GIS eLearning Experiences in Turkey

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ABSTRACT

Until date eLearning environment have only supported or substituted the existing learning environments. However, owing to the improvements in technology over the last decade, it is currently able to support the transition from traditional learning to continuous competent development and to nurture the sustainability and innovativeness of small and medium enterprises.

In this study, concept of eLearning was investigated in its general terms and the situation in Turkey was discussed with special emphasis on GIS training. The current state of involvement of eLearning in the field of GIS training was discussed through some approaches and experiences. Finally routes and suggestions for future development and implementation of such applications in the field were presented.

1. INTRODUCTION

eLearning is frequently referred to as an approach to facilitate and enhance learning by means of personal computers, CDROMs, and the Internet. This includes email, discussion forums as well as collaborative softwares. eLearning is advantageous in that; it enables just-in-time learning, courses can be tailored to the specific needs of the target group and it also enables asynchronous learning. eLearning may also be used to support distance learning through the use of WANs (Wide area networks), and may also be considered to be a form of flexible learning where just-in-time learning is possible. The process of learning occurring exclusively online is called online education, whereas, it is called M-learning when the contents of learning process is distributed to mobile devices such as cell phones or PDAs.

As opposed to the Computer Based Training of the 1980s, the term **eLearning** is most frequently used to refer to computer based training which incorporates technologies that support interactivity beyond what would be provided by a single computer (URL1). eLearning is the fastest-growing technological application in the fields of university education and business training.

The basic components of the eLearning environment can be stated as; **Meaning**, when many things learned on such courses are only useful or needed part of the eLearning; **Practice,** as the direct link between the eLearning environment and the working environment; **Community,** as learning in a community is more effective; and **Identity** as the contribution to the raising of a person by eLearning environment.

The use of computers has allowed storage and access to large quantities of information and explicit knowledge; hence especially in the last decade, access to information has become more readily accessible; and yet the future approach to knowledge is believed to be through networking. In his study, Schuur (2003) stated, "*Altavista gave more than 500.000 hits for 'eLearning' and more than 600.000 for 'e-learning'. The Google search engine already scans over one billion URLs. Around 600 million people have Internet connections of which 190 million are in Europe*". He has also advanced a number of 'Learning- discussion points' as "*eLearning is becoming less important in content terms. The focus should be more on the development of processes in learning systems and on*

complexity management of the system. New paradigms should be defined and adopted, where learning systems are not restricted to existing learning philosophies".

Each person has a unique combination and **level of intelligences** leading to different learning styles and according to Gardner, these may be classified as Logical-Mathematical Intelligence, Kinaesthetic Intelligence, Visual-Spatial Intelligence, Musical Intelligence, Interpersonal Intelligence, Intra-personal Intelligence (Schuur 2003). This approach creates a new variable in the already complex environment of learning. Furthermore, each intelligence/learning style requires its own sort of technological application. Accordingly, Gardner had to add two '**new' intelligences** as Naturalist Intelligence and Existentialist intelligence. As contexts are often quite complex and dynamic, it becomes fairly difficult to follow a linear learning process. Naturally, people combine different sorts of knowledge and thus create a total new knowledge. Hence an efficient eLearning environment should enable learners to be trained using all their intelligences and leaning styles.

2. ELEARNING IN TURKEY

Anadolu University was the first organization to have a contemporary distance learning system for higher education. The basic aim of the open education faculty was to fill the gap for qualified personnel for various fields, English teachers and pre-school teachers in the country also contributing to the improvement of educational levels of employees from different organizations through 2-year and 4-year undergraduate programs having competitive educational quality at convenient costs (URL2).

However, eLearning activities in Turkey are being newly developed, mainly depending on efforts of private organizations. The attempts of the Universities, mostly recognized by Istanbul Technical University (ITU) as one of the leading and accredited universities of Turkey, educational organizations in the country, are not yet satisfactory. Especially the observed high demand addressed particularly by surveying professionals for a basic spatial science reference need to be fulfilled (Altan, 2004).

Distance Education Centre of ITU has been offering more computer programming certificate courses since 2004 with its improved technical substructure (URL3). However, there is no current study on Spatial Informatics.

3. GIS ELEARNING

Geographical information systems (GIS) are computer-based systems that are capable of collecting, storing, analyzing and geographically presenting the referenced information. There have been continuous efforts in the field of GIS to increase access to computer-based teaching and learning resources such as using IT and digital resources, and to enhance the quality of new distance learning courses. The courses under GIS eLearning emphasize student-oriented learning by using the WWW, downloadable study packs, computer based learning materials, core texts, workshops and help lines.

