced to help inform the development of the main objectives of the new Internet curriculum.

- You are invited to express your level of agreement with each item as an appropriate objective for such a curriculum. In addition you will find a space at the end of each part to write any comments and/or any suggestions.

General Objectives

Objective	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
1.1- To be able to turn on the computer.					
1.2- To be able to shut down the computer.					
1.3- To be able to use the mouse.					
1.4- To be able to run a program using Windows.					
2.1- To have some knowledge about the Internet and its history.					
2.2- To have a sense of excitement about the Internet.					
2.3- To know the difference between the Internet and the World Wide Web.					
3.1- To know some criteria for choosing an Internet service provider.					
3.2- To know the hardware and the software needed to be connected to the Internet.					
3.3- To create a new connection to the Internet using Dial-Up Networking software.					
3.4- To connect to the Internet using Dial-Up Networking software.					
3.5- To be able to connect to the Internet using direct access.					
4.1- To be able to install an Internet browser.					
4.2- To be able to set up browser preferences.					
4.3- To use a browser to search for information on the Internet.					
5.1- To search the World Wide Web efficiently for information.					
5.2- To find resources on the Internet using different search strategies e.g. using search engines.					
5.3- To consider security and privacy issues on the Internet.					
6.1- To be aware of the main facilities offered by the Internet e.g. online banking, online shopping…etc.					
6.2- To recognise the basic concepts behind each tool so users can adapt to any platform and any tool that will be available in the future.					
6.3- To be aware of some Internet aspects e.g. digital libraries, electronic publishing, virtual reality…etc.					
6.4- To use the Internet itself to learn more about the Internet.					
7- To be able to use plug-in programs e.g. Real Time.					
8- To send and receive messages using electronic mail (email).					
9.1- To recognise the function of File Transfer Protocol (FTP).					
9.2- To transfer files using File Transfer Protocol (FTP).					
9.3- To download files and programs from the Internet.					
9.4- To decompress files from the Internet using Win-Zip software.					

-General objectives continued.

Objective	Strongly Disagree	Disagree	Don't Know	Agree	Strongly Agree
10.1- To recognise the use of Gopher on the Internet.					
10.2- To be able to search Gopher sites for information.					
11.1- To recognise the main features of Usenet Newsgroups.					
11.2- To use Usenet Newsgroups to exchange ideas and information with other people on the Internet.					
12.1- To recognise the use of electronic mailing lists.					
12.2- To be able to find, join and use electronic mailing lists.					
13.1- To be aware of the use of Telnet.					
13.2- To log on to another computer on the Internet using Telnet.					
14.1-To recognise the use of Internet Relay Chat (IRC).					
14.2- To use Internet Relay Chat (IRC) to communicate with other people on the Internet.					
15- To be aware of the use of some index tools such as Veronica and WAIS.					
16.1- To be able to design a simple web page using HTML.					
16.2- To be able to use an Internet based authoring package such as Dreamweaver.					
16.3- To be able to incorporate media on a web page.					

General comments and/or suggestions:

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Educational Objectives

The objective	Strongly Disagree	Disagree	Don't Know	Agree	Strongly Agree
.1- To be aware of the impact of using the Internet on ducation.					
.2- To recognise some Internet applications in schools.					
.3- To be able to enhance teaching using the Internet.					
.1- To develop and use lesson plans that actually require he use of the Internet.					
.2- To be able to integrate the Internet into the curriculum .g. doing some curriculum activities using the Internet.					
.3- To become aware of some issues related to the use of a ingle computer connected to the Internet in a school.					
.1- To be able to use the Internet in the classroom e.g. xploring resources, online discussion…etc.					
.2- To be able to encourage students to find information on he Internet.					
.1- To be aware of the different types of projects that can e based on the Internet e.g. correspondence, problem olving, collaborative projects, teleconferencing, gathering nd exchanging information.					
.2- To be able to conduct a project based on using the nternet.					
.1- To be familiar with some useful educational resources or students and teachers e.g. educational Newsgroups, ducational FTP sites, educational Web sites…etc.					
.2- To be able to avoid inappropriate materials on the nternet.					
.3- To use Internet resources in writing essays, issertations…etc.					
.4- To know how to conduct a research using the Internet.					
.5- To write Internet references in the correct format.					
.1- To be able to evaluate the effectiveness of using the nternet in teaching and learning.					
.2- To identify strengths and weaknesses of using the nternet to enhance learning.					

General comments and/or suggestions:

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Appendix (D): The statistical analysis for the questionnaire

Table (1) reliability analysis (Alpha) for the general objectives

The general objectives	Corrected item total correlation	Alpha if item deleted
Q1.1 Turning on the computer	.3379	.8901
Q1.2 Turning off the computer	.3427	.8900
Q1.3 The ability to use the mouse	.3373	.8902
Q1.4 The ability to run a program using windows	**.8875**	.8875
Q2.1 Having some knowledge about the Internet and its history	.5514	.8881
Q2.2 Having a sense of excitement about the Internet	.2210	.8914
Q2.3 Knowing the difference between the Internet and the WWW	.2809	.8905
Q3.1 Knowing some criteria for choosing an Internet service provider	.5108	.8870
Q3.2 knowing the hardware and the software needed to connect the Internet	.1030	.8924
Q3.3 Creating a connection to the Internet	.4100	.8886
Q3.4 Connecting to the Internet using Dial-Up Networking	.4720	.8878
Q3.5 The ability to connect to the Internet using direct access	.1759	.8918
Q4.1 The ability to install an Internet browser	.4298	.8883
Q4.2 The ability to set up browser preferences	.3740	.8892
Q4.3 Using a browser to search for information	.3911	.8892
Q5.1 Searching WWW for information	.5906	.8861
Q5.2 Finding resources using different search strategies	.3584	.8899
Q5.3 Considering security and privacy issues on the Internet	.4385	.8882
Q6.1 The awareness of the main facilities offered by the Internet	.2455	.8912
Q6.2 Recognising the basic concepts behind the Internet tools	.2644	.8913
Q6.3 The awareness of some Internet aspects	.5920	.8878
Q6.4 Using the Internet itself to learn more about the Internet	**.0065**	**.8937**
Q7 The ability to use plug-in programs	.4798	.8874
Q8 Sending and receiving electronic mail (email)	.6701	.8878
Q9.1 Recognising the function of File Transfer Protocol (FTP)	.4988	.8876
Q9.2 Transferring files using File Transfer Protocol (FTP)	.6666	.8845
Q9.3 Downloading files using File Transfer Protocol (FTP)	.4254	.8889
Q9.4 Decompressing files From the Internet	.1603	.8918
Q10.1 Recognising the use of Gopher on the Internet	.6196	.8845
Q10.2 The ability to search Gopher sites	.6402	.8841
Q11.1 Recognising the main features of Usenet Newsgroups	.7850	**.8827**
Q11.2 Using Usenet Newsgroups to exchange information	.5973	.8860
Q12.1 Recognising the use of electronic mailing lists	.5929	.8868
Q12.2 The ability to find, join and use electronic mailing lists	.5057	.8882
Q13.1 The awareness of the use of Telnet	.3396	.8903
Q13.2 Logging on to another computer using Telnet	.3205	.8906
Q14.1 Recognising the use of Internet Rely Chat (IRC)	.1051	.8928
Q14.2 Using Internet Rely Chat to communicate with other people	.2144	.8914
Q15 The awareness of the use of some index tools	.3904	.8891
Q16.1 The ability to design a simple web page using HTML	.2651	.8907
Q16.2 The ability to use an Internet authoring package such as Dreamweaver	.3156	.8900
Q16.3 The ability to incorporate media on a web page	.1436	.8917

Table (2) reliability analysis (Alpha) for the educational objectives

The educational objectives	**Corrected item total correlation**	**Alpha if item deleted**
Q1.1 The awareness of the impact of using the Internet on education	.5208	.7013
Q1.2 Recognising of some Internet applications in schools	.3316	.7129
Q1.3 The ability to enhance teaching using the Internet	.3629	.7091
Q2.1 Developing lesson plans based on the Internet	.4040	.7068
Q2.2 The ability to integrate the Internet into curriculum	.0776	.7434
Q2.3 The awareness of using a single computer connected to the Internet in school	**-.0307**	**.7575**
Q3.1 The ability to use the Internet in the classroom	**.6949**	.6885
Q3.2 The ability to encourage students to search the Internet	.3232	.7127
Q4.1 The awareness of the Internet projects	.5013	.6987
Q4.2 The ability to conduct a project based on using the Internet	.4472	.6988
Q5.1 The familiarity with some educational resources	.6446	**.6870**
Q5.2 The ability to avoid inappropriate materials on the Internet	.0747	.7416
Q5.3 The use of Internet resources in writing essays	.2540	.7190
Q5.4 The ability to conduct a research using the Internet	.1302	.7275
Q5.5 Writing the Internet references in the correct format	.2472	.7197
Q6.1 The ability to evaluate the use of the Internet in teaching	.3625	.7090
Q6.2 The Identification of strengths and weaknesses of using the Internet	.5216	.6891

Table (3) descriptive statistics for the general objectives

Question No.	N	Mode	Sum	Mean	Std. Deviation	Variance
Q1.1	20	5	87	4.35	1.14	1.292
Q1.2	20	5	86	4.3	1.13	1.274
Q1.3	20	5	88	4.4	1.14	1.305
Q1.4	20	5	83	4.15	1.23	1.503
Q2.1	20	4	88	4.4	0.5	0.253
Q2.2	20	4	78	3.9	0.85	0.726
Q2.3	20	4	76	3.8	0.83	0.695
Q3.1	20	4	79	3.95	0.89	0.787
Q3.2	20	5	88	4.4	0.68	0.463
Q3.3	20	4	80	4	0.97	0.947
Q3.4	20	5	87	4.35	0.81	0.661
Q3.5	20	5	85	4.25	0.79	0.618
Q4.1	20	**3**	**76**	**3.8**	**1.01**	**1.011**
Q4.2	20	5	82	4.1	0.97	0.937
Q4.3	20	5	92	4.6	0.6	0.358
Q5.1	20	5	94	4.7	0.8	0.642
Q5.2	20	5	94	4.7	0.47	0.221
Q5.3	20	5	89	4.45	0.83	0.682
Q6.1	20	4	74	3.7	0.92	0.853
Q6.2	20	5	80	4	1.08	1.158
Q6.3	20	4	87	4.35	0.49	0.239
Q6.4	20	4	82	4.1	0.72	0.516
Q7	20	4	79	3.95	0.94	0.892
Q8	20	5	96	4.8	0.41	0.168
Q9.1	20	4	83	4.15	0.75	0.555
Q9.2	20	4	80	4	0.92	0.842
Q9.3	20	5	92	4.6	0.6	0.358
Q9.4	20	4	82	4.1	0.72	0.516
Q10.1	20	**3**	**60**	**3**	**1.17**	**1.368**
Q10.2	20	**3**	**59**	**2.95**	**1.15**	**1.313**
Q11.1	20	4	79	3.95	0.89	0.787
Q11.2	20	4	77	3.85	0.81	0.661
Q12.1	20	4	86	4.3	0.66	0.432
Q12.2	20	4	86	4.3	0.57	0.326
Q13.1	20	**4**	**69**	**3.45**	**1.19**	**1.418**
Q13.2	20	**4**	**66**	**3.3**	**1.17**	**1.379**
Q14.1	20	4	74	3.7	0.8	0.642
Q14.2	20	4	71	3.55	0.83	0.682
Q15	20	**3**	**57**	**2.85**	**1.14**	**1.292**
Q16.1	20	4	78	3.9	0.85	0.726
Q16.2	20	4	76	3.8	0.89	0.8
Q16.3	20	4	83	4.15	0.59	0.345

Table (4) descriptive statistics for the educational objectives

Question No.	N	Mode	Sum	Mean	Std. Deviation	Variance
Q1.1	20	5	92	4.6	0.5	0.253
Q1.2	20	4	87	4.35	0.59	0.345
Q1.3	20	5	90	4.5	0.69	0.474
Q2.1	20	5	89	4.45	0.6	0.366
Q2.2	20	5	88	4.4	0.94	0.884
Q2.3	20	**4**	**80**	**4**	**0.97**	**0.947**
Q3.1	20	5	91	4.55	0.51	0.261
Q3.2	20	5	91	4.55	0.76	0.576
Q4.1	20	5	90	4.5	0.61	0.368
Q4.2	20	4	81	4.05	0.83	0.682
Q5.1	20	4	88	4.4	0.6	0.358
Q5.2	20	**4**	**81**	**4.05**	**0.89**	**0.787**
Q5.3	20	4	85	4.25	0.55	0.303
Q5.4	20	4	84	4.2	0.52	0.274
Q5.5	20	4	81	4.05	0.69	0.471
Q6.1	20	5	85	4.25	0.97	0.934
Q6.2	20	5	87	4.35	0.88	0.766

Table (5) shows the frequencies for the general objectives

Degree of Agreement / The general objectives	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
Q1.1 Turning on the computer	1	1	1	4	13
Q1.2 Turning off the computer	1	1	1	5	12
Q1.3 The ability to use the mouse	1	1	1	3	14
Q1.4 The ability to run a program using windows	1	2	1	5	11
Q2.1 Having some knowledge about the Internet and its history				12	8
Q2.2 Having a sense of excitement about the Internet		1	5	9	5
Q2.3 Knowing the difference between the Internet and the WWW		2	3	12	3
Q3.1 Knowing some criteria for choosing an Internet service provider		2	2	11	5
Q3.2 knowing the hardware and the software needed to connect the Internet			2	8	10
Q3.3 Creating a connection to the Internet		2	3	8	7
Q3.4 Connecting to the Internet using Dial-Up Networking		1	1	8	10
Q3.5 The ability to connect to the Internet using direct access			4	7	9
Q4.1 The ability to install an Internet browser		2	6	6	6
Q4.2 The ability to set up browser preferences		1	5	5	9
Q4.3 Using a browser to search for information			1	6	13
Q5.1 Searching WWW for information		1	1	1	17
Q5.2 Finding resources using different search strategies				6	14
Q5.3 Considering security and privacy issues on the Internet		1	1	6	12
Q6.1 The awareness of the main facilities offered by the Internet		3	3	11	3
Q6.2 Recognising the basic concepts behind the Internet tools		3	2	7	8
Q6.3 The awareness of some Internet aspects				13	7
Q6.4 Using the Internet itself to learn more about the Internet			4	10	6
Q7 The ability to use plug-in programs		2	3	9	6
Q8 Sending and receiving electronic mail (email)				4	16
Q9.1 Recognising the function of File Transfer Protocol (FTP)			4	9	7
Q9.2 Transferring files using File Transfer Protocol (FTP)		1	5	7	7
Q9.3 Downloading files using File Transfer Protocol (FTP)			1	6	13
Q9.4 Decompressing files From the Internet		1	1	13	5
Q10.1 Recognising the use of Gopher on the Internet	2	5	6	5	2
Q10.2 The ability to search Gopher sites	2	5	7	4	2
Q11.1 Recognising the main features of Usenet Newsgroups		1	5	8	6
Q11.2 Using Usenet Newsgroups to exchange information		1	5	10	4
Q12.1 Recognising the use of electronic mailing lists			2	10	8
Q12.2 The ability to find, join and use electronic mailing lists			1	12	7
Q13.1 The awareness of the use of Telnet	2	2	4	9	3
Q13.2 Logging on to another computer using Telnet	2	3	4	9	2
Q14.1 Recognising the use of Internet Rely Chat (IRC)		2	4	12	2
Q14.2 Using Internet Rely Chat to communicate with other people		2	7	9	2
Q15 The awareness of the use of some index tools	3	4	7	5	1
Q16.1 The ability to design a simple web page using HTML		2	2	12	4
Q16.2 The ability to use an Internet authoring package		2	4	10	4
Q16.3 The ability to incorporate media on a web page			2	13	5

Table (6) shows the frequencies for the educational objectives

Degree of Agreement / The educational objectives	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
Q1.1 The awareness of the impact of using the Internet on education				8	12
Q1.2 Recognising of some Internet applications in schools			1	11	8
Q1.3 The ability to enhance teaching using the Internet			2	6	12
Q2.1 Developing lesson plans based on the Internet			1	9	10
Q2.2 The ability to integrate the Internet into curriculum	1			8	11
Q2.3 The awareness of using a single computer connected to the Internet in school	1		3	10	6
Q3.1 The ability to use the Internet in the classroom				9	11
Q3.2 The ability to encourage students to search the Internet		1		6	13
Q4.1 The awareness of the Internet projects			1	8	11
Q4.2 The ability to conduct a project based on using the Internet		1	3	10	6
Q5.1 The familiarity with some educational resources			1	10	9
Q5.2 The ability to avoid inappropriate materials on the Internet		1	4	8	7
Q5.3 The use of Internet resources in writing essays			1	13	6
Q5.4 The ability to conduct a research using the Internet			1	14	5
Q5.5 Writing the Internet references in the correct format		1	1	14	4
Q6.1 The ability to evaluate the use of the Internet in teaching		2	1	7	10
Q6.2 The Identification of strengths and weaknesses of using the Internet		1	2	6	11

Table (7) shows the percentage of frequencies for the general objectives

Degree of Agreement / The general objectives	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
Q1.1 Turning on the computer	5%	5%	5%	20%	65%
Q1.2 Turning off the computer	5%	5%	5%	25%	60%
Q1.3 The ability to use the mouse	5%	5%	5%	15%	70%
Q1.4 The ability to run a program using windows	5%	10%	5%	25%	55%
Q2.1 Having some knowledge about the Internet and its history				60%	40%
Q2.2 Having a sense of excitement about the Internet		5%	25%	45%	25%
Q2.3 Knowing the difference between the Internet and the WWW		10%	15%	60%	15%
Q3.1 Knowing some criteria for choosing an Internet service provider		10%	10%	55%	25%
Q3.2 knowing the hardware and the software needed to connect the Internet			10%	40%	50%
Q3.3 Creating a connection to the Internet		10%	15%	40%	35%
Q3.4 Connecting to the Internet using Dial-Up Networking		5%	5%	40%	50%
Q3.5 The ability to connect to the Internet using direct access			20%	35%	45%
Q4.1 The ability to install an Internet browser		10%	30%	30%	30%
Q4.2 The ability to set up browser preferences		5%	25%	25%	45%
Q4.3 Using a browser to search for information			5%	30%	65%
Q5.1 Searching WWW for information		5%	5%	5%	85%
Q5.2 Finding resources using different search strategies				30%	70%
Q5.3 Considering security and privacy issues on the Internet		5%	5%	30%	60%
Q6.1 The awareness of the main facilities offered by the Internet		15%	15%	55%	15%
Q6.2 Recognising the basic concepts behind the Internet tools		15%	10%	35%	40%
Q6.3 The awareness of some Internet aspects				65%	35%
Q6.4 Using the Internet itself to learn more about the Internet			20%	50%	30%
Q7 The ability to use plug-in programs		10%	15%	45%	30%
Q8 Sending and receiving electronic mail (email)				20%	80%
Q9.1 Recognising the function of File Transfer Protocol (FTP)			20%	45%	35%
Q9.2 Transferring files using File Transfer Protocol (FTP)		5%	25%	35%	35%
Q9.3 Downloading files using File Transfer Protocol (FTP)			5%	30%	65%
Q9.4 Decompressing files From the Internet		5%	5%	65%	25%
Q10.1 Recognising the use of Gopher on the Internet	10%	25%	30%	25%	10%
Q10.2 The ability to search Gopher sites	10%	25%	35%	20%	10%
Q11.1 Recognising the main features of Usenet Newsgroups		5%	25%	40%	30%
Q11.2 Using Usenet Newsgroups to exchange information		5%	25%	50%	20%
Q12.1 Recognising the use of electronic mailing lists			10%	50%	40%
Q12.2 The ability to find, join and use electronic mailing lists			5%	60%	35%
Q13.1 The awareness of the use of Telnet	10%	10%	20%	45%	15%
Q13.2 Logging on to another computer using Telnet	10%	15%	20%	45%	10%
Q14.1 Recognising the use of Internet Rely Chat (IRC)		10%	20%	60%	10%
Q14.2 Using Internet Rely Chat to communicate with other people		10%	35%	45%	10%
Q15 The awareness of the use of some index tools	15%	20%	35%	25%	5%
Q16.1 The ability to design a simple web page using HTML		10%	10%	60%	20%
Q16.2 The ability to use an Internet authoring package such as Dreamweaver		10%	20%	50%	20%
Q16.3 The ability to incorporate media on a web page			10%	65%	25%

Table (8) shows the percentage of frequencies for the educational objectives

Degree of Agreement / The educational objectives	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
Q1.1 The awareness of the impact of using the Internet on education				40%	60%
Q1.2 Recognising of some Internet applications in schools			5%	55%	40%
Q1.3 The ability to enhance teaching using the Internet			10%	30%	60%
Q2.1 Developing lesson plans based on the Internet			5%	45%	50%
Q2.2 The ability to integrate the Internet into curriculum	5%			40%	55%
Q2.3 The awareness of using a single computer connected to the Internet in school	5%		15%	50%	30%
Q3.1 The ability to use the Internet in the classroom				45%	55%
Q3.2 The ability to encourage students to search the Internet		5%		30%	65%
Q4.1 The awareness of the Internet projects			5%	40%	55%
Q4.2 The ability to conduct a project based on using the Internet		5%	15%	50%	30%
Q5.1 The familiarity with some educational resources			5%	50%	45%
Q5.2 The ability to avoid inappropriate materials on the Internet		5%	20%	40%	35%
Q5.3 The use of Internet resources in writing essays			5%	65%	30%
Q5.4 The ability to conduct a research using the Internet			5%	70%	25%
Q5.5 Writing the Internet references in the correct format		5%	5%	70%	20%
Q6.1 The ability to evaluate the use of the Internet in teaching		10%	5%	35%	50%
Q6.2 The Identification of strengths and weaknesses of using the Internet		5%	10%	30%	55%

Table (9) shows the sum and the total percentage of the agreement and the disagreement for the general objectives