There is also a growing interest towards the joint development of GIS eLearning by the partners from public and private sectors to develop training programmes using open and distance learning. The Association of Geographical Information (AGI) is the leading organisation concerned with continuous professional development (CPD) in the field of geography. They have defined CPD by us-

ing eLearning as "the systematic maintenance, improvement and broadening of knowledge and skill, and the development of personal qualities necessary for the execution of professional and technical duties throughout one's working life". The AGI CPD programme is currently being redesigned (AGI 2005).

Despite the emergence of distance-learning courses for professionals in GIS, it appears that very few of them are capable of providing substantial training or education towards the development of personal skills. This is incongruent with the trends in industry where employers ask for more and more flexible and self-confident individuals with competent skills of communication, problem analysis and problem solving, planning and networking.

Buckley and Donert (2005) stated that some current educational programmes fail to meet the demands or expectations of employers and suggested the “Conversational Model” which focuses on the individual learner and the interaction between tutor and student. UNIGIS is another distance-learning course designed specifically for students working in the field of geographical information and is now being represented by a worldwide network of educational institutions. The course strives to encourage the development of transferable skills in a sector, which is arguably characterized as having a highly technical and computer driven focus. UNIGIS course is a representative example which has been developed from a paper-based system into an on-line distance-learning system. It has evolved substantially and recruits large numbers of students from all around the world. However, whilst there is a mail base, the level of communication and interaction between users is limited and students, most commonly work independently on the training materials.

Due to the multidisciplinary character, the spatial information is required already by various faculties of Universities and Colleges where the questions of spatial queries are important mainly because the Geographic Information touches every aspect of life forms (AGI 2005) such as: planning the delivery of health services, managing the coastal zone and flood defences, managing epidemics such as the recent foot and mouth crisis, monitoring pollution, tree preservation orders, access to the countryside and public rights of roads, satellite monitoring of land-use, geographic provision of emergency services, crime and disorder analysis, vehicle routing and general traffic management, tracking of parcel deliveries, planning the built environment, delivering water, gas and electricity to customers, planning and managing large sporting and cultural events, joining up government, tourism and heritage, planning safe school routes, giving citizens greater access to government, using GPS for navigation and service delivery, public transport planning and provision, retail store location, buying and selling of commercial and residential property, monitoring of global warming and recycling contaminated land.

As the most common example of GIS eLearning, Live Training Seminars are designed for those who ask for a GIS training on a focused topic presented live by an ESRI technical expert (URL4). This may lead to enabling options such as; printable slides of the presentation, questions and answers from the live training seminar, a software exercise with accompanying data, an optional exam to assess understanding, and a certificate after successful completion of the exam.

4. GIS EDUCATION IN TURKEY

In Turkey, GIS for management, decision making, planning, land evaluation, construction of infrastructure, socio-economic development, education, etc. are of vital importance. One of the reasons for the inadequate water and sewerage infrastructures and unplanned urban expansion experienced in the country is the insufficiency of maps and the map use. As GIS is closely related to maps and mapping, education and training in GIS have become more important for the surveyors and geographers as well as mapmakers and users such as Departments of Urban and Regional Planning, Geology and Geophysics Engineering.

The first program for the training of surveying departments namely, "Map and Cadastre Engineering" later on named as "Geodesy and Photogrammetry Engineering" was started in the year 1949. Today, it is being taught under the programs of Geodesy and Photogrammetry in twelve universities located in different regions of Turkey. The Geodesy and Photogrammetry Department of ITU was launched in 1969. It is currently being planned to change the name of the department to "Geomatic Engineering" as a result of continuous developments in the fields of Geodesy, Photogrammetry, Remote Sensing, Satellite Technologies, GIS, Cartography and other topics, without limiting the duties of the program. ITU is also keen on developing a network of people in the Euro-Asia region for exchanging ideas and sharing experiences aimed at solving problems and would like to establish a mechanism for more direct contribution of geo-spatial information to the society. The Geodesy and Photogrammetry Engineering program of ITU is relatively competitive, with 50 faculty members, and number of students ranging between 200 and 240. The average graduation rate has been approximately 50-60 students per year. Currently, 29 tenure-track faculties, 3 lecturers, 19 assistants and 4 visiting scholars share the academic and educational workload of the Department. There is now an increasing interest towards the recognition of geographic information science and technology as a discipline in its own right, and complete programs are becoming available at the undergraduate level. In accordance with the developments in teaching and learning, concepts have changed and the uses of computer networks and information technology have become widely used to develop teaching possibilities (Demirel, 2004; Kulur, 2002).