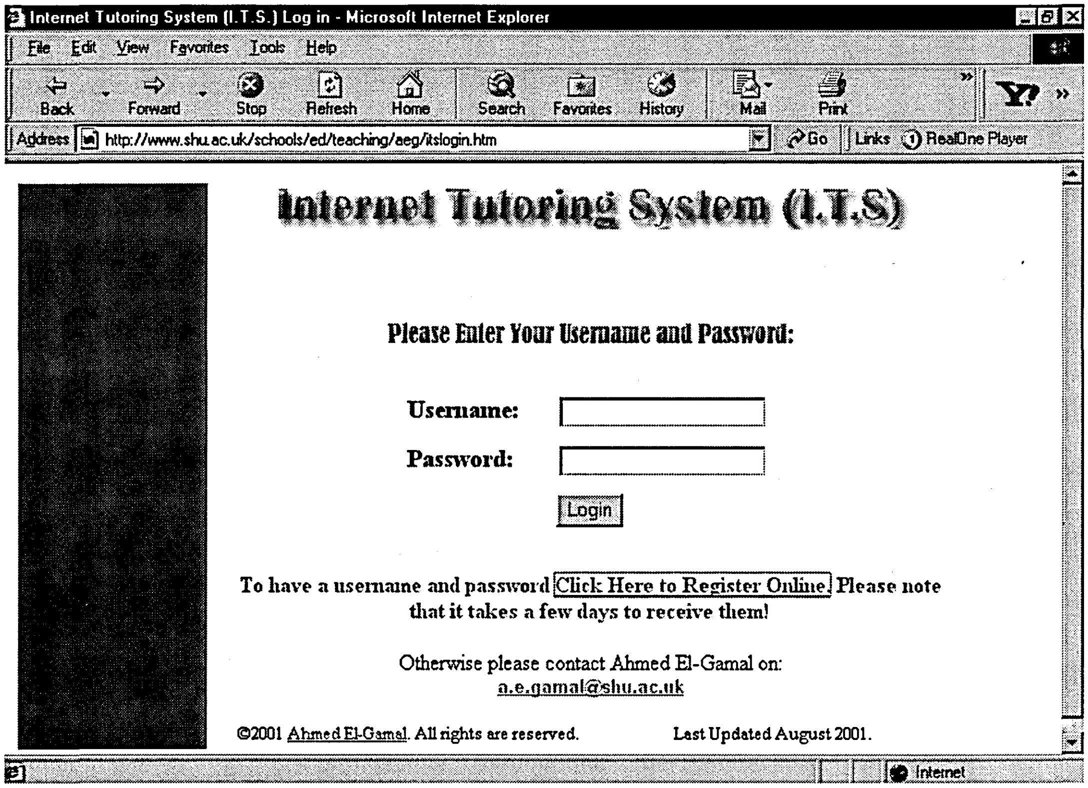
Question No.	Strongly Disagree	Disagree	Not Sure	Sum	Percentage	Agree	Strongly Agree	Sum	Percentage
Q1.1	1	1	1	3	15%	4	13	17	85%
Q1.2	1	1	1	3	15%	5	12	17	85%
Q1.3	1	1	1	3	15%	3	14	17	85%
Q1.4	1	2	1	4	20%	5	11	16	80%
Q2.1					0%	12	8	20	100%
Q2.2		1	5	6	30%	9	5	14	70%
Q2.3		2	3	5	25%	12	3	15	75%
Q3.1		2	2	4	20%	11	5	16	80%
Q3.2			2	2	10%	8	10	18	90%
Q3.3		2	3	5	25%	8	7	15	75%
Q3.4		1	1	2	10%	8	10	18	90%
Q3.5			4	4	20%	7	9	16	80%
Q4.1		2	6	8	**40%**	6	6	12	**60%**
Q4.2		1	5	6	30%	5	9	14	70%
Q4.3			1	1	5%	6	13	19	95%
Q5.1		1	1	2	10%	1	17	18	90%
Q5.2					0%	6	14	20	100%
Q5.3		1	1	2	10%	6	12	18	90%
Q6.1		3	3	6	30%	11	3	14	70%
Q6.2		3	2	5	25%	7	8	15	75%
Q6.3					0%	13	7	20	100%
Q6.4			4	4	20%	10	6	16	80%
Q7		2	3	5	25%	9	6	15	75%
Q8					0%	4	16	20	100%
Q9.1			4	4	20%	9	7	16	80%
Q9.2		1	5	6	30%	7	7	14	70%
Q9.3			1	1	5%	6	13	19	95%
Q9.4		1	1	2	10%	13	5	18	90%
Q10.1	2	5	6	13	**65%**	5	2	7	**35%**
Q10.2	2	5	7	14	**70%**	4	2	6	**30%**
Q11.1		1	5	6	30%	8	6	14	70%
Q11.2		1	5	6	30%	10	4	14	70%
Q12.1			2	2	10%	10	8	18	90%
Q12.2			1	1	5%	12	7	19	95%
Q13.1	2	2	4	8	**40%**	9	3	12	**60%**
Q13.2	2	3	4	9	**45%**	9	2	11	**55%**
Q14.1		2	4	6	30%	12	2	14	70%
Q14.2		2	7	9	**45%**	9	2	11	**55%**
Q15	3	4	7	14	**70%**	5	1	6	**30%**
Q16.1		2	2	4	20%	12	4	16	80%
Q16.2		2	4	6	30%	10	4	14	70%
Q16.3			2	2	10%	13	5	18	90%

Table (10) shows the sum and the total percentage of the agreement and the disagreement for the educational objectives

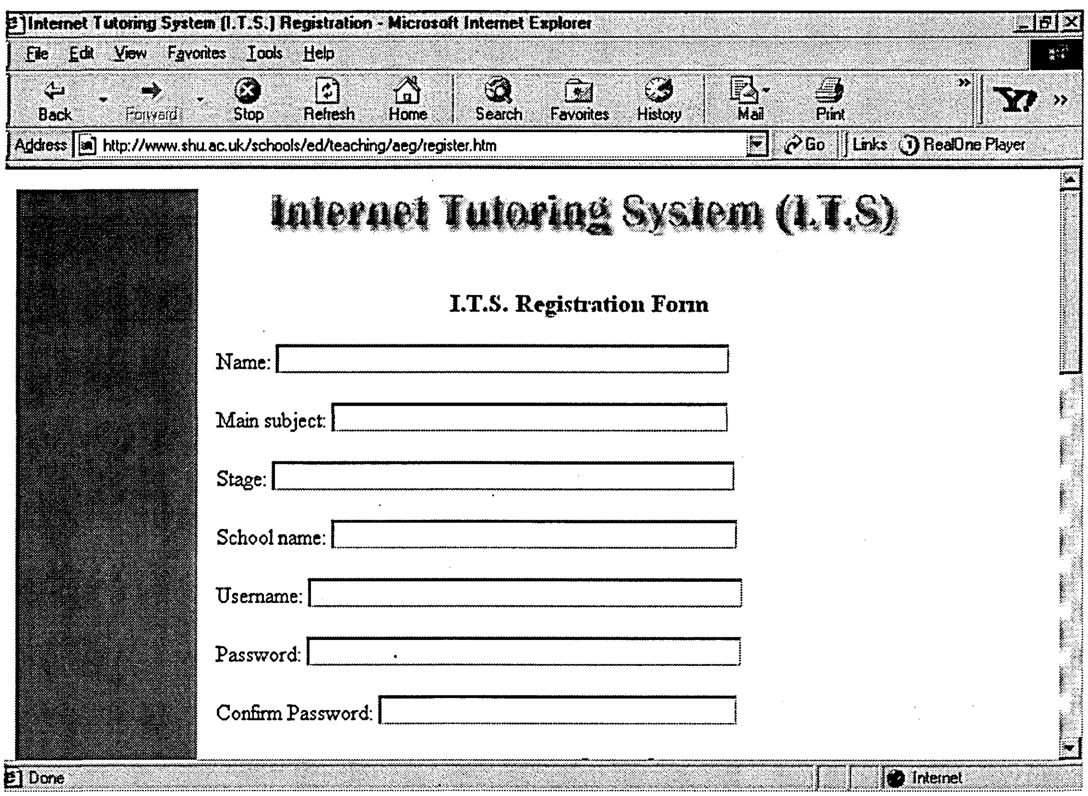
Question No.	**Strongly Disagree**	**Disagree**	**Not Sure**	**Sum**	**Percentage**	**Agree**	**Strongly Agree**	**Sum**	**Percentage**
Q1.1					0%	8	12	20	100%
Q1.2			1	1	5%	11	8	19	95%
Q1.3			2	2	10%	6	12	18	90%
Q2.1			1	1	5%	9	10	19	95%
Q2.2	1			1	5%	8	11	19	95%
Q2.3	1		3	4	20%	10	6	16	80%
Q3.1					0%	9	11	20	100%
Q3.2		1		1	5%	6	13	19	95%
Q4.1			1	1	5%	8	11	19	95%
Q4.2		1	3	4	20%	10	6	16	80%
Q5.1			1	1	5%	10	9	19	95%
Q5.2		1	4	5	**25%**	8	7	15	**75%**
Q5.3			1	1	5%	13	6	19	95%
Q5.4			1	1	5%	14	5	19	95%
Q5.5		1	1	2	10%	14	4	18	90%
Q6.1		2	1	3	15%	7	10	17	85%
Q6.2		1	2	3	15%	6	11	17	85%

Appendix (E) Internet Tutoring System

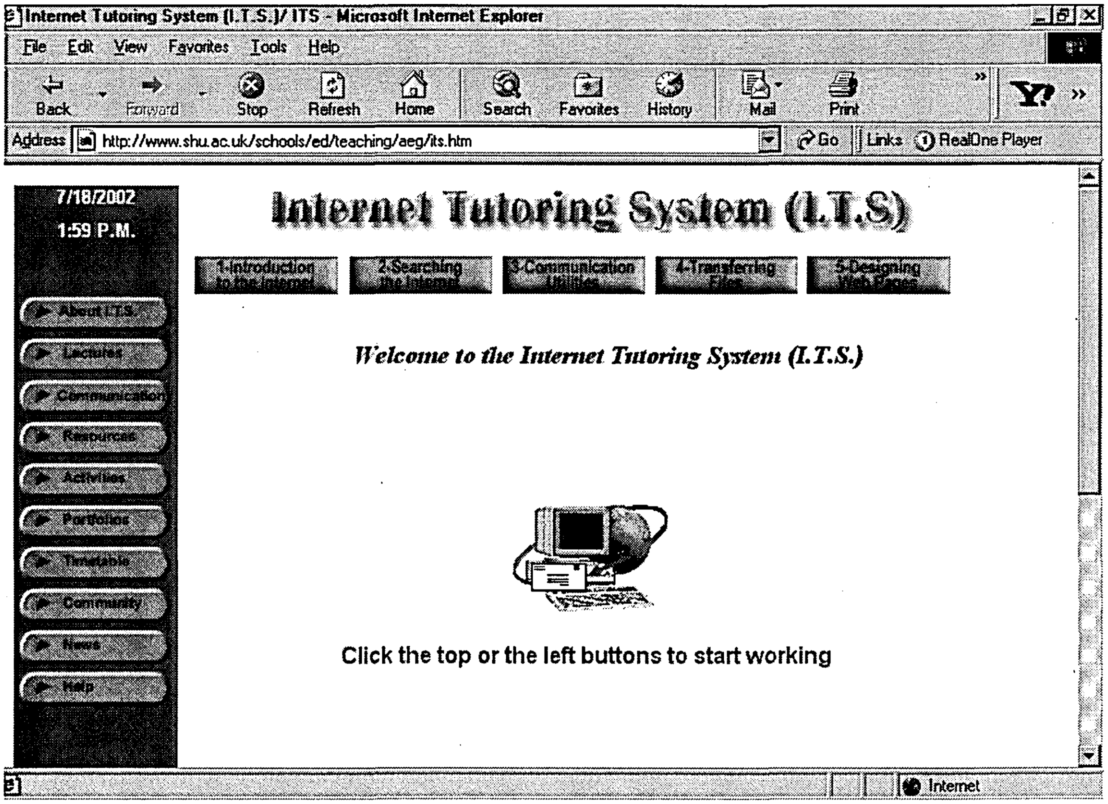
Log in page:



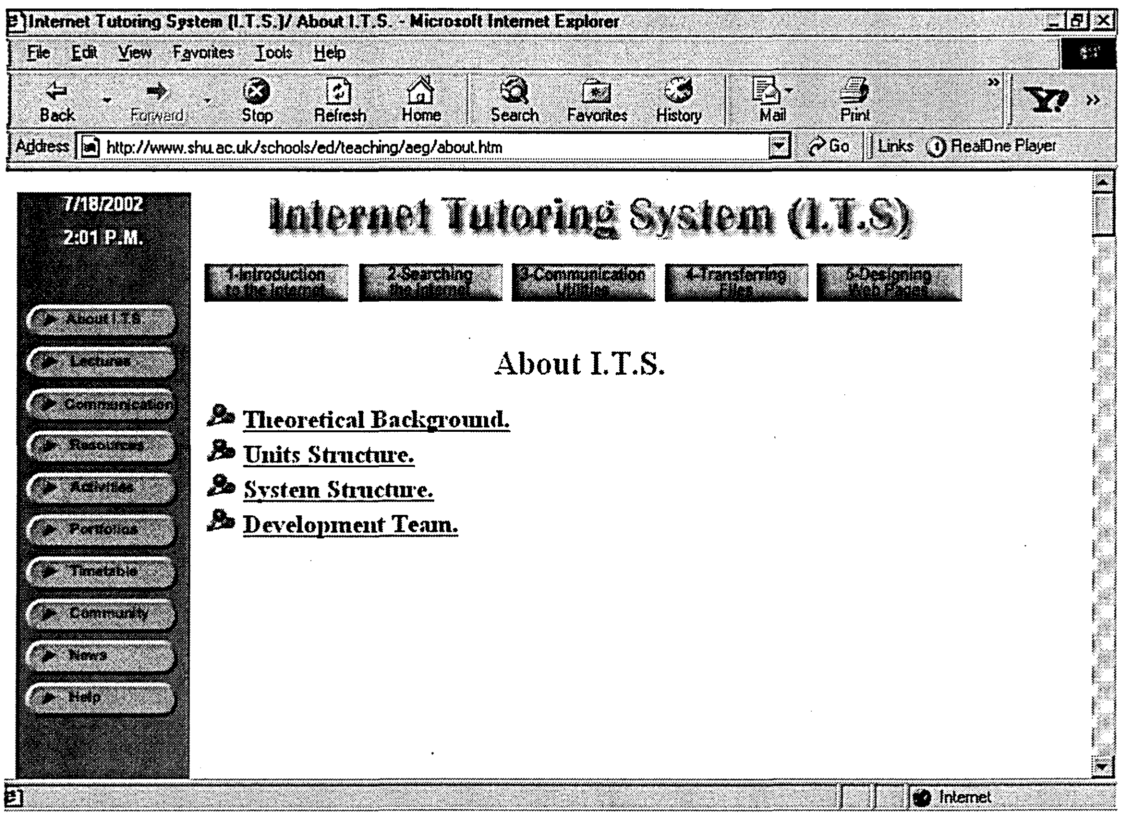
Registration page:



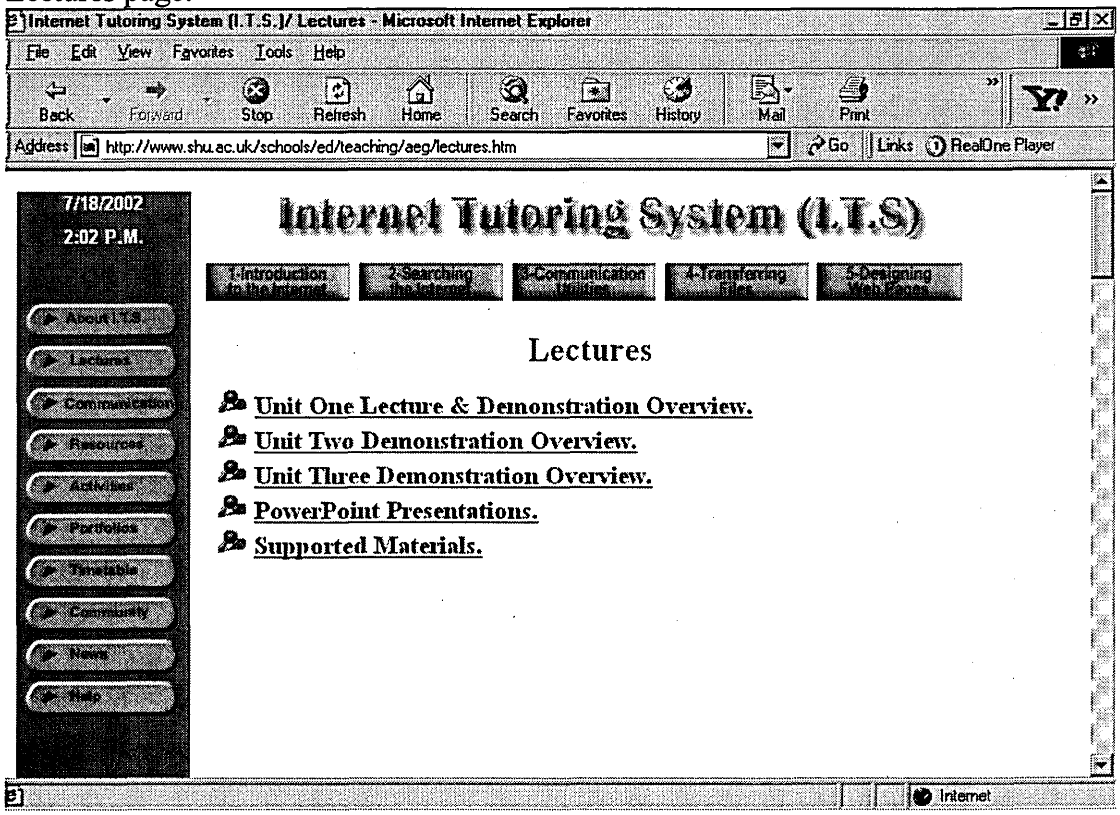
Main page:



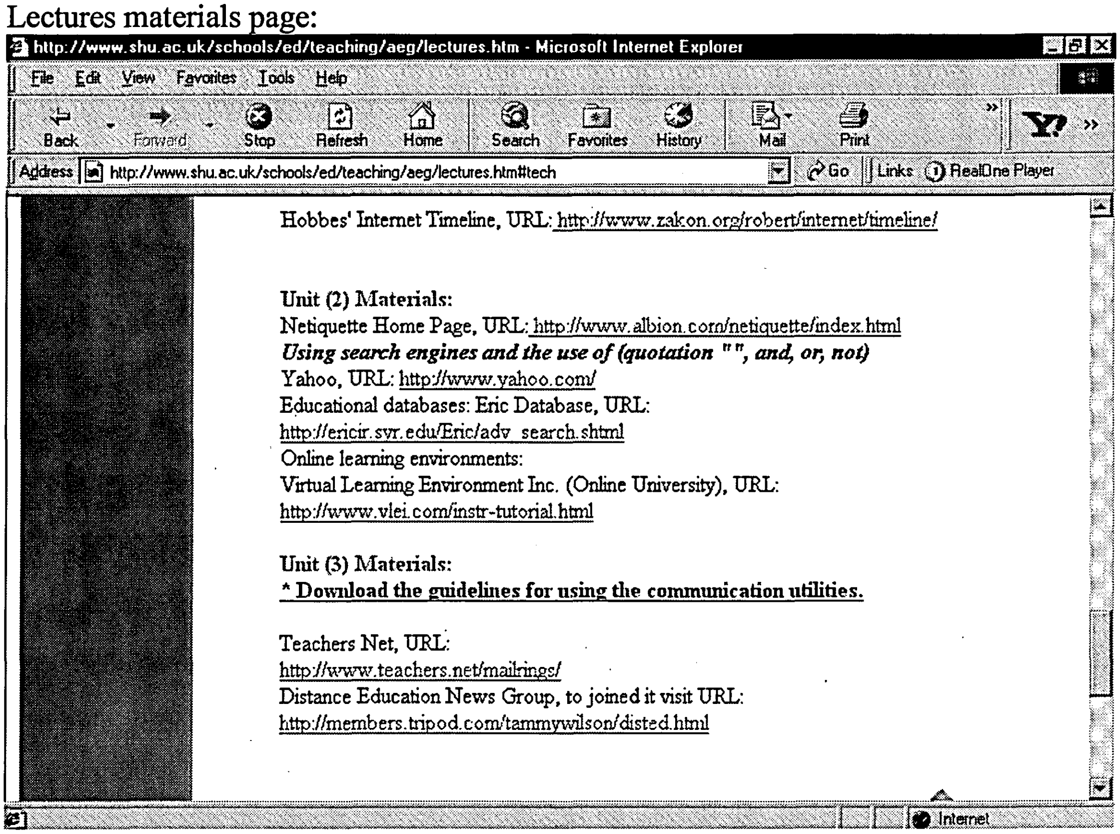
About ITS page:



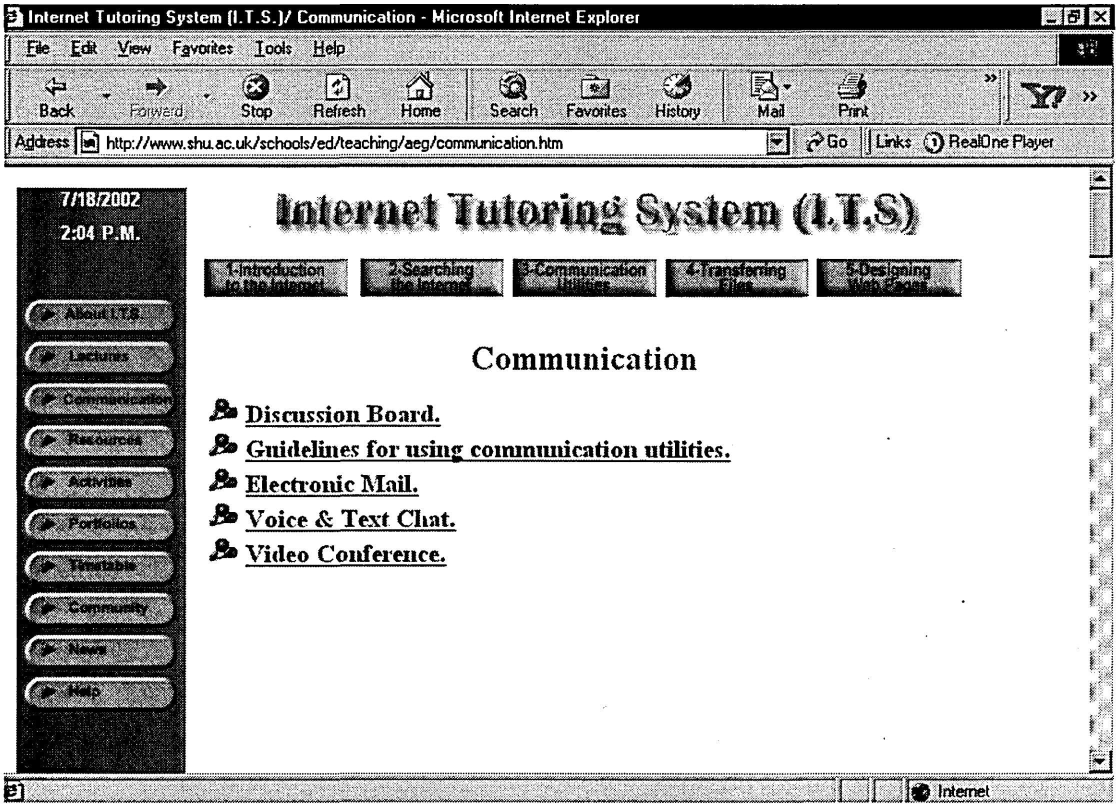
Lectures page:



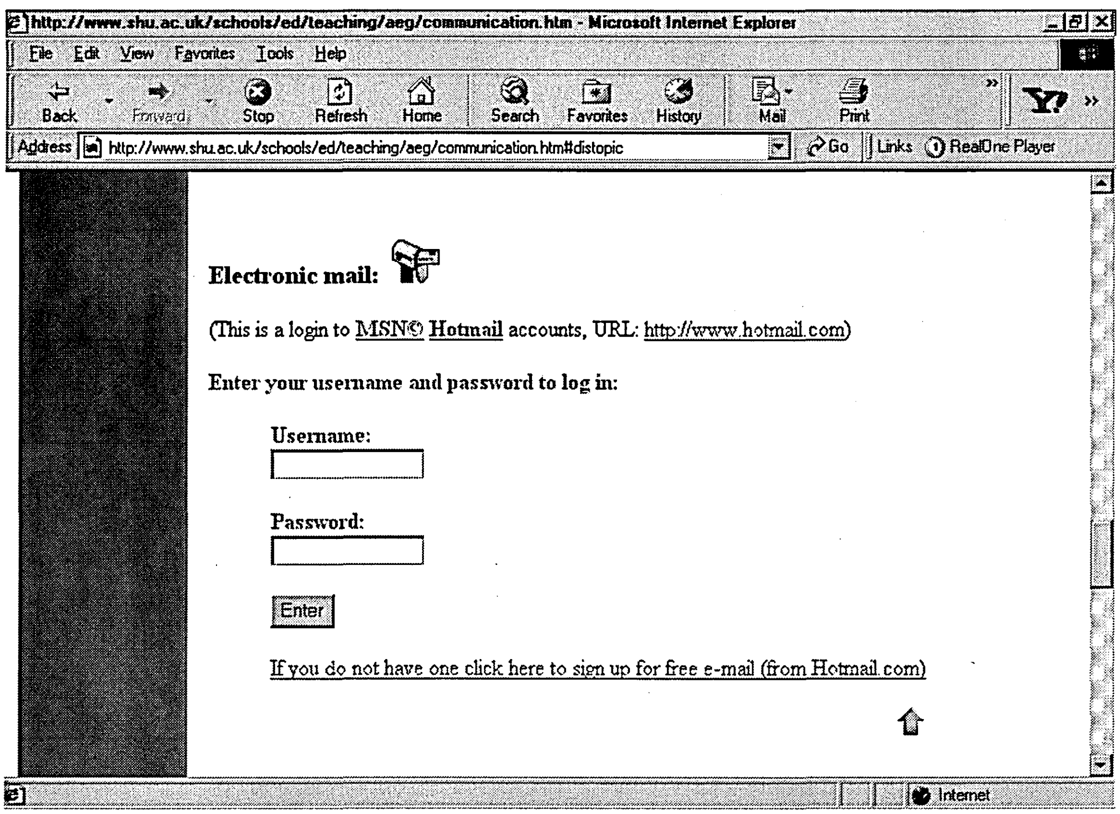
Lectures materials page:



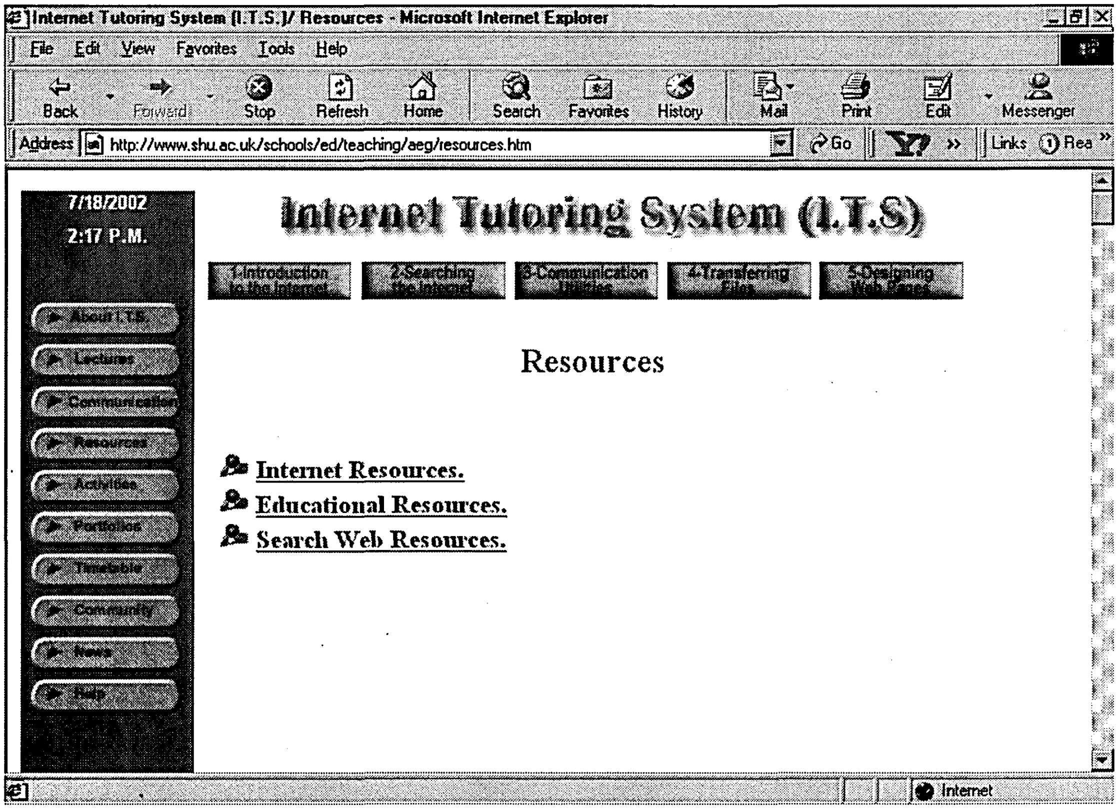
Communication tools page:



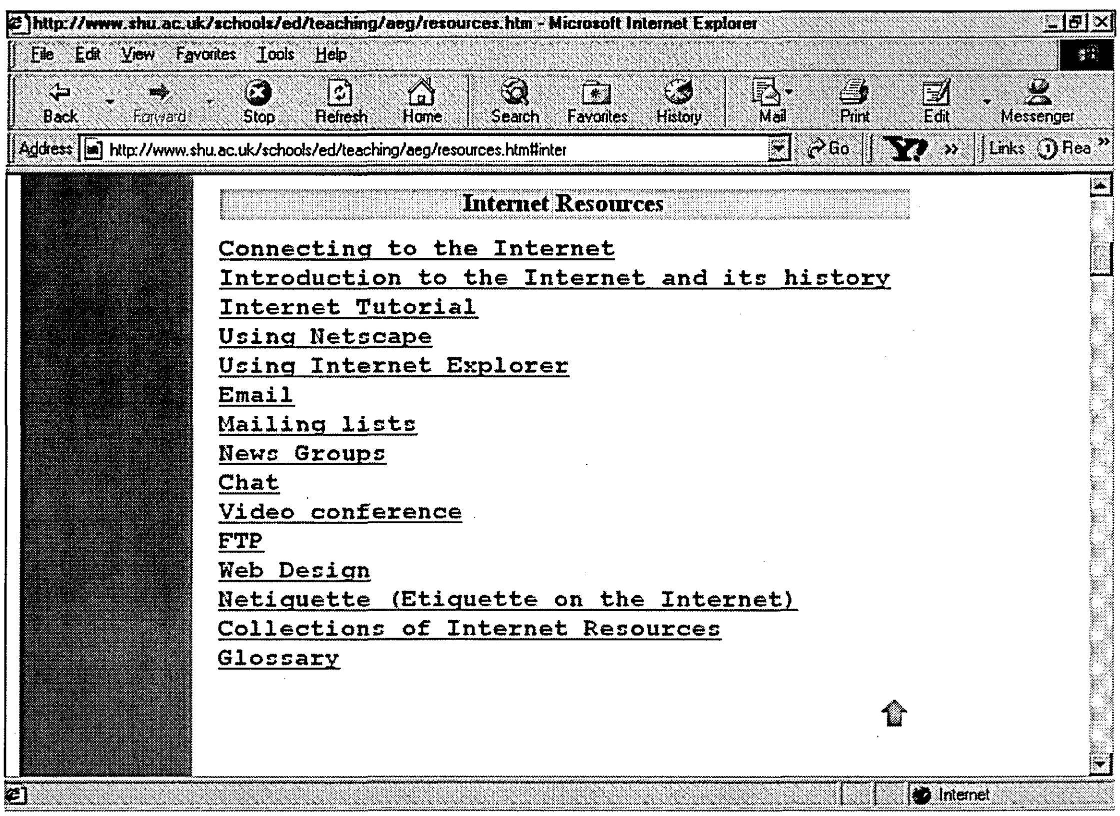
Electronic mail page:



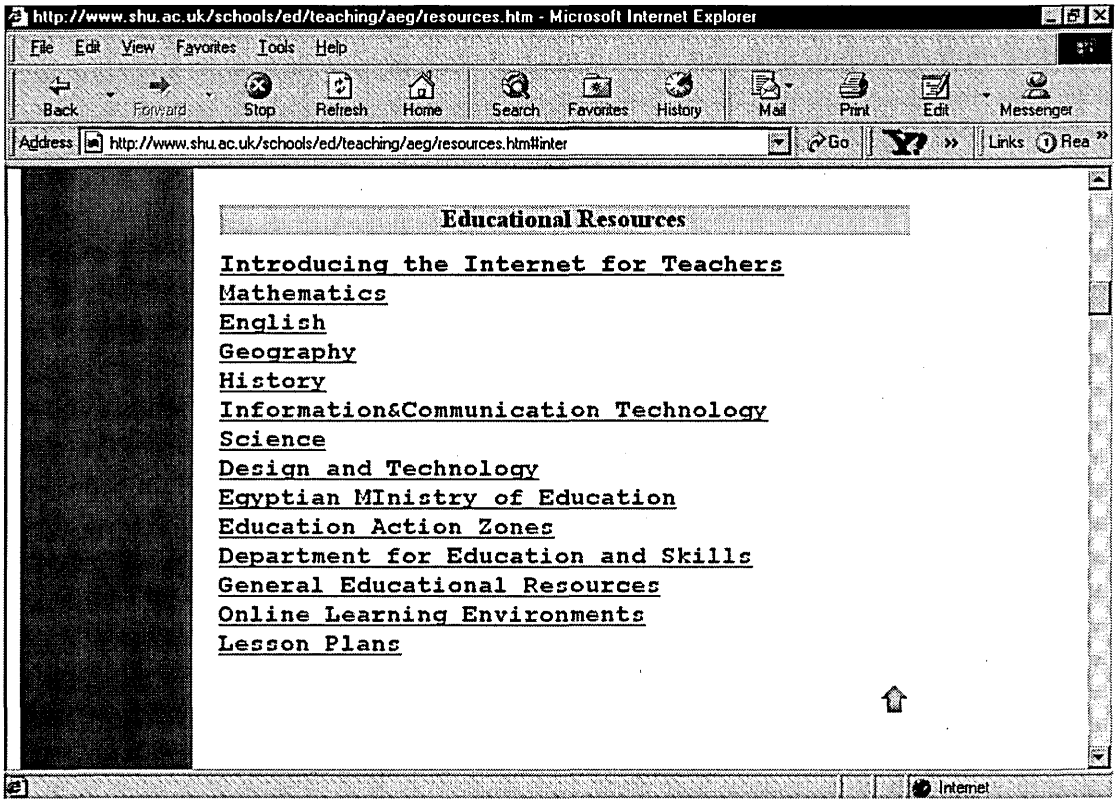
Main resources page:



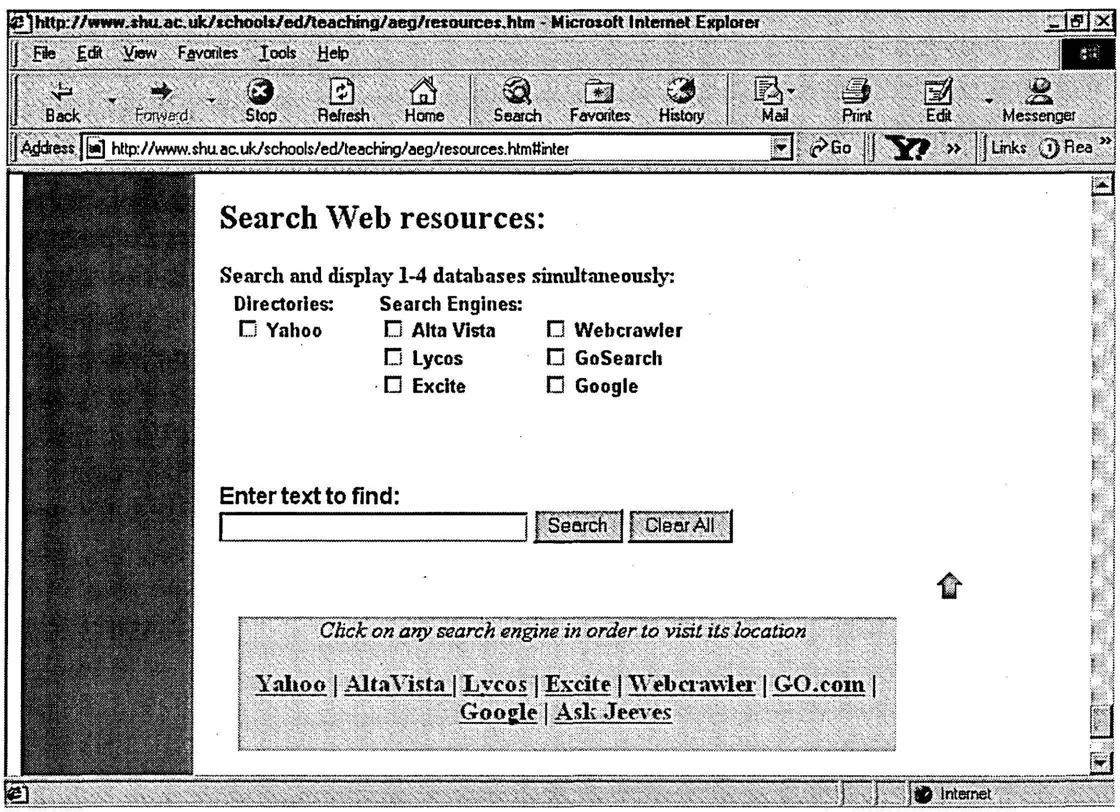
Internet resources page:



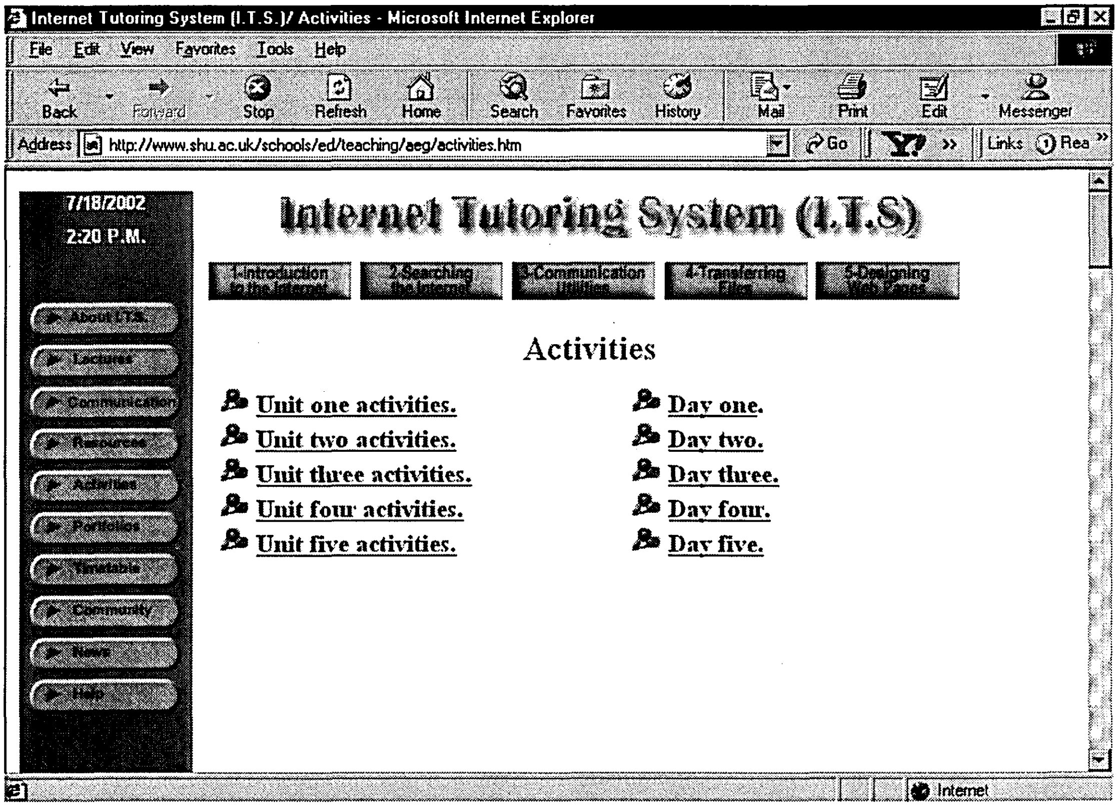
Educational resources page:



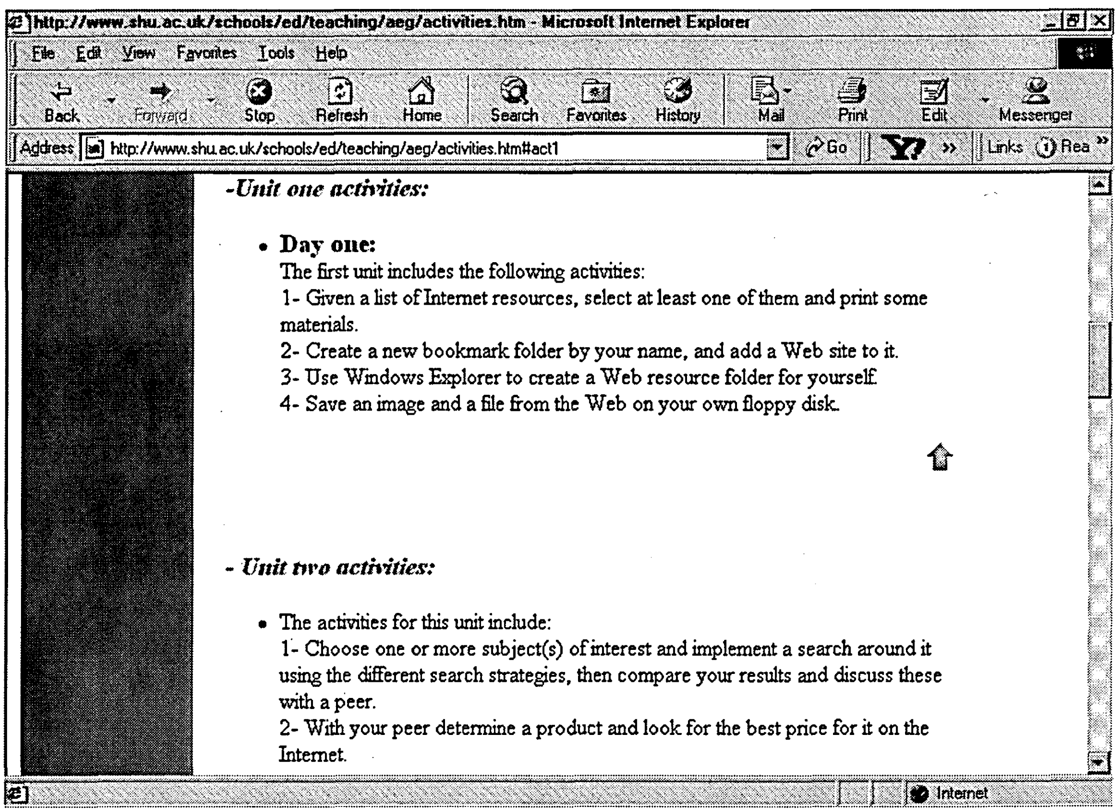
Search Web resources page:



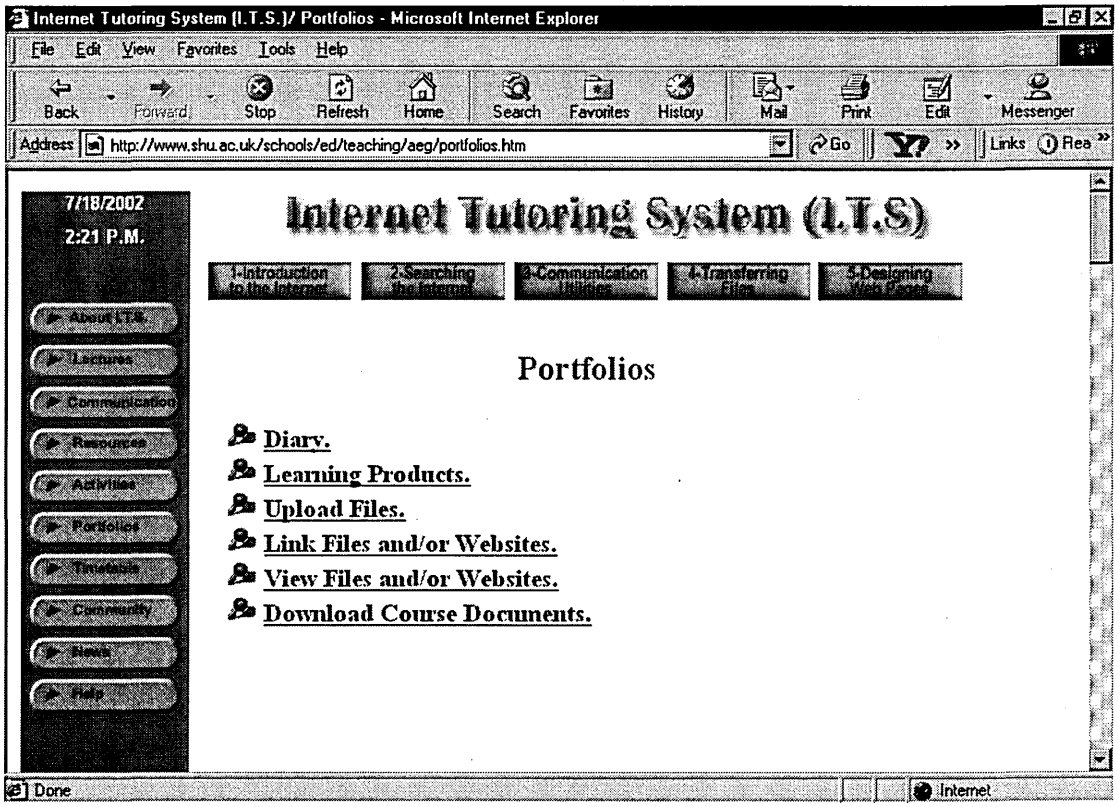
Activities page:



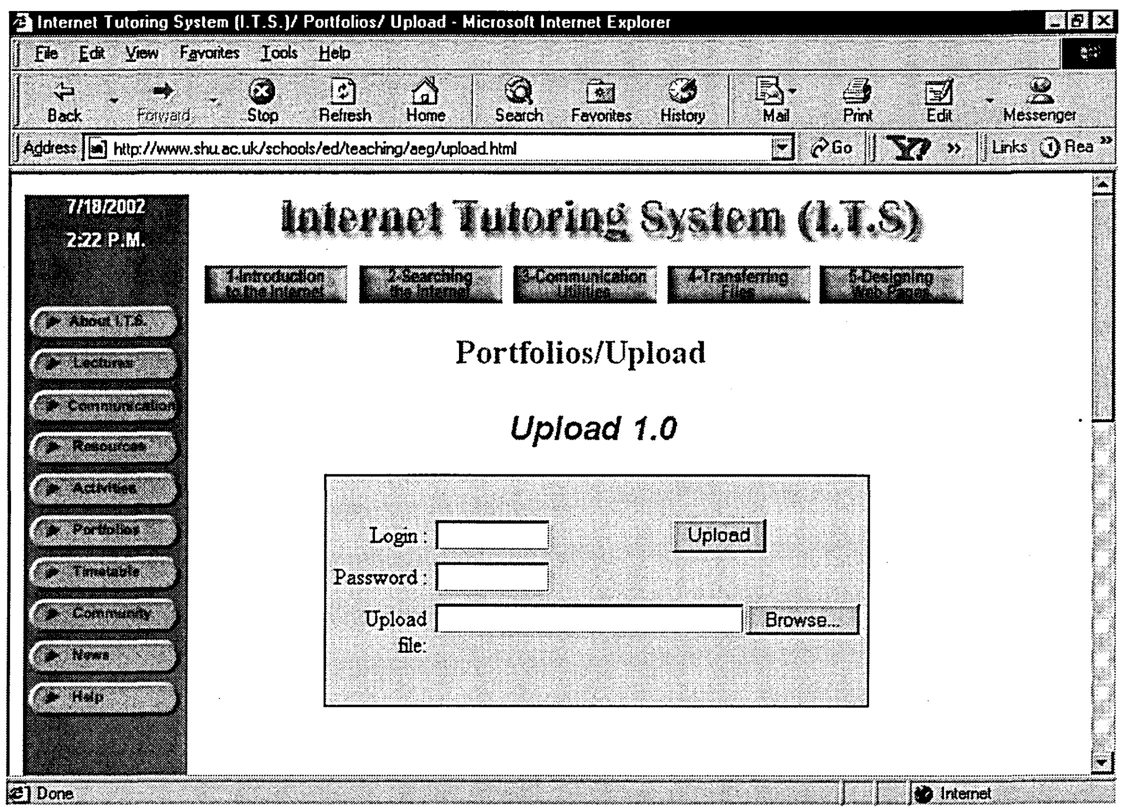
Day one activities page:



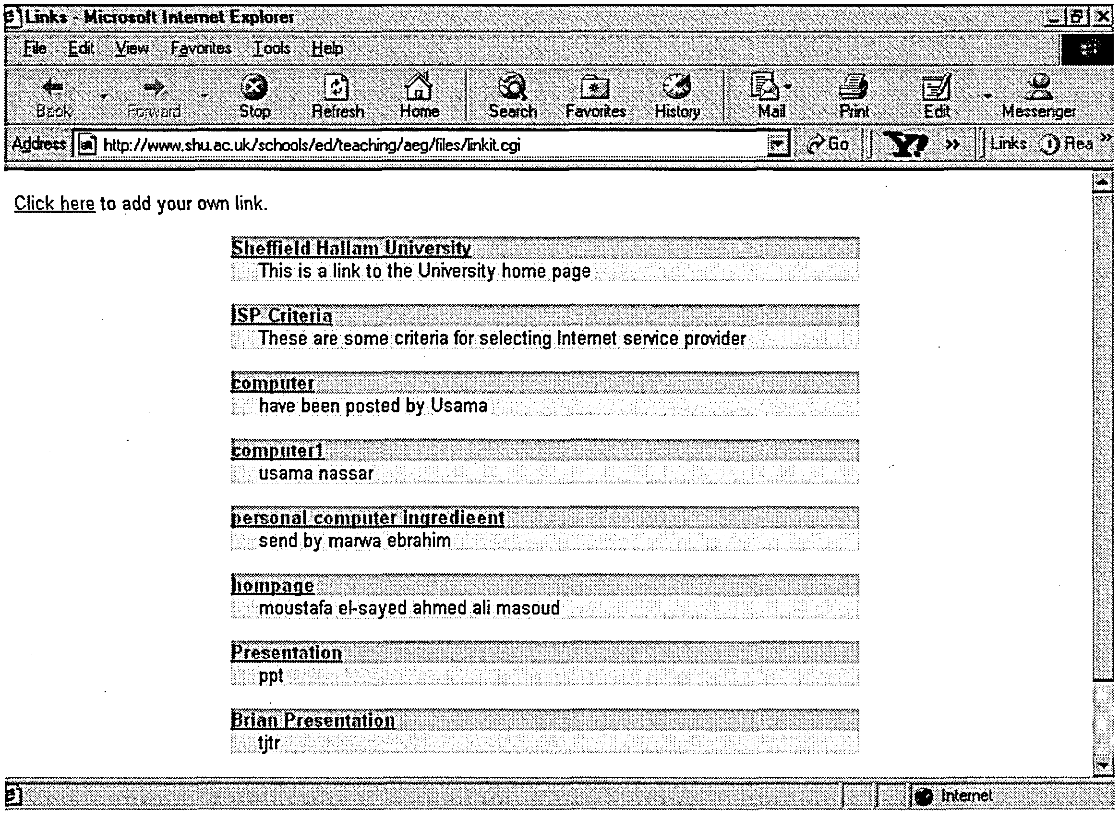
Portfolios page:



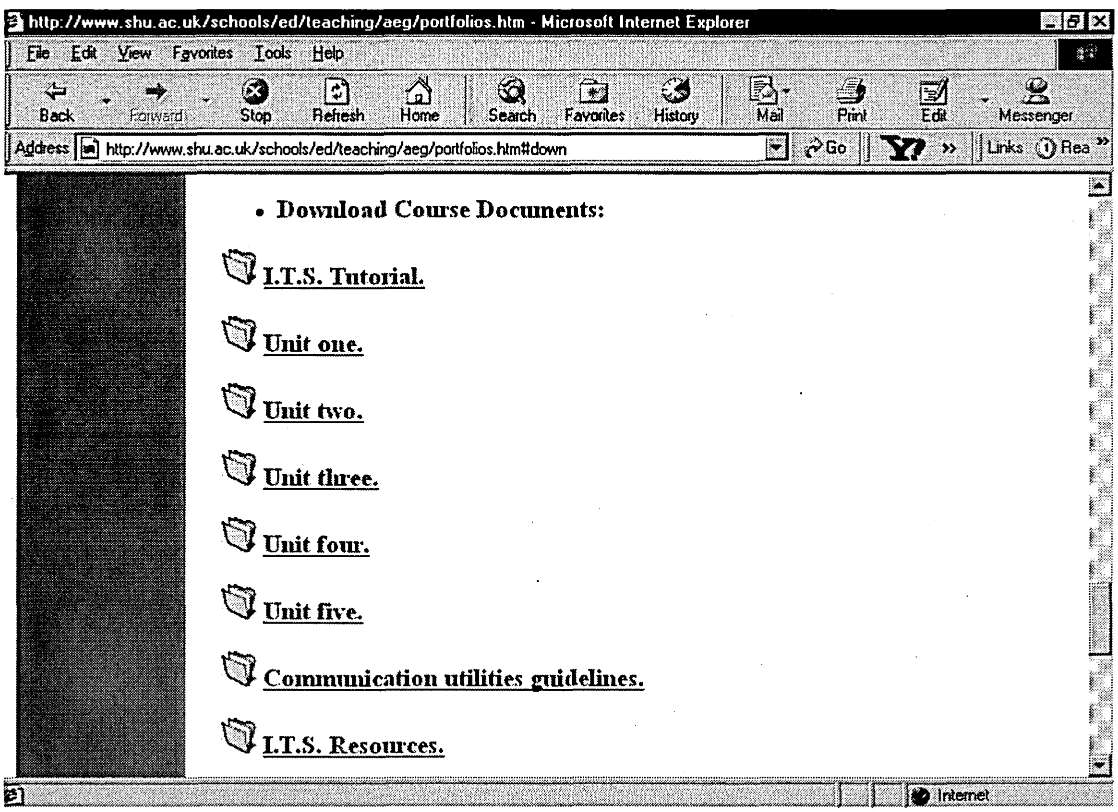
Uploading portfolios page:



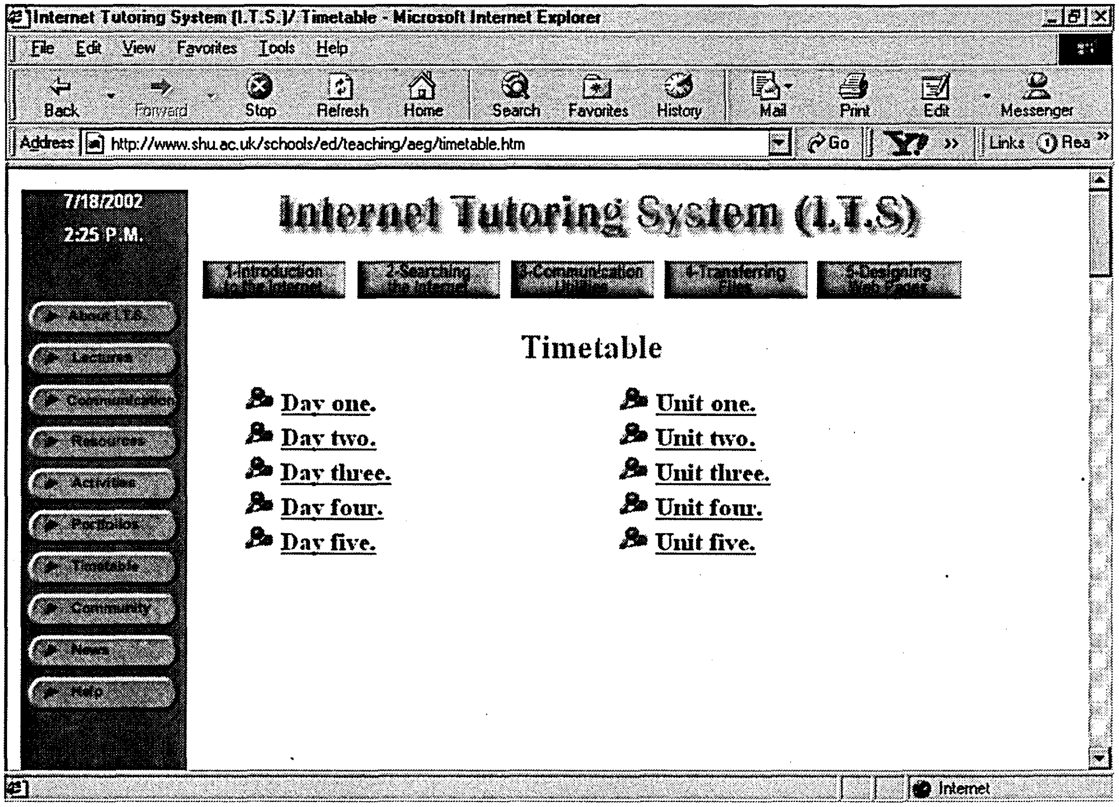
Linking portfolios and Web resources page:



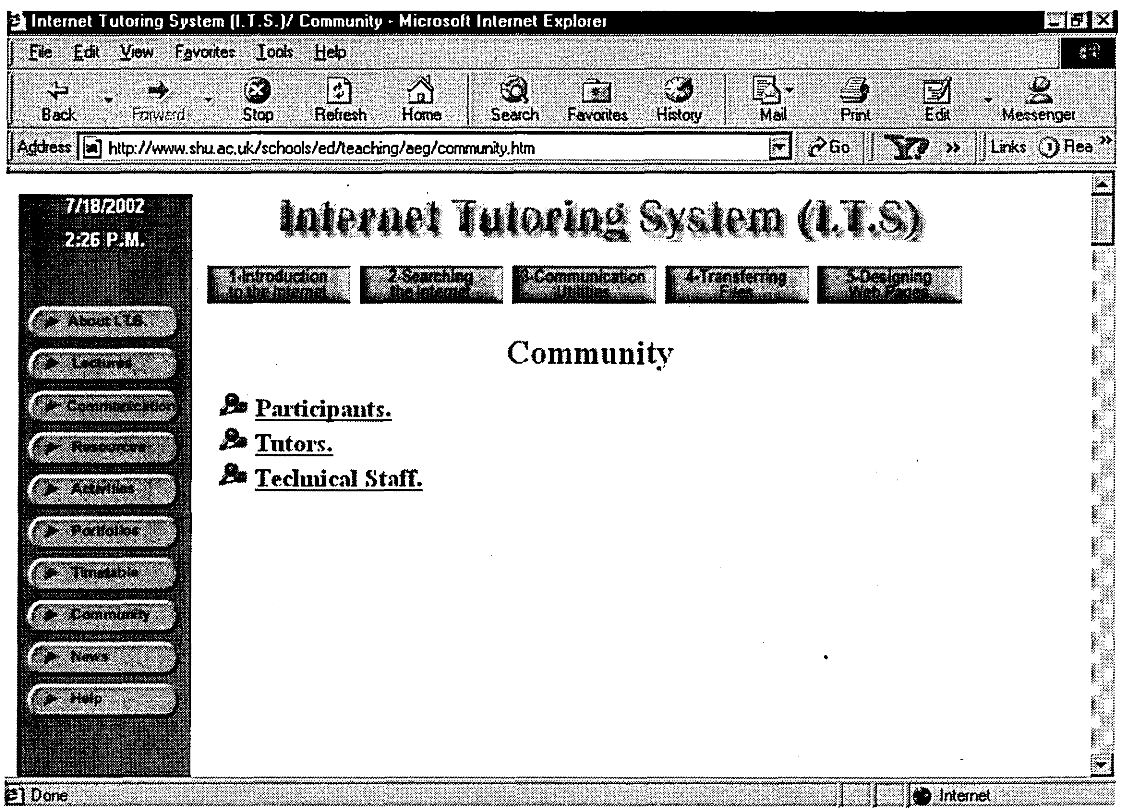
Download course documents page:



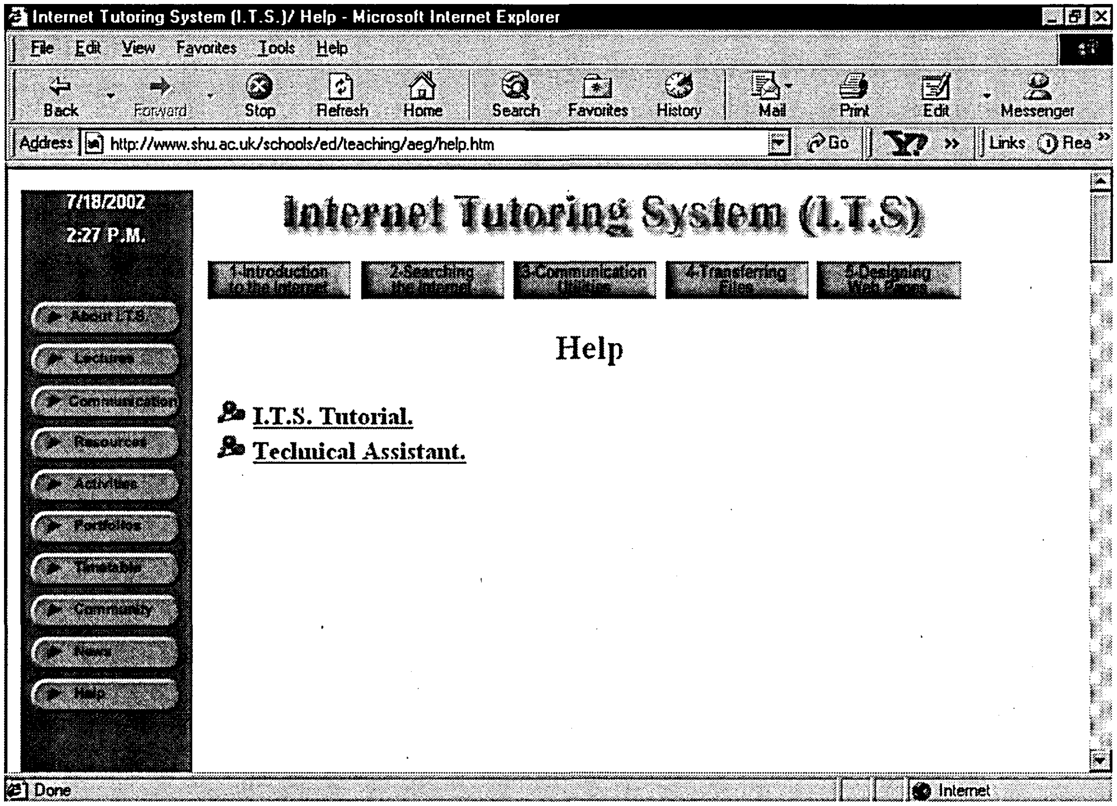
Course timetable page:



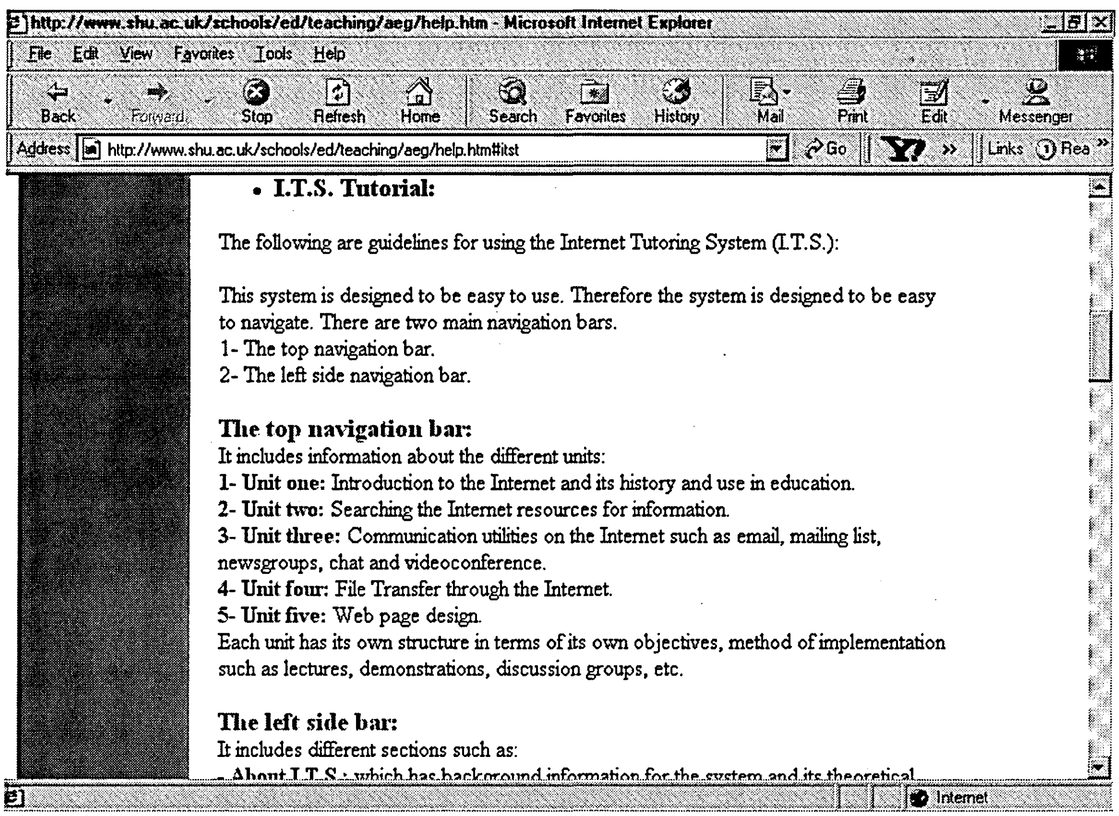
Community page:



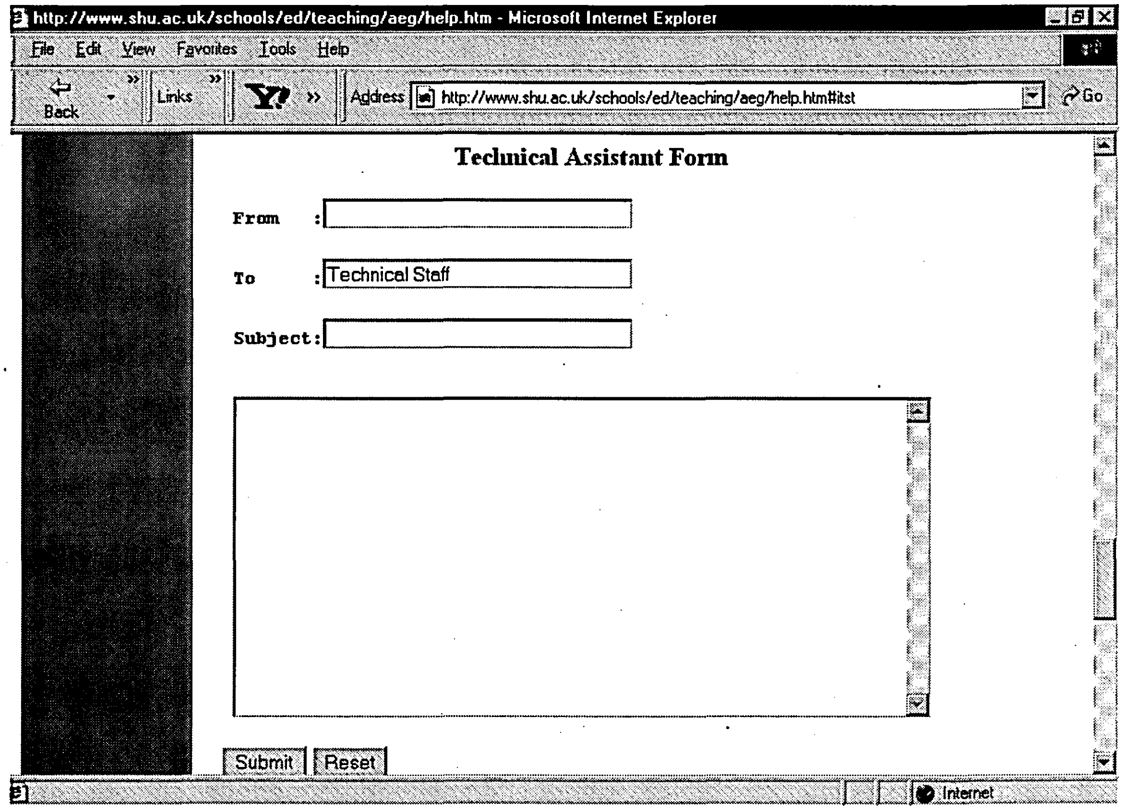
Help page:



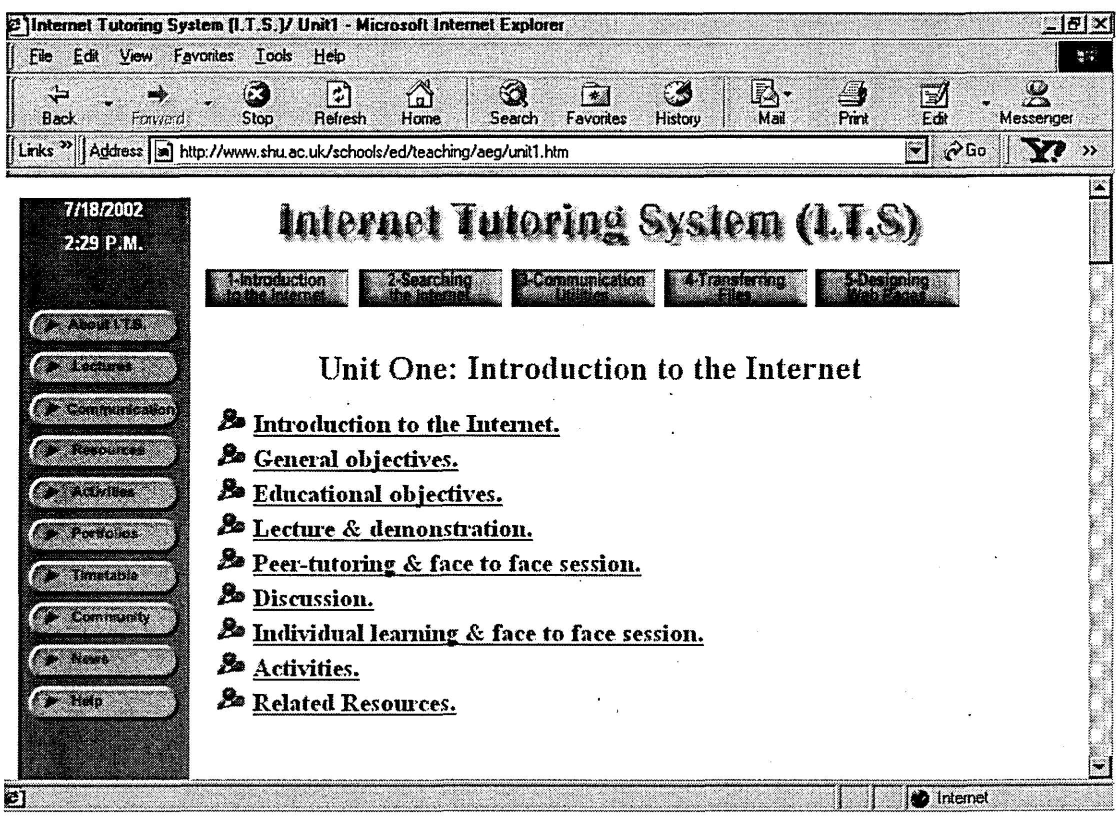
ITS tutorial page:



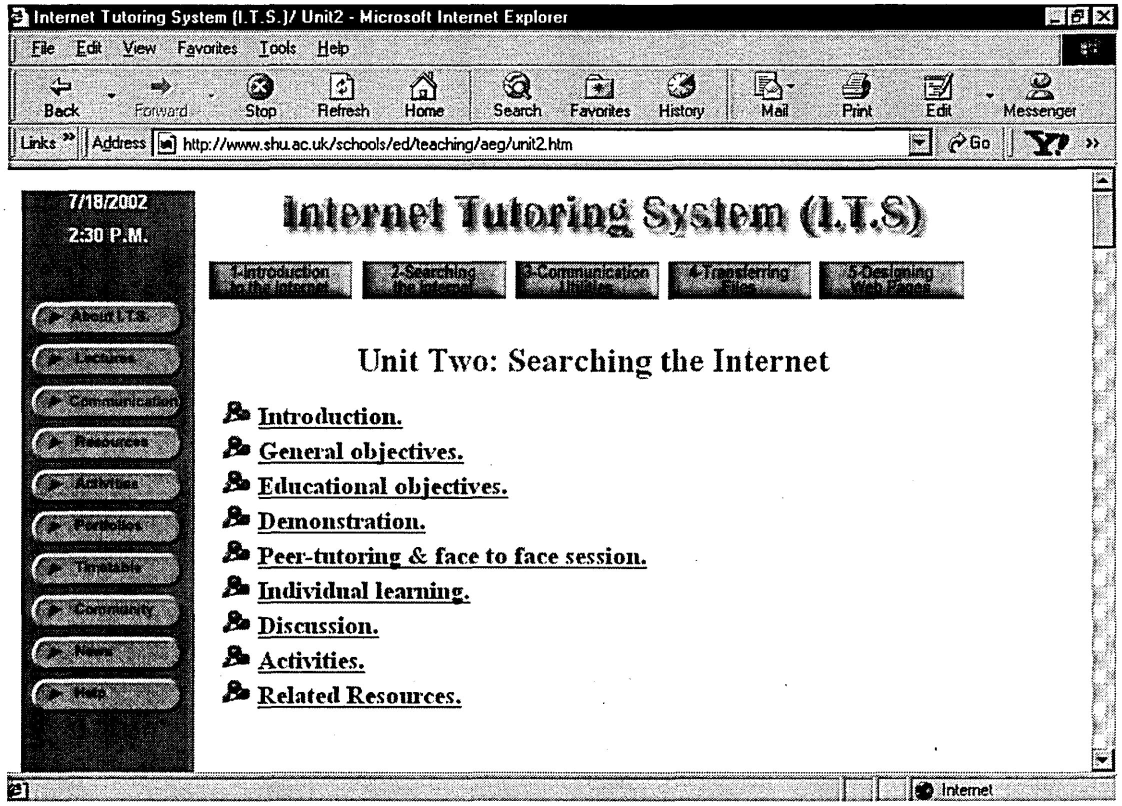
Technical assistant form page:



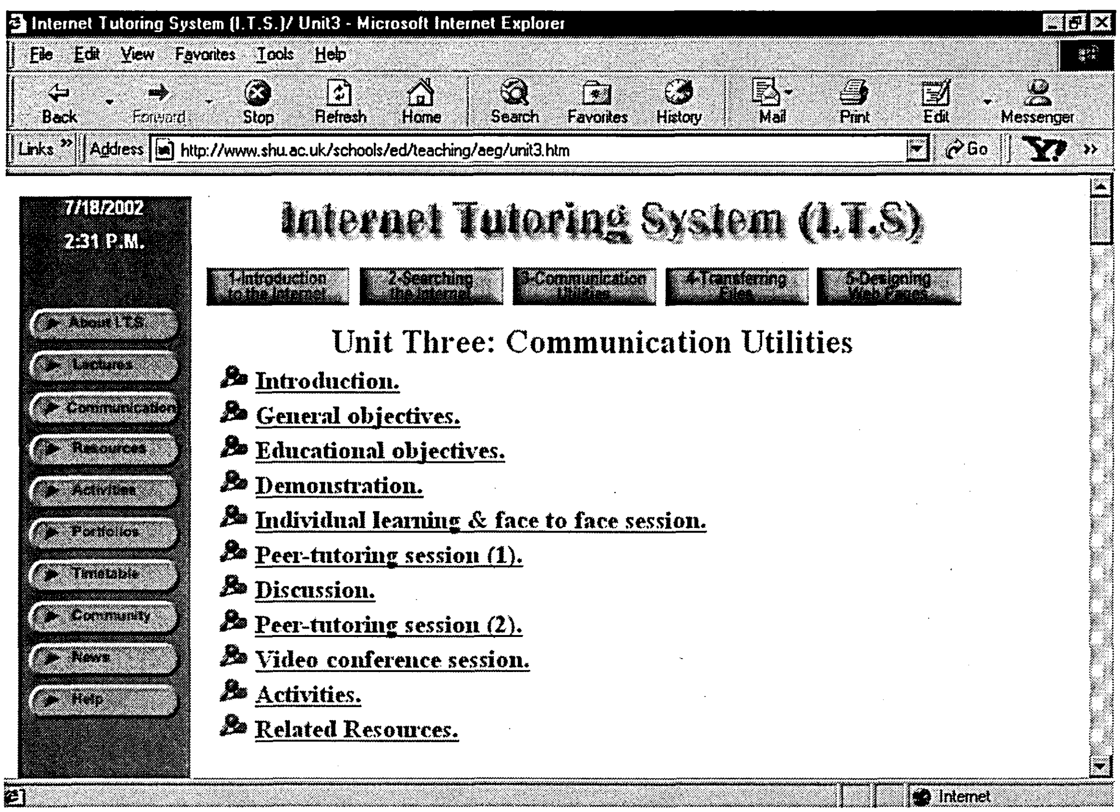
Unit one page:



Unit two page:



Unit three page



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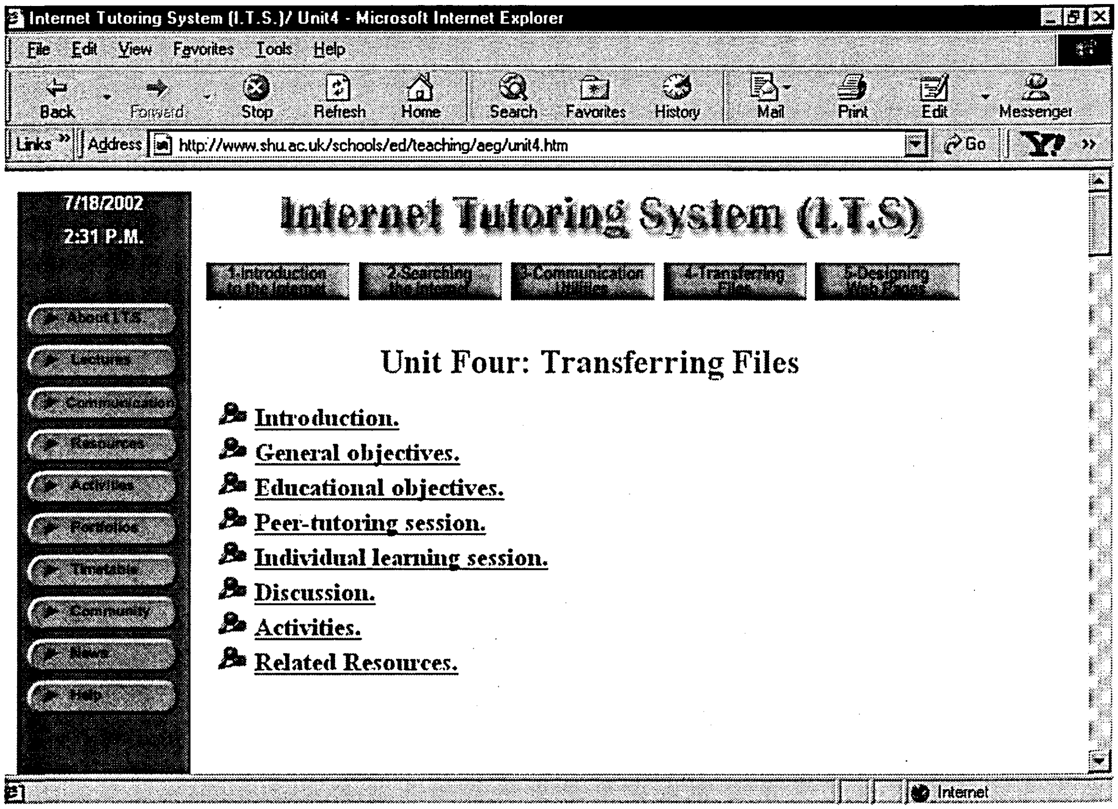
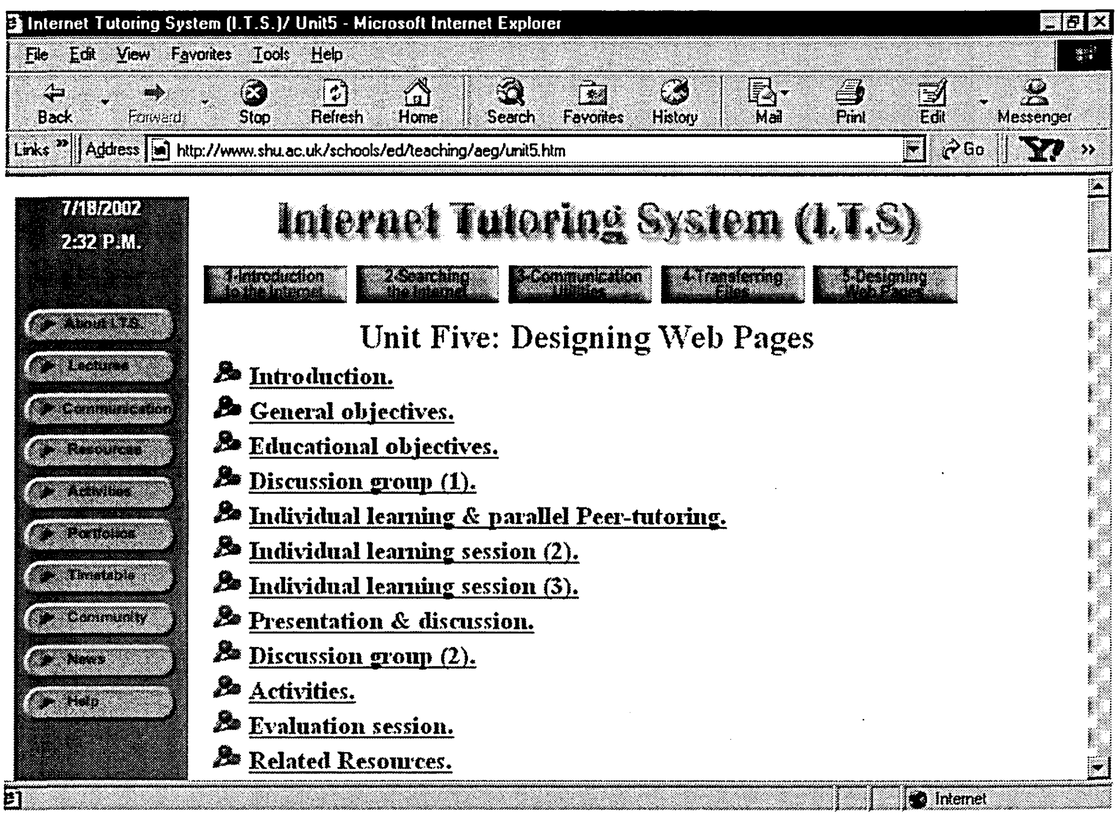


Unit five page:



Appendix (F) Internet Tutoring System materials and resources

(a) Internet Tutoring System Tutorial

ITS Tutorial:

This system is designed to be easy to use. Therefore the system is designed to be easy to navigate. There are two main navigation bars.

1- The top navigation bar.
2- The left side navigation bar.

The top navigation bar:

It includes information about the different units:

1- Unit one: Introduction to the Internet and its history and use in education.
2- Unit two: Searching the Internet resources for information.
3- Unit three: Communication utilities on the Internet such as email, mailing list, newsgroups, chat and videoconference.
4- Unit four: File Transfer through the Internet.
5- Unit five: Web page design.

Each unit has its own structure in terms of its own objectives, method of implementation such as lectures, demonstrations, discussion groups, etc.

The left side bar:

It includes different sections such as:

- **About I.T.S.:** which has background information for the system and its theoretical basis. In addition, it has some information about the development team.
- **Lectures:** which has information about the lectures and demonstration within the course. It has also the materials related to the lectures.
- **Communication:** this section has information and links to use the different communication utilities over the Internet such as email, chat and videoconference.
- **Resources:** it contains all the resources related to the whole system and it is divided into educational resources and Internet resources which is related to the general use of the Internet. It also has a searching facility in order to search a range of search engines over the Internet.

- **Activities:** it includes information about the activities within the course day by day.
- **Portfolios:** it aims to share resources among participants. Therefore, it is designed to enable participants from uploading the relevant files to the system, and linking it. Furthermore, you can download all the course materials in Word format in order to save and/or print them.
- **Timetable:** it has the timetable for the whole course arranged day by day.
- **Community:** It includes information about all course participants "learning community" including tutors, learners and technical support team.
- **News:** it includes updated news for the course. Therefore, try to keep checking it from time to time.
- **Help:** it has this tutorial for the system. Additionally, it has a technical support form, which you can fill it in at the time you face any technical difficulties and then you can submit it.

Additional features:

- **Home title:** at the top of each page you can click on the title to take you to the homepage.
- **Text navigation:** At the bottom of each page, you can find the same top and left side buttons, but in text which you can use it to navigate as well as the buttons.
- **Top arrows:** the arrows to the right take you to the top of the current page as soon as you click on it.

(b) Internet Tutoring System Activities

- **Unit one activities:**

The first unit includes the following activities:

1- Given a list of Internet resources, select at least one of them and print some materials.

2- Create a new bookmark folder by your name, and add a Web site to it.

3- Use Windows Explorer to create a Web resource folder for yourself.

4- Save an image and a file from the Web on your own floppy disk.

- **Unit two activities:**

The activities for this unit include:

1- Choose one or more subject(s) of interest and implement a search around it using the different search strategies, then compare your results and discuss these with a peer.

2- With your peer determine a product and look for the best price for it on the Internet.

3- Search the Internet for educational resources and if you find an interesting Web site, post it to the ITS/Portfolio/Linkit, write your name and the current date and a brief comment about it.

4- *Prepare for the discussion:* Select one useful educational site from your point of view and prepare to present and discuss it (for 5 minutes) with the whole group in the next discussion session. In addition, explore some resources related to Netiquette and citing Internet resources and prepare it for the discussion.

Unit three activities:

1- Use the email in order to exchange your ideas and opinions with your peer about the use of email in education. When you finish, save and print out these emails.

2- Use the chat program in order to discuss with your group the different uses of chatting in education. Make sure to save these discussions and print them out at the end.

3- Find a relevant mailing list and news group and subscribe to them.

4- Plan with your peer an educational project based on using the Internet. Then determine the way(s) to implement it, and write a brief description about its purpose, and its method of implementation. Prepare to make a brief presentation (10 minutes each group including discussion) in the video conference session.

5- Explore the use of the videoconference. Then arrange with the other group to give your presentation. Share your presentations with the other group (s) by using sharing files utility.

Unit four activities:

1- Search FTP search engines and the Web for some relevant materials to your lesson topic such as articles, diagrams, images, audio and video clips and download them.

2- Browse the Internet for lesson plans, view and print them, then discuss them with your peer.

3- Develop a lesson plan based on using the Internet resources.

4- Compress the downloaded files and presentations, and upload them in the Portfolio section.

5- Add links to the files and presentations in order to share them with the whole group. After that, decompress any received files and view them.

Unit five activities:

1- Work individually and/or with your peer in order to develop an individual paper prototype for an educational Web page.

2- Select a Web authoring tool such as Netscape Composer, Dreamweaver, etc. Then, start implementing your educational web page design.

3- Complete and review your web page.

4- Prepare a short presentation in order to discuss your Web page design.

(c) Internet Tutoring System Resources

Connecting to the Internet:

- Office of Information Technology, University of Maryland, URL: http://www.helpdesk.umd.edu/comm/#pc_net

Internet Tutorial:

- Interactive Guide to the Internet, in order to download it visit the URL: (http://www.sierramm.com/)
- Net tutor (Ohio State University, URL: http://gateway.lib.ohio-state.edu/tutor/
- Internet 101, URL: http://www.stimulus.com/education/internet101.html
- Best of the Internet Tutorials, URL: http://www.bgsu.edu/departments/tcom/tutors2.html
- The Complete Internet Guide and Web Tutorial (Microsoft), URL: http://www.microsoft.com/insider/internet/default.htm
- Internet 101, URL: http://www2.famvid.com/i101/
- Learn the net, URL: http://www.learnthenet.com/english/index.html
- Internet tutorial (Life on the Internet), URL: http://www.screen.com/start/guide/default.html

Introduction to the Internet and its history:

- Internet: "The Big Picture", URL: http://navigators.com/internet_architecture.html
- Hobbes' Internet Timeline, URL: http://www.zakon.org/robert/internet/timeline/
- WNet School, Internet Primer, URL: http://www.wnet.org/wnetschool/primer/index.html
- Using the Internet, URL: http://www.scan.org/scanplex/train/usinet/index.htm

Using Netscape:

- Netscape Tutorial, URL: http://w3.aces.uiuc.edu/AIM/2.0/tutorial/index.html
- Another Netscape Tutorial, URL:

http://w3.aces.uiuc.edu/AIM/scale/tutorials/netscape/

Internet Explorer:

- Microsoft Network (MSN), URL:

http://www.microsoft.com/windows/ie/download/ie55.htm

FTP:

- FTP search engine, URL: http://www.file2k.com/
- FTP Find: FTP search engine, URL: http://www.ftpfind.com/
- WsFTP, URL: http://www.wsftp.com/
- WinZip, URL: http://www.winzip.com/

Web Design:

- On ***using Netscape Composer*** click on chapter 6 in:

http://help.netscape.com/products/client/communicator/IntroComm/Introcom.html

- For animated backgrounds visit:

http://www.gjor.com/fs_1ftan.html#line140

- For free backgrounds visit:

http://www.free-backgrounds.com/

- How to build a Web site with free stuff on:

http://www.wdvl.com/Authoring/Design/FreeStuff/

** These are Sheffield Hallam University guidelines for publishing web pages:

http://www.shu.ac.uk/services/cis/help/student_homepages/index.html

Email:

- MSN Hotmail:

http://www.hotmail.com

- Yahoo Mail:

http://mail.yahoo.com

Mailing lists:

- The Teacher's Guide, Teacher Mailrings URL:

http://www.theteachersguide.com/listservs.html

- Teachers Net, URL:

http://www.teachers.net/mailrings/

News Groups:

- Distance Education News Group, to join it, visit URL:

http://members.tripod.com/tammywilson/disted.html

Video conference:

- Microsoft NetMeeting, URL:

http://www.microsoft.com/windows/netmeeting/

Chat:

- MSN Messenger Service, URL:

http://messenger.msn.com/

Glossary:

- Glossary of Internet Terms, URL: http://www.matisse.net/files/glossary.html
- Internet Dictionary, URL: http://www.msg.net/kadow/answers/

Introducing the Internet for Teachers:

- Introduction to the Internet for Teachers, URL:
  http://www.massnetworks.org/~nicoley/tutorial/index.html
- South Smithfield Primary School, URL: http://www.geocities.com/Athens/4610/
- Ed Web Home Room, URL:

http://edweb.gsn.org/resource.cntnts.html

- Teachers Net, URL:

http://www.teachers.net/

Collections of Internet Resources:

- Internet Guides, Tutorials, and Training Information (the Library of Congress):

http://lcweb.loc.gov/global/internet/training.html

- Internet Guidebooks:

http://www.cln.org/guidebooks.html

- Margaret's Tutorials:

http://www.clever.net/cam/cybertut.html

- Net and Web Tutorials:

http://www.cudenver.edu/public/library/reference/netscape.html

Educational Resources:

- BBC Online Education, URL:

http://www.bbc.co.uk/education/home/

- Discovery Channel

http://www.discovery.com/

Math:

- Math lessons: http://www.mathslessons.co.uk/
- Birmingham City Council, Department of Education, Mathematics Resources:

http://atschool.eduweb.co.uk/ufa10/resource.htm#cat1

- Gareth Pitchford's Primary Resources - collection of resources for KS1, KS2 and K-12 teachers with ideas for English, Math, Science and History lessons as well as Art activities and cartoon resources. http://www.primaryresources.co.uk/

English:

- The complete works of Shakespeare at:

http://tech-two.mit.edu/Shakespeare/

- Webster Dictionary:

http://www.m-w.com/netdict.htm

- English as a foreign language magazine on:

http://www.eflweb.com/

- This location contains some links to resources relevant to reading English and communication:

http://www.accesseric.org/

ICT:

- ICT@KJS: http://www.thekjs.essex.sch.uk/yates/

Geography:

- Internet Geography: http://www.internetgeography.co.uk/

History:

- History Learning Site: http://www.historylearningsite.co.uk/
- Modern World History: http://www.bbc.co.uk/education/modern/
- School History: http://www.schoolhistory.co.uk/

Science:

- Science in Action: http://www.bbc.co.uk/sia/

Design and Technology:

- Design and Technology: http://www.richmond.ic24.net/home.htm

EAZs:

- The Standard Site for the Education Action Zones (EAZs), URL: http://www.standards.dfes.gov.uk/eaz/
- Thrybergh Community Learning Partnership, URL: http://www.thrybergh.com/

DEFF:

- Department for Education and Skills Web site (DFEE), URL: http://www.dfes.gov.uk/index.htm

Online learning environments:

- Virtual Learning Environment Inc. (Online University), URL: http://www.vlei.com/instr_tutorial.html
- Learn Space, URL: http://www.lotus.com/home.nsf/welcome/learnspace

Lesson Plans:

Download the lesson Planner from
http://www.roba.co.uk/

- BBC Web Guide: http://www.bbc.co.uk/webguide/servlet/start?pathinfo=education/home_edu.shtml&IN_CAT=EDU_GUIDE

- Eric Virtual Library lesson plans, URL: http://askeric.org/Virtual/Lessons/
- Awesome Library, URL: http://www.awesomelibrary.org/Library/Materials_Search/Lesson_Plans/Lesson_Plans.html

Educational Projects:

- Global school House:

http://www.gsn.org/

- Keypals:

http://www.keypals.com/

- Learning Circles:

http://www.att.com/education/lcguide/p.intro/a.intro.html#Themes

- Webquest:

http://edweb.sdsu.edu/webquest/webquest.html

General:

- Teachers Web: http://www.teachersweb.co.uk/
- In the Staff Room: http://www.inthestaffroom.com/
- Teacher Xpress: http://www.teacherxpress.com/

(d) Criteria for choosing an Internet service provider (ISP)

- **Connection speed:** anyone who is willing to connect to the Internet should consider the connection speed i.e. the speed of transferring information from the Internet. As a general rule the speeder the connection the good the ISP.

- **The reputation and the age of the ISP:** this is also very important because new ISPs usually need six to twelve month to work out any bugs any in the system.

- **Technical support:** anyone should look into the type of technical support provided by the ISP, which varies a lot from one ISP to another.

- **Web pages service:** some ISPs provide users with personal or business Web pages, which are very important for schools to have.

- **Email addresses:** also some ISPs provide users with email addresses and its number varies from ISP to another (McLain, 1998).

(e) Guidelines for using communication tools

In order to use Hotmail, MSN Messenger, and Netmeeting, you will need to do the following:

Hotmail:

1- Go to the following location:

http://www.hotmail.com

2- Sign up for a Hotmail account if you do not have one. Then send this email address to your colleagues.

MSN Messenger (Chatting):

3- Check for the MSN Messenger on your machine, , if you did not find it then download it from:

http://messenger.msn.com/

4- Install the MSN Messenger in your machine.

5- Run the MSN Messenger and sign in using your Hotmail account as a username and your Hotmail password as a password.

6- In order to see and contact your colleagues, add their Hotmail addresses to your contact using "**Add contact**". As soon as you do so you will be able to see them if they were online.

Netmeeting (Videoconference):

7- Check for the Netmeeting on your machine, if you did not find it then download it from:

http://www.microsoft.com/windows/NetMeeting/default.ASP

8- Install the Netmeeting on your machine as well.

9- Run the Netmeeting at the same time, then click on Directory icon or in tools menu. In order to contact your colleagues using the Netmeeting.

10- You should see their names if they were online, just click on the name in order to establish the connection. And then start your meeting.

Appendix (G) Evaluation resources

(a) Training Needs Checklist

Name: ………………………………………………………………………………

Main subject and/or responsibilities: ……………………………………………….

Stage: ………………………………………………………………………………..

School name: …………………………………………………………………………..

1- Have you used a computer before? (Yes / No).

If "Yes", how do you rate your level? (Beginner 1 2 3 4 5 Advanced).

What is the platform that you are using? (IBM - Mac - Other…………..).

2- Have you used the Internet before? (Yes / No).

If "Yes", how do you rate your level? ? (Beginner 1 2 3 4 5 Advanced).

3- Where do you usually use the Internet? (Home - School - Other……………...).

If you have used the Internet in the school before, what sort of things were you using the Internet for?

………………………………………………………………………………………

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4- How did you learn to use the Internet? (From a Friend – Training Course – Books – Other…...……………).

5- What type of browser do you use? (Netscape Navigator – Internet Explorer – Other………………….).

6- Have you used a Web-based learning environment before? (Yes / No).

7- What are your expectations for this course?

…………………………………………………………………………………………

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(b) Course Evaluation Form

- *Please note that the instructions for each group of questions are written in italic.*

Personal details:

For questions 1-6, please fill in your own details:

1- Name: ....

2- Main subject and/or Responsibilities: ....

3- Stage: ....

4- School name: ....

5- Gender: Male Female

6- Age: ....

Course objectives and content:

For questions 7-10, please tick only one answer:

7- The course objectives are clear and relevant. (strongly disagree – disagree – not sure – agree - strongly agree)

8- The content is well-organised. (strongly disagree – disagree – not sure – agree - strongly agree)

9- The course activities are sufficient and clear. (strongly disagree – disagree – not sure – agree - strongly agree)

10- How do you describe the learning resources? (relevant – not sure – irrelevant)

11- Could you please write below any comments and/or suggestions you have for the course objectives and/or content? e.g. add, delete or modify any objectives.

....

....

....

....

....

Learning process:

For questions 12-16, please tick only one answer:

12- The Internet Tutoring System motivates you to learning about the use of the Internet. (strongly disagree – disagree – not sure – agree - strongly agree)

13- Did you feel disoriented "getting lost" during the use of the system. (yes – not sure - no)

If yes, when did you feel disoriented? At the course (beginning – middle – end – all the time). *Please tick as many as appropriate*

14- Did you feel overload because of the amount of information you had? (yes –not sure – no)

15- The course timetable was manageable. (strongly disagree – disagree – not sure – agree - strongly agree)

16- The interaction with your peers enriches your learning experience. (strongly disagree – disagree – not sure – agree - strongly agree)

17- Please writes any learning difficulties that you encountered during the course.

....

....

....

....

....

Teaching methods:

For questions 18-23, please tick only one answer:

18- The lectures and demonstrations guide your learning within the course. (strongly disagree – disagree – not sure – agree - strongly agree)

19- The tutors gave you enough support during the course. (strongly disagree – disagree – not sure – agree - strongly agree)

20- Do you think you need more face to face sessions during the course? (yes –not sure – no)

21- During the course, your peers were cooperative and supportive. (strongly disagree – disagree – not sure – agree - strongly agree)

22- The individual study sessions gave you the opportunity to develop your own skills and knowledge. (strongly disagree – disagree – not sure – agree - strongly agree)

23- The discussions during the course were constructive and valuable. (strongly disagree – disagree – not sure – agree - strongly agree)

The Internet Tutoring System:

For questions 24-27, please tick only one answer:

24- The Internet Tutoring System guides you through your learning process. (strongly disagree – disagree – not sure – agree - strongly agree)

25- Do you agree or disagree with the following characteristics in the I.T.S.:

- Clear user interface. (strongly disagree – disagree – not sure – agree - strongly agree)
- Easy to use. (strongly disagree – disagree – not sure – agree - strongly agree)
- Useful links. (strongly disagree – disagree – not sure – agree - strongly agree)
- Reliable speed. (strongly disagree – disagree – not sure – agree - strongly agree)
- Organised information. (strongly disagree – disagree – not sure – agree - strongly agree)

26- The technical support for the system is sufficient and fast. (strongly disagree – disagree – not sure – agree - strongly agree)

27- Did you have any technical difficulties during the course? (yes – not sure - no)
if yes, can you please summarise them:

....

....

....

....

28- Can you please write any comments and/or suggestions for the future development of the system?

....

....

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....

Learning outcome:

For questions 29-32, please tick only one answer:

29- How do you rate your own progress in the overall course in relation to the course objectives? (Low 1 – 2 - 3 - 4 – 5 High)

30- How do you rate your own progress in the following units:

- Unit one, introduction to the Internet. (Low 1 – 2 - 3 - 4 – 5 High)
- Unit two, searching the Internet. (Low 1 – 2 - 3 - 4 – 5 High)
- Unit three, communication utilities of the Internet. (Low 1 – 2 - 3 - 4 – 5 High)
- Unit four, transferring files using the Internet. (Low 1 – 2 - 3 - 4 – 5 High)
- Unit five, Web pages design. (Low 1 – 2 - 3 - 4 – 5 High)

31- The overall course met your own expectations. (strongly disagree – disagree – not sure – agree - strongly agree)

32- The portfolio helped you to organise and share the learning products. (strongly disagree – disagree – not sure – agree - strongly agree)

33- Please make any comments and/or suggestions for the future development of the overall course:

....

....

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....

Appendix (H) List of codes for the questionnaires

a- Codes for the questionnaire for the objectives of the Internet curriculum:

The following codes were assigned for the questions in the questionnaire for the objectives of the Internet curriculum:

Since all the questions have the same format, they all have the same codes as follows:

Question code 1 = Strongly disagree

Question code 2 = Disagree

Question code 3 = Not sure.

Question code 4 = Agree.

Question code 5 = Strongly agree.

b- Codes for the course evaluation questionnaire:

The following codes were assigned for each group of questions according to the anticipated responses for them:

For question 3 (stage):

Question code 1 = Stage 1

Question code 2 = Stage 2

Question code 3 = Stage 3

Question code 4 = Stage 4

For question 5 (gender):

Question code 1 = Male

Question code 2 = Female

For question 10:

Question code 1 = Irrelevant

Question code 2 = Not sure

Question code 3 = Relevant

For questions 7-9, 12, 15-16, 18-19, 21-26, 31-32:

Question code 1 = Strongly disagree

Question code 2 = Disagree

Question code 3 = Not sure

Question code 4 = Agree

Question code 5 = Strongly agree

For question 13, 14, 27:

Question code 1 = No

Question code 2 = Not sure

Question code 3 = Yes

For question 13.1:

Question code 1 = At the course beginning

Question code 2 = At the course middle

Question code 3 = At the course end

Question code 4 = All the time

For question 29-30.5:

Question code 1 = Very low

Question code 2 = Low

Question code 3 = Average

Question code 4 = High

Question code 5 = Very high

Appendix (I) Observation Sheet

This observation sheet is mainly to observe the learning process for learners i.e. teachers and/or ICT coordinators during the course. This includes observing their behaviours, attitudes and the aspects that they give attention to. It also aims to record the following aspects related to the course:

Course objectives and content:

- The clarity of the course objectives and content to the students at the different stages of the course.
- The clarity of the course activities and the students' implementation of these activities during the sessions.
- The extent to which the students are using the learning and information resources relevant to the course.

Learning process:

- The clarity of the learning environment to the students and it role in the learning process.
- How often do the students get lost during the use of the learning environment?
- The extent to which the students are seeking help from the tutors and from each other during the use of the learning environment.
- The difficulties that the students face while using the learning environment.

Teaching methods:

- The students interaction with the tutor, e.g. are the students ask questions and ideas, respond to questions, seeking help etc.
- The students interaction with each other, e.g. are the students collaborating with each other during the course, are they participate in activities etc.
- The extent to which the students participate in the class discussion and in the online discussion.

The Internet Tutoring System:

- The clarity of the user interface to the students.
- The ease of use.
- The connection speed to the learning environment.
- The facilities for running the learning environment.
- The technical difficulties that the students face during the course.

Learning outcome:

- The overall progress of the students compared to the course objectives.
- The students' commitment and satisfaction to the course.

Appendix J: Associated published papers

Developing a Constructivist Internet Curriculum for Teachers

Paper presented at the ICCE 2001 conference in Seoul, South Korea

Ahmed El-Gamal and Brian Hudson
Pedagogy and New Technologies Research Group,
School of Education, Sheffield Hallam University

Abstract

This paper considers the issues surrounding the development of an Internet curriculum for teachers in Egypt. Firstly the methodology and the procedures for developing the Internet curriculum are addressed. Subsequently consideration is given to the structure of the content in constructivist learning environments and its impact on the structuring of the Internet curriculum. Furthermore the stages for knowledge acquisition in constructivist learning environments are discussed. As a result of the lack of appropriate models of content structures for constructivist learning environments, a model is developed for the structure and the stages of knowledge acquisition for the Internet curriculum.

Keywords: Internet - Internet Education - Constructivist Learning Environment - Teacher Education - Well-structured Content - Semi-structured Content - Ill-structured Content.

1. Introduction

At the present time we are beginning to witness the realisation of the potential of the Internet in teaching and learning in schools by its use in enhancing and enriching the classroom experience (Williams, 1995). However, it has been found that there is a lack of computer knowledge and experience among teachers in developing countries (Al-Mohaissin, 1997). Moreover, Mohaiadin (1997) found that there is also a lack of knowledge and skills in using the Internet, and this could be a consequence of the fact that the use of the Internet has been typically learned through friends rather than through formal curriculum. For example Shezhang (1998) has found that 73% of a group of social studies students learned how to use the Internet from friends.

Therefore this research will focus on developing an Internet curriculum for Egyptian teachers. A constructivist learning environment, based on the Jonassen model (1997a), will be designed in the next phase of this research in order to represent this curriculum. However, the pedagogical and epistemological models developed by Jonassen (1997a), Honebein et al. (1993) and Hannafin & Oliver (1999) have influenced the development of an Internet curriculum in order to be appropriate for representation in a constructivist learning environment. So the research also aims to investigate this impact. An emphasis is given to the different structures of the content in constructivist learning environments and how this influences the structure of the Internet curriculum.

2. Methodology

The methodology adopted in this study is action research (Cohen & Manion, 1994; Elliott, 1991). Accordingly, it aims to solve one of the immediate and pressing day-to-day problems of practitioners (McKernan, 1996), which is the lack of well-developed Internet curriculum for training teachers on the use of the Internet. The content for the constructivist learning environment has been identified by examining the field of study for what practitioners do (Jonassen, 1999). Therefore, the identification of the content and the objectives of the Internet curriculum have been based on the content analysis of the Internet teachers' guides, users' guides and the teachers' training materials in Egypt. Consequently, a list of objectives for the Internet curriculum was developed based on the content analysis results, which was conducted in the light of the procedures outlined by Borg and Gall (1989) and by McKernan (1996).

According to Jonassen (1999), all proposed objectives need to be evaluated for their suitability. Therefore, a Web-based questionnaire was developed in order to reflect the practitioners' experiences on this curriculum. Based on the results of the content analysis and of the questionnaire, the final objectives for this curriculum were divided into two main types: 1- General objectives, which are concerned with the essential knowledge and skills for using the Internet. 2- Educational objectives, which are concerned with the knowledge and skills that are related to different educational uses and projects based on the Internet.

3. The content structure within constructivist learning environments

The focus of any constructivist learning environment, as modeled by Jonassen (1997a) is the question or issue, the case, the problem, or the project that learners attempt to solve or resolve. Another model of learning environment, presented by Hannafin & Oliver (1999), consists of four basic components: enabling contexts, resources, tools, and scaffolds. They describe enabling contexts as the vehicles through which individuals are oriented to a need or problem and through which interpretative perspectives are situated. Enabling contexts guide students in recognising or generating problems to be addressed and in framing learning needs.

3.1. Types of content structure

The content within the constructivist learning environment has been divided by Honebein et al. (1993) into two main types: external context imposed by someone else and internal context generated by the learner. The notion of imposing context has been also used by Hennafin & Oliver (1999). However, they distinguished three main types of contexts, externally imposed contexts, externally induced contexts and individually generated contexts. Yet Jonassen (1997b) has divided the content into two main types: ill-structured content and well-structured content. However, the literature review has shown that most instructional designers are in direct opposition to the aspect of ill-structured content (Merrill, 1991; Stanton & Baber, 1992; Jonassen, 1993). On the other hand, most of the constructivist theorists criticise well-structured content (Spiro et al., 1991; Jonassen, 1997b). Accordingly, this conclusion has lead to the development of what we prefer to call "Semi-structured content".

3.2. Semi-structured content

This structure is developed within this study. It is based on an assumption that there is a gap between well-structured and ill-structured domains. This gap has been found between the extreme views of both constructivists (ill-structured content) and instructional designers (well-structured content). This gap cannot be ignored or skipped. Rather a bridge should be built to gradually enable the learner to transfer from well-structured domains to ill-structured domains. To some extent, this structure corresponds to the second type of context, externally induced context, proposed by Hannafin & Oliver (1999), which introduces the learner to a domain without identifying specific problems to be addressed. Furthermore, the assumption is that not all learning domains can be presented as well-structured or ill-structured, rather they could be a combination of both structures. This structure is also based on the different stages of knowledge acquisition identified by Jonassen (1991), and the levels of understanding described by Biggs (1996). This also aims to enable learners to cope with the next phase of knowledge acquisition (Jonassen, 1991), i.e. to acquire advanced knowledge in order to solve complex-domain or context-dependent problems. At this phase, the learners are more likely to be in the multistructural understanding level (Biggs, 1996), i.e. several aspects of the task are learned but are treated separately (understanding as knowing about). In addition the cognitive process of organising, i.e. mentally organising the information into a coherent mental representation (Mayer, 1999), is seen to be developed better within a semi-structured content in terms of its role as a medium between the other cognitive processes, which are selecting the information (within a well-structured context) and integrating it (within a ill-structured context). Therefore, *the characteristics of semi-structured content* are:

- It has general objectives, rather than specific objectives. These objectives tend to be more implicit to the learner, but explicit to the teacher.
- Both teacher and learner share the control of the learning process.
- The learning process is directed from a distance "remote-directed learning", using a technology-based environment.
- The emphasis is on scaffolding tasks and activities (Hudson, 1998). These scaffolding activities aim to help learners bridge the gap between their actual and potential levels of development in association with their peers and/or tutor interaction (Vygotsky, 1962; Cunningham, 1991).
- The complexity of the context is gradually developing when using this structure.
- Developing peer tutoring and face to face sessions are essential parts and are based on Vygotsky's Zone of Proximal Development.

In a semi-structured content domain, the learners will be likely to start to develop their metacognitive skills in order to be able to direct their own learning content (Honebein et al., 1993). Therefore, the aim is to transfer the control of the learning process gradually from the teacher to the learner by sharing it. Moreover, the teacher should establish what the researchers prefer to call "remote-directed learning", by which the learning process is not fully directed by the teacher or even fully self-directed by the learner, rather it is remotely directed using a technology-based environment.

4. Structure of the Internet curriculum

The structure of an Internet curriculum has been based on all the previous assumptions, structures and stages of knowledge acquisition and is also built to enable cognitive flexibility (Dick, 1991; Spiro et al., 1991).
The objectives for the Internet curriculum have been organised into five main units. A model was developed in order to represent three main structures for the Internet curriculum: 1-Well-structured content, which has specific and detailed objectives for the learning process. 2- Semi-structured content, which has general objectives that guide the learning process. 3- Ill-structured content, which does not have overly prescribed objectives. It was found by Dick (1991) that designs based solely on constructivist principles hardly considered the entry level of students because without this level research shows they will not be able to learn new skills. Designs that are too reliant on constructivist principles tend to overlook the gap between the level of understanding of beginners and the tools and information that they are provided with. It was also found (Spiro, et al., 1991) that the objectives of learning tend to differ for introductory and more advanced learning. When first introducing a subject, teachers are often satisfied if students can demonstrate a superficial awareness of key concepts and facts, as indicated by memory tests that require the student only to reproduce what was taught in roughly the way that it was taught. Thus, in introductory learning, ill-structuredness is not a serious problem: learners are not expected to master complexity or to transfer independently their acquired knowledge to new situations. For all these reasons, it is considered to be appropriate to write the objectives for the first unit in the Internet curriculum in some detail. This unit (Unit One: Introduction to the Internet) aims to provide the learners with the appropriate amount of knowledge and skills in order to start using the Internet. Jonassen (1991) also suggested that introductory knowledge acquisition is better supported by more objectivistic approaches, with a transition to constructivist approaches that represent complexity and ill-structuredness as the learners acquire more knowledge. This results from the fact that learners have not assembled or integrated adequate knowledge structures during introductory knowledge acquisition. This transition can be accomplished by presenting semi-structured domains. Furthermore, this transition (from well-structured to semi-structured) has been made from the first unit to the third unit using the second unit as a connector. A similar transition has been also realised between the third unit and the fifth unit (from semi-structured to ill-structured) using the fourth unit as a connector. Constructivist learning environments seem to be most appropriate for the last stage, advanced knowledge acquisition. It is at that stage that misconceptions are most likely to result from instruction that oversimplifies and pre-packages knowledge (Jonassen, 1991).
At the end of the learning process, experts need very little instructional support and will likely be served by the rich level of instructional support provided by most constructivist environments (Jonassen, 1991). This stage is seen as the advanced level, in which the learner should be able to master the complexity and transfer the knowledge. These two goals become prominent only later (mastery of complexity and transfer), when students reach increasingly more advanced levels of the same subject matter. It is then, when conceptual mastery and flexible knowledge application become paramount goals, that the complexity and diversity characteristics of ill-structured domains become a serious problem for learning and instruction (Spiro, et al., 1991). Therefore, the units are presented into three main levels: introductory, intermediate and advanced level. In introductory learning, learners are not expected to master complexity or independently transfer their acquired knowledge to new situations (Spiro, et al., 1991). Honebein et al. (1993) argued that providing realistic levels of complexity in the learning environment could actually make learning easier. They also argued that the use of a complex stimulus environment applies best to advanced knowledge acquisition in ill-structured domains. Within these three levels, *three types of control* are likely to develop: firstly, *teacher control* develops at the introductory level, then *teacher-learner control* at the intermediate level and finally *learner control* at the advanced level.

5. Conclusion

To conclude, it has been found that there is a lack of studies about the development of curricula appropriate for constructivist learning environments. This could be the result of the extreme constructivist assumption that the content cannot be prespecified (Jonassen, 1997a; Honebein et al., 1993). However, a few studies have considered the content structure for constructivist learning environments e.g. (Hannafin & Oliver, 1999 and Jonassen, 1997b). Therefore, there is a need for structuring content and developing a curriculum that is appropriate for constructivist learning environments, especially if the learners do not possess prerequisite knowledge and skills (Spiro, et al., 1991; Dick, 1991). In this study, a model has been developed for structuring our Internet curriculum as well-structured, semi-structured and ill-structured contents. This model is considered to be appropriate for many subjects, especially if they are flexible and changeable like the Internet. This flexibility should not have a major influence on this structure because the semi-structured content and the ill-structured content are also flexible, and they give the learners the space and the opportunity to select and construct knowledge according to their cognitive preferences.

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Multiple Roles of the Teacher in Web-Based Learning Environments

Ahmed El-Gamal, Sheffield Hallam University

Abstract

This paper addresses the development and implementation of an Internet curriculum in a Web-Based Learning Environment. It outlines the development process of the content structure for the Internet curriculum and its impact on the levels of control over the learning process. This research was conducted with a group of pre-service teachers in the Faculty of Specific Education in Egypt who are intending to become Educational Technology specialists.

The main aim of this paper is to highlight the different roles of the teacher within a Web-based learning environment in relation to the content structure and the control over the learning process. It also argues that teachers should play multiple roles within Web-Based learning environments rather than a single role in order to accommodate the different learning styles of the learners.

Introduction

In the early sixties, teachers started to use non-traditional media such as television and radio programmes, and they used to call these at that time "teaching aids", because they were intended to aid them in teaching. Recently, Internet learning has become a growing trend in the educational system. Accordingly, Perrin and Mayhew (2000) state that for some students, taking an on-line course is merely a way to supplement their traditional on campus learning experience, while for others it is a welcomed alternative to the classroom setting. Moreover, they refer to electronic learning as it brings education to the living room where everyone in the family can participate, rather than keeping it in the classroom where only students and their peers can take part. Therefore, the teachers' vision of the Internet can be different from the old one as a "teaching aid", not only because of its different nature but also because of its tremendous range of tools and resources e.g. synchronous and asynchronous discussion, email, search tools, Web design, uploading and downloading files etc. For that reason, teaching and learning using the Web is becoming a challenge for both the teacher and the learner. Fetherston (2001) highlight some pedagogical challenges for teachers who are using the Web. The most important challenge from his point of view came from the various media that can be used by the Web and the many kinds of possible interactions. Hence, the challenge, which is faced by teachers themselves, is to find good pedagogical practices that will build on the inherently engaging nature of the Web and to produce engagement that will lead to good learning.

Furthermore, teaching via the Web could be seen as time consuming and requiring more effort from the teacher rather than the traditional methods. For example, the teacher "in most cases" spends more time online to mentor the students and to moderate the online discussion. Moreover, the teacher needs to be aware of many technical aspects that he/she can solve by his/herself. In addition, the teacher needs to keep up-to-date with any changes to the system and/or the learning environment e.g. new interface design, new versions with more features etc. The teacher may also face some technical difficulties e.g. the system is down, the connection is very slow etc.

The biggest challenge from my point of view is drawn upon the structure of the content for the learning environment. For example, the teacher might use a set of pedagogical approaches that could be beneficial with a particular subject, while they are not the same with a different subject.

This research aims to develop, implement and evaluate an Internet curriculum for teachers in order to enable them to use the Internet in their own subjects. Therefore, an Internet curriculum was developed in the light of the available Internet teaching guides and materials. Then, a Web-Based learning environment called "Internet Tutoring System ITS" was developed in order to facilitate the teaching and learning of this curriculum. Subsequently, the whole course was tested with a group of 18 pre-service teachers in the Faculty of Specific Education in Menofia University, Egypt. They represent three different stages: stage two, three and four (note that stage one was not selected because they do not possess prerequisite knowledge and skills on using PCs). Their major field of study is instructional technology, therefore there is an emphasis on the study of new technologies in education. This range of stages was selected in order to investigate the impact of the course structure on them.

This paper also highlights the different roles of the teacher within the Web-based learning environment in relation to the different content structures and the control over the learning process. Therefore, in the following sections, a discussion of the different content structures for the Internet curriculum is presented. Moreover, the different types of control over the learning process, that are likely to emerge within the learning process, and the relation to the content structure are addressed. Based on this relation, the notion of the "multiple roles" of the teacher within the Web-based learning environment will be presented.

The content structure of the Internet curriculum

The structure of the Internet curriculum has been based on constructivist assumptions, structures and stages of knowledge acquisition as outlined by Jonassen (1993, 1997), Honebein et al. (1993) and Hannafin & Oliver (1999). Moreover, it is built to enable cognitive flexibility which results from learning knowledge in a variety of contexts (Dick, 1991 and Spiro et. al., 1991).

The structure of the curriculum was developed in a systematic way that starts with simple objectives and gradually develops to more complex and advanced objectives (El-Gamal & Hudson, 2001). The objectives for the Internet curriculum have been organised into five main units (see table 1).

Table 1. The main units of the Internet curriculum and the number of objectives in each unit.

The Internet curriculum units	General Objectives	Educational Objectives	Total
1- Unit one: Introduction to the Internet.	12	3	15
2- Unit two: Searching the Internet for information.	9	3	12
3- Unit three: Internet communication utilities.	6	5	11
4- Unit four: Transferring files from the Internet.	5	3	8
5- Unit five: Designing web pages.	3	2	5

As shown in table 1, the number of objectives gradually decrease from one unit to the next, the more the learner advances in the learning process the less the specification of content. The structure of these units can also be demonstrated as three connected circles, each one leads to the other and they have common objectives, and the structure is developed according to the development of the learners' understanding (see figure 1).

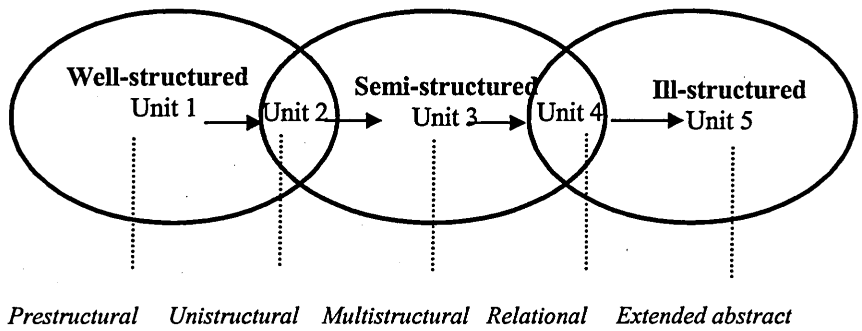

Figure 1. The relationship between the content structure and the learners' understanding.

Within this structure, the first unit (Introduction to the Internet) is represented as well-structured because it contains the basic skills and knowledge for using the Internet. According to Biggs (1996), the learners are more likely to demonstrate prestructural understanding during the first unit, as they are just being introduced to the Internet.
The second unit (Searching the Internet for information) aims to develop the skills for selecting and exploring the information at the same time. Therefore it has a common position between well-structured and semi-structured content. In this unit, the learners are more likely to demonstrate unistructural understanding, because it is supposed at this stage that they will understand only a few aspects concerning the Internet.
The third unit (Internet communication utilities) is represented in a semi-structured content, because it is based on communication utilities on the Internet. Therefore, peer tutoring can be used in order to develop communication skills between the learners. In this unit the learners are more likely to demonstrate the multistructural understanding, because they will have experienced several aspects of the Internet individually, but each of these aspects is likely to be learned relatively independently of each other.
The fourth unit (Transferring files from the Internet) includes the first two cognitive skills (selecting and organising the information) and then it prepares the learners for the third process which is to integrate this information from the Internet. Therefore this unit has a common position between the semi-structured and ill-structured content. Within this unit, the learners are more likely to demonstrate relational understanding, in which they will be likely to establish relations between the different Internet aspects and of course their relation to their field or subject area.
The fifth unit (Designing web pages) is considered to be the most advanced unit in this curriculum, in which the learner integrates all the knowledge that he/she has acquired. Therefore, this unit has an ill-structured content and the learner has the control in this unit. In this unit, the learners are more likely to demonstrate the extended abstract level of understanding, because at this time, they should be able to reflect on their experiences in the process of designing a web page.

A suggested model for the structure and the stages of knowledge acquisition for the Internet curriculum

The model, shown in figure 2, represents three main structures for the Internet curriculum:

1- *Well-structured content*, which has a specific and detailed objectives for the learning process.
2- *Semi-structured content*, which has general objectives that guide the learning process.
3- *Ill-structured content*, which does not have overly prescribed objectives.

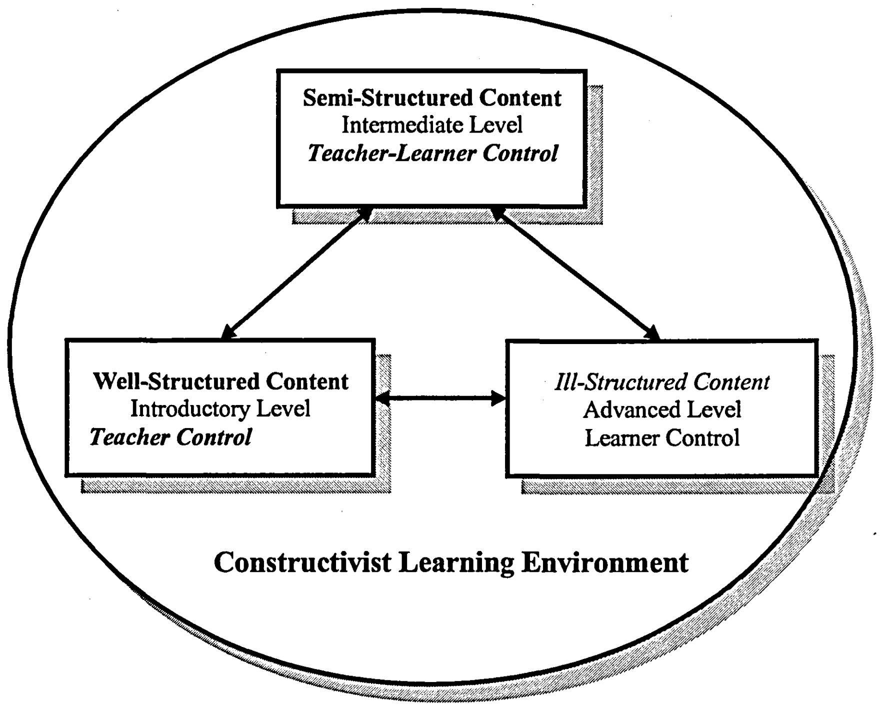

Figure 2. Model for the structure and the stages of knowledge acquisition for the Internet curriculum.

It is found by Dick (1991) that designs based solely on constructivist principles hardly considered the entry level of students because without this level, research shows they will not be able to learn new skills. Designs that are too reliant on constructivist principles tend to overlook the gap between the level of understanding of beginners and the tools and information that they are provided with.

It is also found (Spiro, et. al., 1991) that the objectives of learning tend to differ for introductory and more advanced learning. When first introducing a subject, teachers are often satisfied if students can demonstrate a superficial awareness of key concepts and facts, as indicated by memory tests that require the student only to reproduce what was taught in roughly the way that it was taught. Thus, in introductory learning, ill-structuredness is not a serious problem. Learners are not expected to master complexity or independently transfer their acquired knowledge to new situations.

For all these reasons, it is considered to be appropriate to write the objectives for the first unit in the Internet curriculum in some detail. This unit (Unit One: Introduction to the Internet) aims to provide the learners with the appropriate amount of knowledge and skills in order to start using the Internet. Jonassen (1991) also suggests that introductory knowledge acquisition is better supported by more objectivistic approaches, with a transition to constructivistic approaches that represent complexity and ill-structuredness as the learners acquire more knowledge. This is as a result of the fact that learners have not assembled or integrated adequate knowledge structures during introductory knowledge acquisition. This transition can be accomplished by presenting semi-structured domains. Furthermore, this transition has been made from the first unit to the third unit (from well-structured to semi-structured) using the second unit as a connector. It has been also realised between the third unit and the fifth unit (from semi-structured to ill-structured) using the fourth unit as a connector. Constructivist learning environments seem to be the most appropriate for the third stage, advanced knowledge acquisition. It is at this stage that misconceptions are most likely to result from instruction that oversimplifies and pre-packages knowledge (Jonassen, 1991).

At the end of the learning process, experts need very little instructional support and are likely to be served by the rich level of instructional support provided by most constructivist environments (Jonassen, ibid.). This stage is seen as the advanced level, in which the learner will able to master the complexity and transfer the knowledge. These two goals become prominent only later (mastery of complexity and transfer), when students reach increasingly more advanced levels of the same subject matter. It is then, when conceptual mastery and flexible knowledge application become paramount goals, that the complexity and diversity characteristic of ill-structured domains become a serious problem for learning and instruction (Spiro, et. al., 1991). These three types of content are presented in three main levels of knowledge acquisition: *introductory level, intermediate level and advanced level.* In introductory learning, learners are not expected to master complexity or independently transfer their acquired knowledge to new situations (Spiro, et. al., 1991). Honebein & et al. (1993) argue that providing realistic levels of complexity in the learning environment could actually make learning easier. They also argued that the use of the complex stimulus environment applies best to advanced knowledge acquisition in ill-structured domains. Furthermore, within these three types of content structures, three types of control are likely to develop (see figure 3).

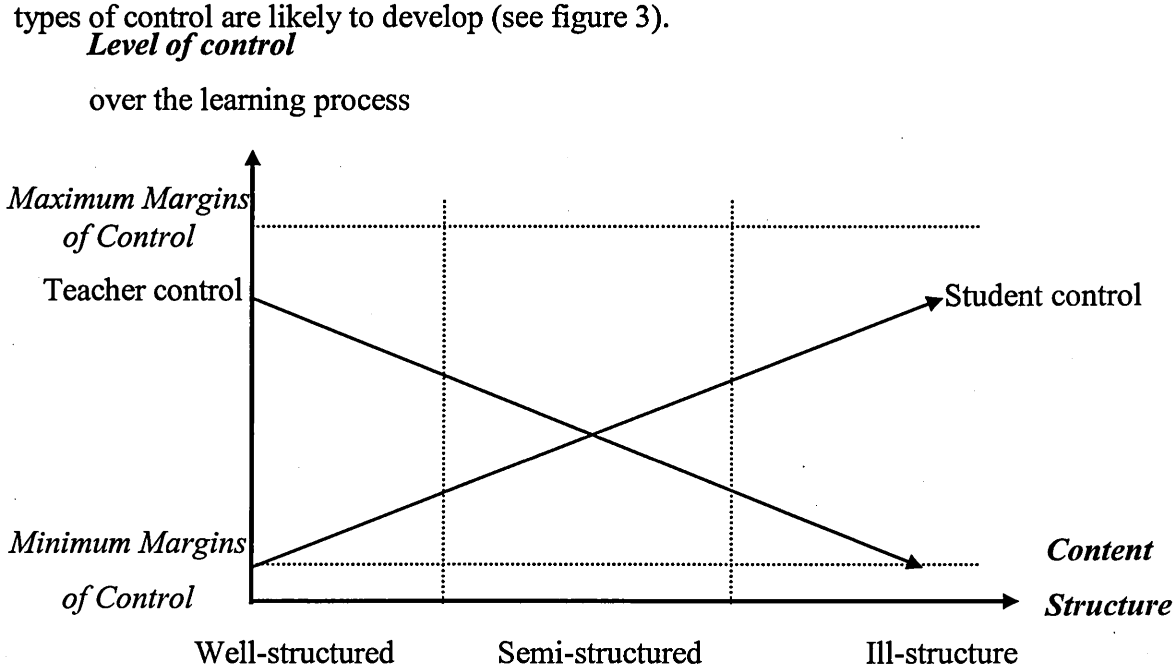

Figure 3. The relationship between the content structure and the level of control over the learning process.

Firstly, teacher control develops at the introductory level, where the learner does not have prerequisite knowledge and skills. In this level the teacher is likely to present well-structured content in order to enable the learner to become oriented with the learning environment. Secondly, in "teacher-learner control" both the teacher and learner are sharing the control over the learning process and at this stage the teacher is more likely to become a "mature partner" to the student. Finally, learner control develops gradually as the learner gains advanced knowledge and skills and becomes more familiar with the learning environment and the content. Moreover, both teacher and student have minimum and maximum margins of control over the learning process, i.e. none of them can fully control the learning process, and none of them can totally lose control over the learning process. Therefore, this relation is seen to be very complex especially in the light of the relations between the teacher, the student and the content which is also seen to be very complex in the Didaktik triangle. This triangle is a key tool for the analysis of the complex relations between teacher, student and content in the teaching/studying/learning process (see figure 4).

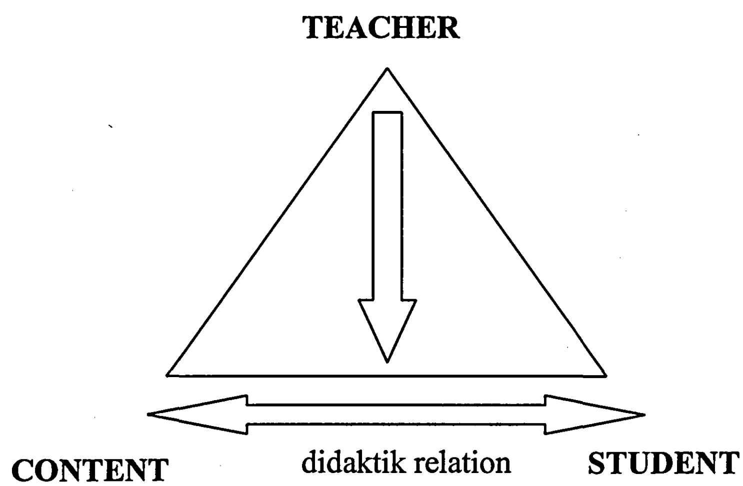

Figure 4. Shows the Didaktik relations in the Didaktik triangle.

The Didaktik tradition provides a framework which places the teacher at the heart of the teaching/studying/learning process. Furthermore, it provides a framework for teachers' thinking about the most basic how, what and why questions around their work. This follows from the emphasis that is placed upon Didaktik analysis and from the relative professional autonomy of the teacher within this tradition (Hudson, 2002).

The didaktik relation between the student, teacher and subject matter within the learning environment is seen to be influencing the role of the teacher in terms of adapting and/or adopting teaching strategies that accommodate both the learners' learning styles and the content structure. For example, a teacher in a mathematics classroom may be focusing on using a problem solving approach, while a teacher in a philosophy classroom may be focusing on a group discussion approach. It is the same situation with students, e.g. a particular teaching approach can be effective with a particular group of students, while the same approach may not be effective with a different group of students.

Web-based learning environment outline

The pedagogical and epistemological models developed by Jonassen (1997a), Honebein et al. (1993) and Hannafin & Oliver (1999) have influenced both the development of the Internet curriculum and the design of the learning environment. The main purpose of this course is to make all the participants active and to promote their own learning by maximising the use of a wide range of tools and resources on the Internet. Additionally, it aims to use a set of teaching approaches in order to accommodate the different learning styles of the students. Relevant to this is what Clay (1999) suggests which is to include opportunities for at least four types of the following training in a Web-based training programme:

- group sessions;
- one-on-one lab sessions;
- web-based tutorials;
- printed materials;
- list-serves;
- mentorships;
- monthly discussion sessions among peers;
- observation of other distance courses.

He also suggested that effective training programs must be designed to meet the needs of persons with a variety of learning styles. While many instructors will learn well from group training sessions, others will do better with self-paced printed materials.
Therefore, the Web-based learning environment (see figure 5) for this course included the following elements:

1- The consideration of learners' prerequisite knowledge and needs.
2- The designing of flexible content structure (well – semi – ill).
3- Effective course and content organisation.
4- Seminars and demonstrations.
5- Peer support, through discussion and hands-on-sessions.
6- Individual learning sessions.
7- Synchronous discussions (using videoconferencing, and instant messages).
8- Asynchronous discussions (using email, and discussion board).
9- Learning materials and information resources (including Web resources, course documents, subject-based resources, and general-purpose resources).
10- Authentic activities based on the notion of an "active leaner".
11- Multiple products rather than single product (through the use of digital portfolios in order to maintain records of the students' learning products).
12- Learning community (the notion of building a community of learners, teachers and technical support team).
13- Technical assistance is also a crucial element in the learning environment (by using program help and sending technical enquiries).

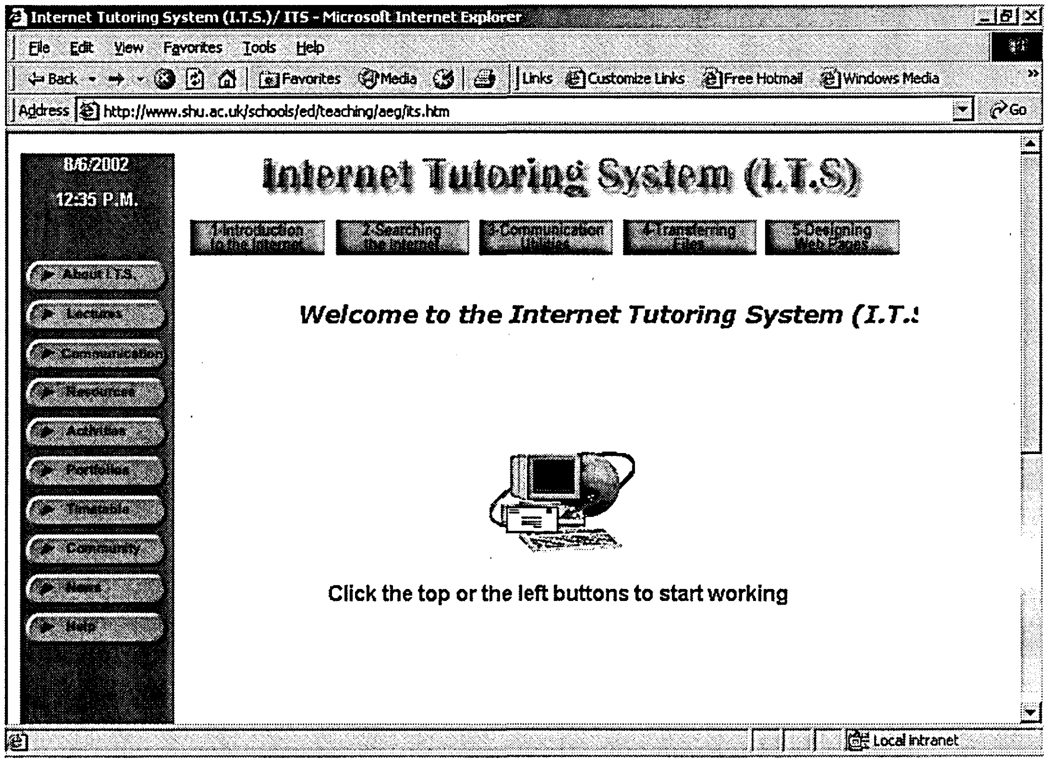

Figure 5. The main Web-based learning environment elements.

Teacher's roles within Web-based learning environments

Based on the constructivistic assumptions for learning environments identified by Jonassen (1993), he presents the following methods for supporting learning in constructivist learning environments "CLEs" (Jonassen, 1997):

Exploration

Its most important cognitive components are goal-setting and managing the pursuit of goals, involving speculation, conjecture, manipulation of the environment, observation and evidence gathering, drawing conclusions, etc.

Modelling

- Behavioral modelling of the overt performance (demonstrates how)
- Cognitive modelling of the covert cognitive processes (articulates reasoning)

Articulation

CLEs require articulation (and reflection) on one's learning experience

Coaching

The role of a coach is complex and inexact. A good coach motivates, analyses performance, provides feedback and advice, provokes reflection. Coaching may be solicited/unsolicited by the learner.

Reflection

Learners reflect on their own learning – processes and outcomes

Scaffolding

Scaffolding is a systemic approach to supporting the learner. It provides temporary frameworks to support learning and student performance. Scaffolding represents any kind of support for cognitive activity that is provided by an adult when the child and adult are performing the task together.

Hannafin (1999) also presents scaffolding as a method for supporting learning efforts within an open learning environment. He also presents the following types of scaffolds:

Conceptual scaffolds are typically provided for externally-imposed or -induced enabling contexts, where it is possible to anticipate methods that are sensitive to demands.

Metacognitive scaffolds support the underlying processes associated with individual learning management. They provide guidance in how to think during learning.

Procedural scaffolds emphasise how to utilise available resources and tools. They orient to system features and functions and otherwise aid navigation.

Strategic scaffolds suggest alternative approaches during analysis, planning, strategy, and tactical decision-making. They help in identifying and selecting needed information, evaluating available resources, and relating new to existing knowledge and experience.

Scaffolding is also seen by Young (1993) to be one of the four tasks for designing instruction for situated learning. He describes four broad tasks for the design of situated learning: selecting the situations, providing scaffolding, determining and supporting the role of the teacher, and assessing situated learning.

The second task is described as providing the necessary "scaffolding" for novices to operate within the complex realistic context and which still permits experts to work within the same situation. Accordingly, he describes the role of the teacher as a coach. Moreover, he states that the teacher's role should be to "tune the attention" of students to the important aspects of the situation or problem-solving activity, specifically those attributes that are invariant across a range of similar problems and therefore will transfer to many new situations. This can be achieved as teachers work along with students on a new problem.

von Glasersfeld (1996) uses the metaphor of "midwife" in order to describe the teacher's role within the constructivist learning environment. He therefore describes the teacher as a "midwife in the birth of understanding" as opposed to being "mechanics of knowledge transfer". Therefore, their role is not to dispense knowledge but to provide students with opportunities and incentives to build it up. Robotham (1995) also describes the role of the teacher as a "causer of learning" in a self-directed learning setting, where he saw the self-directed learner as no longer operating as a passive receiver of information, but taking responsibility for the achievement, and ultimately the setting of learning outcomes. Moreover, according to Mayer (1999), the learner is a sense-maker, whereas the teacher is a cognitive guide who provides guidance and modelling on authentic academic tasks.

Hanley (1994) identifies a summary of some suggested characteristics of a constructivist teacher:

1. Become one of many resources that the student may learn from, not the primary source of information.
2. Engage students in experiences that challenge previous conceptions of their existing knowledge.
3. Allow student response to drive lessons and seek elaboration of students' initial responses. Allow students some thinking time after posing questions.

4. Encourage the spirit of questioning by asking thoughtful, open-ended questions. Encourage thoughtful discussion among students.
5. Use cognitive terminology such as "classify," "analyse", and "create" when framing tasks.
6. Encourage and accept student autonomy and initiative. Be willing to let go of classroom control.
7. Use raw data and primary sources, along with manipulative, interactive physical materials.
8. Don't separate knowing from the process of finding out.
9. Insist on clear expression from students. When students can communicate their understanding, then they have truly learned.

These characteristics are seen to be key characteristics for teachers who are teaching or intending to teach in a Web-based learning environment. In the light of these characteristics, Hanley (1994) describes the role of the teacher as organising information around conceptual clusters of problems, questions and discrepant situations in order to engage the student's interest. Moreover, teachers assist the students in developing new insights and connecting them with their previous learning.

Although these characteristics can help teachers when teaching in Web-based learning environments, there are some primary factors that might inhibit them from teaching via distance. These factors are identified by Clay (1999) as:

1. Increased workload.
2. The altered role of the instructor.
3. Lack of technical and administrative support.

Discussion

Although there are many advantages for the students to participate in Internet courses, frequently they experience some frustration with the technology (Clay, 1999). For example, the students within the Internet course reported the following problems: slow Internet connection, lack of skills and experience in using the Internet etc. Therefore, for some students Internet technology might be frightening at some stages, especially at the course beginning. Therefore, to calm the fears of many anxious students Perrin and Mayhew (2000) suggest that:

"The instructor plays a vital role of serving as both a mentor and humanizer. As a mentor, the instructor acts as a resource, directing students to solutions by providing insight on where to go, who to contact and how to solve problems in general. By drawing out personal commitment, participant interaction, and enthusiasm, the instructor is seen as a humanizer working to personalize what is often feared to be an impersonal experience"

The role of "humanizer" is crucial especially at the start of any online course, as the students need to be oriented to the new Web-based learning environment.

Mentor role

The mentor role of the teacher within a Web-Based learning environment is quoted several times in the relevant literature. Wang (2001) defines mentoring in his study as the discourse techniques and other facilitating strategies that mentors used in facilitating individual online activities and teamwork, such as providing support and guidance, mediating negotiation, and reflection. An essential mentoring activity is seen to be mentoring the online discussion. In this course, a discussion board is used in order to facilitate the asynchronous discussions among course participants (see figure 6). It was found to be very important for any teacher to know what is going on online. What are the students' main topics of interest? Are they focusing or widening the discussions? Are they considering "Netiquette" for online discussions or not? All these questions can be answered for teachers while they are mentoring the discussions. Moreover, he/she needs to facilitate the students' discussions by encouraging them to participate in the discussions and questioning and identifying their own needs and opening new discussion forums for them in order to meet their needs.

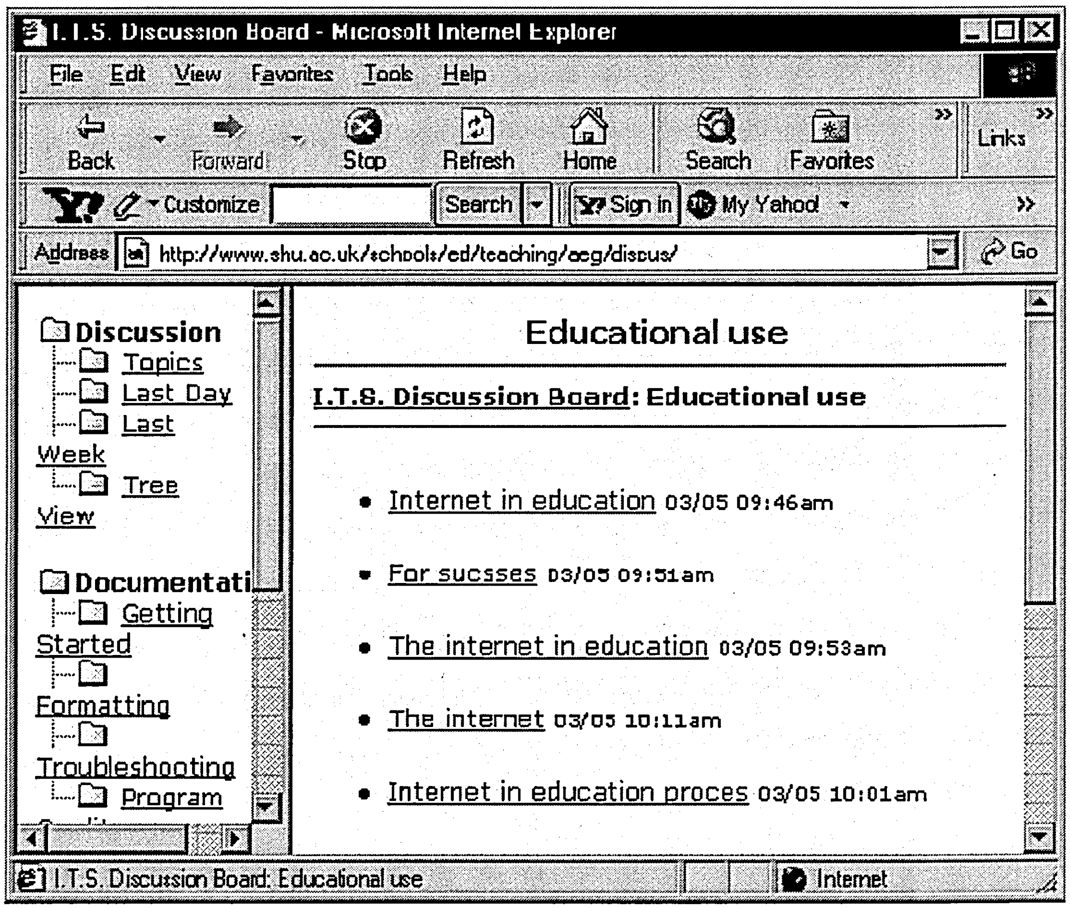

Figure 6. Shows the online discussion using the discussion board.

Mentoring online discussion was found to be very important in terms of guiding the students' discussions in order to maintain it within the course objectives. Moreover, it was found to be important to help the students to remain actively participated in the discussion.

Facilitator role

Shotsberger (2000) states that both instructors and developers should be willing to question their design of web courses and decide for themselves whether current communication methods have been adopted out of convenience or out of a desire to optimise interaction. Within this course, the researcher tried to ensure that all participants had access to a wide range of communications options, both synchronous and asynchronous, that can be used in large-group, small-group, and one-to-one settings. For example, the researcher used videoconferencing and instant massages for synchronous discussions and email and a discussion board for asynchronous discussions. Shotsberger (2000) also states that with synchronous communication in an online learning environment, a facilitator or leader role is needed in order to set the conversational tone and pace. During this course, most of the students find the discussions constructive and valuable, regarding both synchronous and asynchronous discussions (see figure 7 for the students' comments on the discussion).

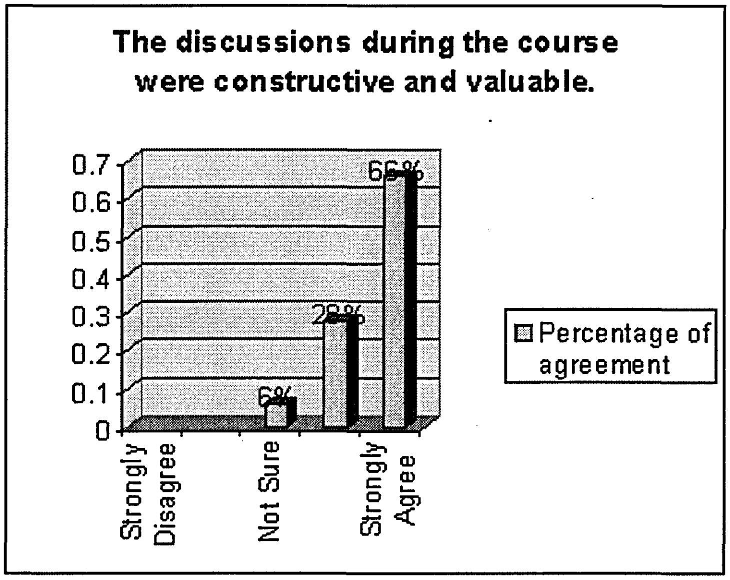

Figure 7. Shows the students comments on the discussion.

Furthermore, the majority of students thought that the tutors gave them enough support during the course (see figure 8).

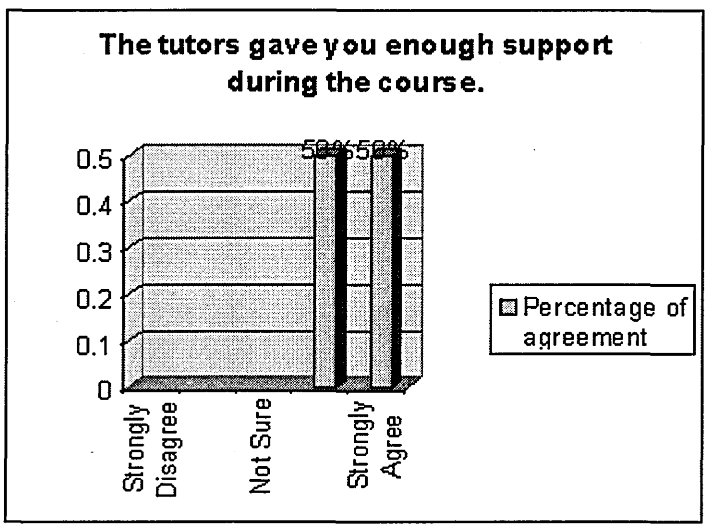

Figure 8. Shows the students comments on the tutors' support.

The tutors support included one-to-one interaction with the students, which is still seen to be a key element in the teaching and learning process and in the tutors' support for Web-based learning environments. Based on the "Cyperschool" model, Javid (2000) emphasises one-to-one interaction that allows the students to seek solutions to their specific issues and design their learning projects in close collaboration with the instructors. Therefore, the teachers serve as guides and coaches, facilitating instead of directing learning.
Although the students in the Internet course have one-to-one tutor support, many students felt that they need more one-to-one support (see figure 9). This result indicates the importance of the one-to-one tutor support, which is seen as an essential element when teaching and learning new skills such as the use of the Internet.

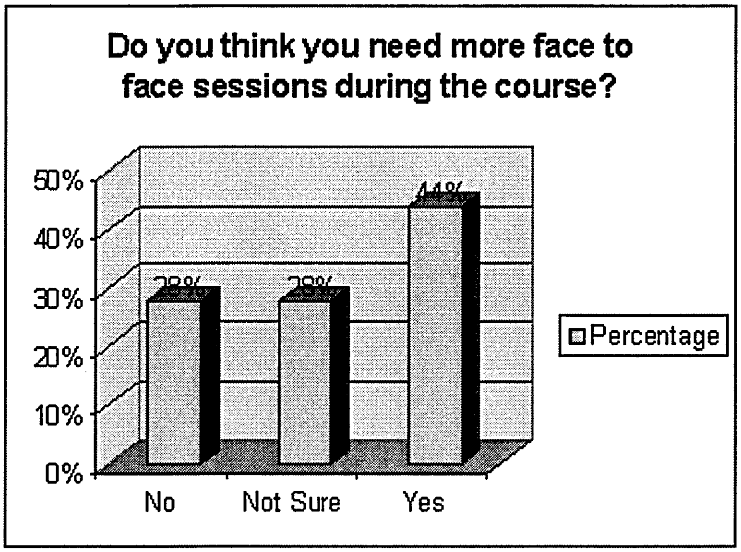

Figure 9. Shows the students needs for more face to face sessions.

Mature partner role

Within the notion of the "Zone of Proximal Development", see Vygotsky (1962), the role of the teacher is described as a more mature partner. Hudson (1998) emphasises scaffolding tasks and activities. These scaffolding activities aim to help learners bridge the gap between their actual and potential levels of development in association with their peers and/or tutor interaction (Vygotsky, 1962). Moreover, Lefoe (1998) stresses that students should have more control in the constructivist learning environment and the teacher takes on the role of 'coach and facilitator', which in many situations is better described as "co-learner".

In the semi-structured content domain, the students will be likely to start to develop their metacognitive skills in order to be able to direct their own learning content (Honebein et al., 1993). Therefore, the aim is to transfer the control of the learning process gradually from the teacher to the learner by sharing it.

Accordingly, peer-tutoring is seen to be an essential part within Web-based learning environments, and it is used in order to give the students the opportunity to share their own experiences and to promote their own learning. In this course, most students found their peers cooperative and supportive (see figure 10).

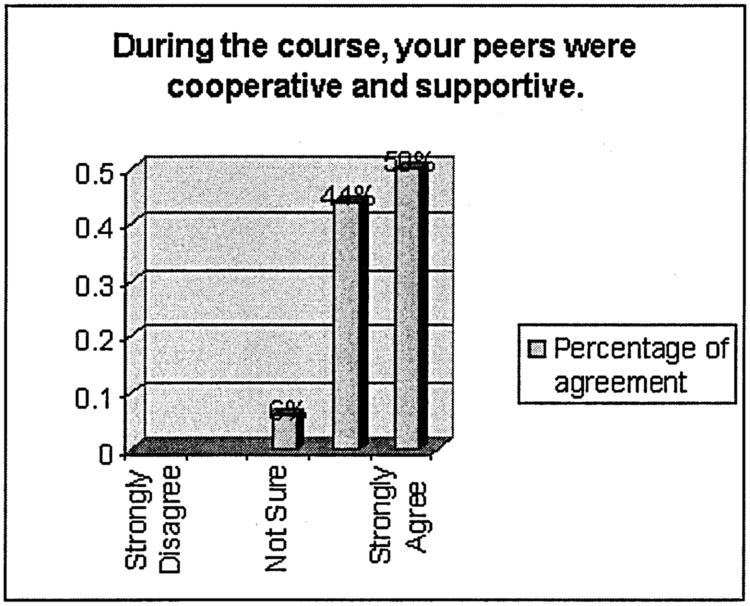

Figure 10. Shows students comments on their peers cooperation and support.

Moreover, they thought that the interaction with their peers enriches their learning experiences (see figure 11). The course observer also reported on the high level of interaction and support among the students themselves. For example, they were collaborating in conducting Internet search, translating difficult English words into Arabic and moderating synchronous discussions with each other etc.

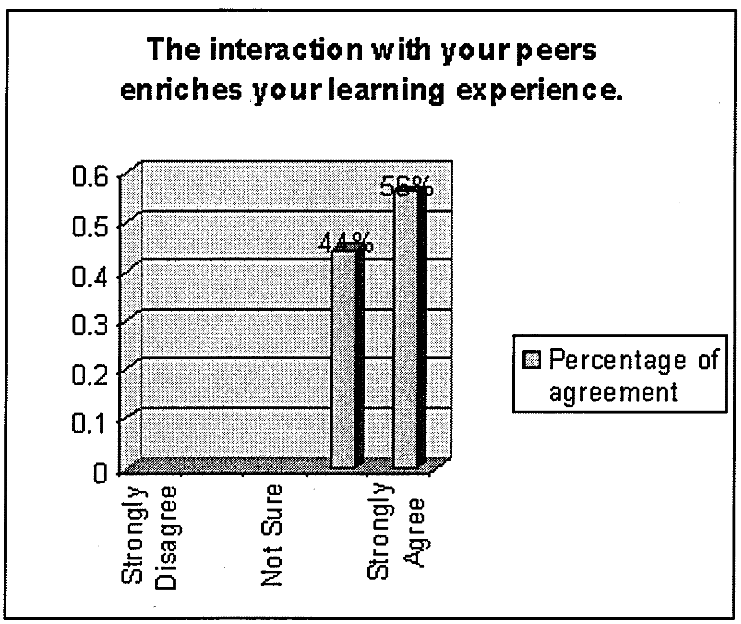

Figure 11. Shows students comments on their peers' influence on their learning experiences.

Guide and advisor roles

The teacher should give the students enough guidance and support when using the Web-based learning environment in terms of guiding them through the system explaining to them the essential parts that they will need during the course. Moreover, he/she needs to be willing to devote some time to support the students while they are online. This is because they will sometimes need his/her advice, especially concerning the use of the learning environment e.g. uploading the assignments, downloading learning resources etc. Nowadays, there is no doubt that teachers might spend more time online rather than inside the classroom. Part of guiding the students through the Web-based learning environment is seen to be the design of the learning environment itself. Therefore, the teacher should establish what the researcher prefers to call "remote directed learning", by which the learning process is not fully directed by the teacher or even fully self-directed by the learner, rather it is remotely directed using a technology-based environment. This guidance can be provided for students in the form of a wide range of resources and tools that might help them during studying online e.g. online tutorial, help or troubleshooting, and a contact with the technical team if possible. In this course the students comments about the system were very positive (see figure 12), as they thought the Internet Tutoring System guides them through their learning process, by giving them guidelines and instructions for uploading and downloading materials, by referring them to the course assignments, deadlines, etc.

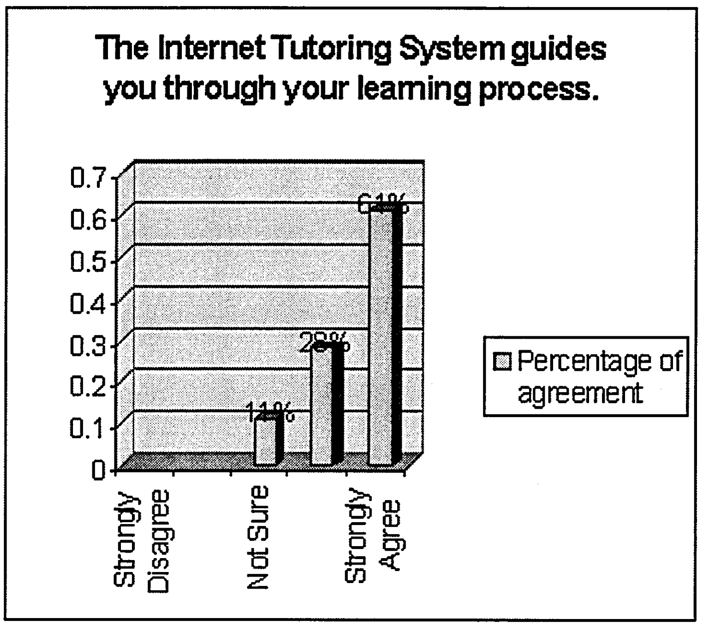

Figure12. Shows the students comments on the Internet Tutoring System.

Orchestrating and managing roles "key roles"

Two roles are seen to be key roles for teachers when they are teaching in a Web-based learning environment. These two roles are the manager role and the orchestrating role.

Analoui (1995) describes the role of the teacher in light of the fact that people at all levels of the organisation are entitled to be described as managers, because they "manage" their work situations, with colleagues, peers, clients, and their family relationships. Therefore, he proposed that teachers ought to be viewed as what they really are – managers in their own right. Like all managers, lecturers and trainers have to manage the resources which are made available to them in the best way they can. Teachers have to fulfil many managerial roles; conveying knowledge, skills, types of behaviour and attitude to students. The role of the teacher is also described by Lefoe (1998) as a task manager which is also shared in a constructivist learning environment between student and teacher.
In this study, the manager role is seen to be not only in managing learning resources, but also in managing the different roles and responsibilities within the Web-based learning environments. Hudson (1995) also refers to this idea when he highlights the notion of the "orchestrating" teachers. This notion is described as one who uses a variety of instructional modes...integrated the content of microcomputer-based instruction with the ongoing curriculum, and coordinated microcomputing activities with other instructional activities. This idea is developed further in Hudson et al. (2002).
The orchestrating role is seen to be a challenging role for teachers who are using a Web-based learning environment. This is because they need to "orchestrate", coordinate and manage their responsibilities and their different roles in order to accommodate the different learning styles for students and the different content structures. Furthermore, it allows teachers to integrate different teaching strategies in order to maximise the use of the different tools and resources offered by the Web by using "the appropriate method with the appropriate group of students for the appropriate content structure at the appropriate time". Figure (13) illustrates the multiple roles of teachers in a Web-based learning environment. It also focuses on the manager and "orchestrating" roles as key roles.

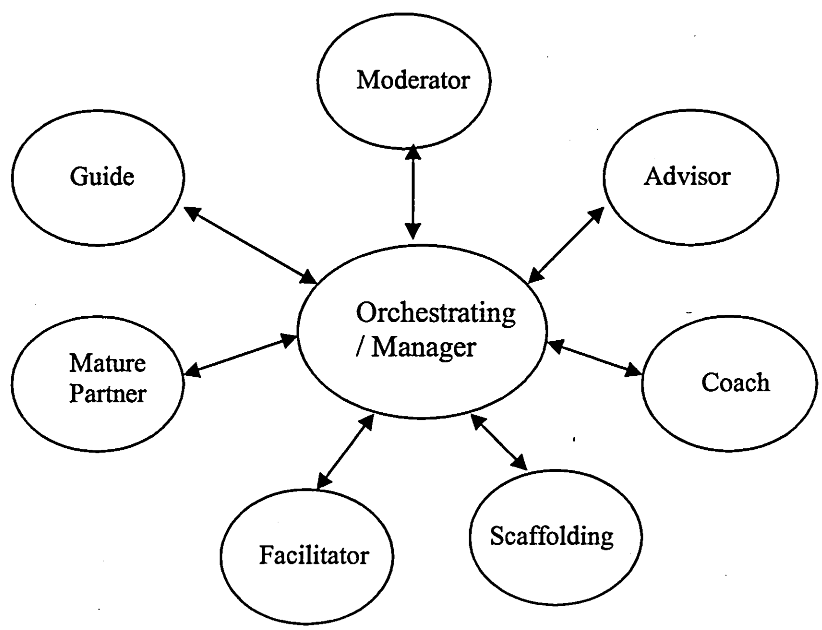

Figure 13. Teacher's multiple roles within the Web-based learning environments.

Conclusion

Educators should realise that for students to be successful in the twenty first century they need to be lifelong learners, and that helping them to develop the necessary skills to become lifelong learners requires a different approach to teaching and learning (Conway, 1997). He also states that:

> "The direct instruction method that was used almost exclusively in the earlier part of this century, though still effective for some skills, is giving way to a more cooperative approach. One that involves students working together toward common goals, teachers serving as 'experts', and coaches, and facilitators, and sometimes just plain getting out of the way and letting students discover things for themselves."

Hanley (1994) also concludes that the goal is for the learner to play an active role in assimilating knowledge into his/her existing mental framework. Moreover, the ability of students to apply their school-learned knowledge to the real world is valued over memorizing bits and pieces of knowledge that may seem unrelated to them. The constructivist approach requires the teacher to relinquish his/her role as sole information-dispenser and instead to continually analyze his/her curriculum planning and instructional methodologies.

Teaching in a Web-based learning environment is seen by Perrin & Mayhew (2000) as requiring more time, patience and understanding from teachers than teaching in a traditional course. They also state that:

> *"no longer is it sufficient to only have in-depth knowledge of the course content, but the instructor must have a thorough understanding of the technology. Without advanced technological knowledge, the instructor will be dependent on a computer technician to answer the simple student questions about accessing a portion of the course or making changes to the course design. With this new Internet technology, instructors are expected to teach in a format that they have never learned. Therefore, this type of learning can be both intriguing and frightening for the students as well as the instructors."*

To conclude, the multiple roles for the teacher are seen to be a key element in Web-based learning environments. The roles highlighted in this paper are only guidelines and examples of the different roles of the teachers. Therefore, several roles can emerge as the technology develops. However, there is still one remaining question that needs an answer. What are the most effective roles for teachers when teaching in a Web-based learning environment?

This question can only be answered by the teacher him/herself, as he/she can determine the different "appropriate" roles that he/she needs to play in a particular situation, in a particular subject and with a particular group of students.

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Author:
Ahmed El-Gamal
Pedagogy and New Technologies Research Group
School of Education
Sheffield Hallam University
36 Collegiate Crescent Campus
Sheffield, S10 2BP, UK
Tel: +44 (0)114 225 5705
Fax: +44 (0)114 225 2324
Email: a.e.gamal@shu.ac.uk
http://www.shu.ac.uk/schools/ed/teaching/aeg/