Efforts for the teaching of GIS course cannot be referred to as eLearning. However ITU has achieved satisfactory experience before offering applied eLearning. GIS Course at ITU (3+0 credit) has no application hours. But students take term projects for the GIS Course. In the scope of these term projects, each project group is to digitize different cities of Turkey from raster data in the first stage. Raster data can be obtained from the web page of the course. In the second stage, a geographic information system is to be established and files of different continents are to be used. Each project group is to prepare report for both of these stages. In this work it is aimed to have each project group to form a GIS basically. It is also aimed to teach how to plan a GIS project, with the processes involving gathering of data, establishing the relations in the database, analyzing the data and finally the visualization of these works. Students are to learn the problems which occur due to the standardization problems in GIS, by establishing different information systems and presenting the data with maps. At the end of these projects students will have the ability to think graphically, to map out information, and to build analytical solutions around maps and graphics. All explanations and detailed steps of the project can be found at the course page on the Internet. The hardware and software available in the computer laboratory of the ITU Civil Engineering Faculty will be used during the project. The softwares available in the computer laboratory include AutoCAD, MapInfo, Intergraph GeoMedia, Bentley MicroStation & GeoGraphix, ArcView, ArcGIS, EGHAS (Turkish GIS Software), NetCAD (Turkish GIS Software), and Microsoft Access.

The courses also refer to the campus information system and CD version of the e-atlas. These studies have been developed by the joint efforts of the students and faculty members (Ulugtekin et al. 2001).

Furthermore, by making use of the texts and graphics prepared by specialists, the students learn how to use the Turkish mapping programs in the Computer Aided Graphic Design course. The previous graduates before the computer aided education are also encouraged to learn these programs by the same practice. This experience may also be transferred to eLearning.

The GIS seminars initiated by the Chamber of Surveying and Cadastre Engineering - GIS Commission, first as round table for small groups has received great interest as theoretical and application based tools for continuously teaching.

5. GIS ELEARNING IN TURKEY, THE ONLINE GIS PROJECT

Turkish researchers are working in ISPRS Commissions and Chamber of Surveying and Cadastre Engineering Standing Commissions. The Chamber is the member of FIG (International Federation of Surveyors) and ICA (International Cartographic Association). ITU is an active member in EEGECS (European Education in Geodetic Engineering Cartography and Surveying). All of these organisations widely use and innovation GIS eLearning in their own educational project. Subject of this study is a project of this work.

The unique approach for the GIS eLearning in Turkey is the proposed OnlineGIS project currently being developed at Photogrammetry Division of ITU, which is to be granted by FIG (Demirel, 2004). A modular structure is considered in the scope of the project and the program is structured around a predict-observe-explain paradigm that asks students to use their existing knowledge. Students visit virtual sites, view and analyze data in a real-time fashion and draw conclusions based on their observations. The program is not being used yet, however it will be improved to a viable form in a short period of time.

The designed OnlineGIS project established a spatial scientific learning module, which will provide up-to-date knowledge on spatial science for undergraduate students, who are taking courses of Spatial Information Systems. Furthermore, the observed high demand addressed from surveying professionals for such a basic spatial science reference can also be adequately fulfilled.

The project more specifically aims at developing scientific learning modules, which improve teaching at the institutes involved in internet technologies, multimedia presentation and communication technologies in the fields of GIS and conceptual data modelling. The learning modules are intended to be used for preparation and reinforcement of lectures. Furthermore, engagement of the user is enhanced by interactive components such as animations, simulations and requirements for feedback. These are going to be supported by realistic simulations, which will enable complex theory to be understood through the provision of computer-generated simulations, supported by both digital and conventional associated learning materials. The briefly highlighted potential promotes the utilization and implementation of the available technologies in this project and although, it is currently the only project having this aim in Turkey, considering the speed of Internet and its applications, GIS eLearning applications can as well spread very rapidly.

The OnlineGIS project adopts a problem oriented teaching which can be described by 5 principles: i) reference to application, ii) multiple contexts and perspectives, iii) social learning arrangements,

iv) information and construction supply, v) briefing guidance and support. A problem based approach concentrates on design and analysis in lectures, de-emphasizing issues such as the fine detail of instrument handling and field procedures. The information presentation can be available in the form of text, pictures, video sequences, simulations, audio, etc.
Using the problem-based approach of OnlineGIS, students will be able to recognize the problems present by themselves, and within the groups of students having varying technical knowledge and interest to the subject. The problem solving stage is designed to be conducted in two folds; one being interactive via e-groups, e-mail lists and direct e-mail to the lecturer and the other being direct communication within the groups and the lecturer. Results will be presented during the lecture and discussed. Additionally the results presented by the groups will be available on the web page in order to encourage other students and motivate them to present better projects. At the end of the term students will be graded.

The types of teaching-learning activities for the application education on information communication technology was listed by Demirel (2004) as search, analysis, guide students, discussions on the web, collaborations on the web, communications with experts, support e-Pals and production of results.

The contents of the proposed project can be divided into three sections; namely *fundamentals of spatial science* including spatial data structure, spatial data acquisition technologies, conceptual data modelling, relevant hardware, software, applications and organizations; *a sample interactive application with real data sets* and *a guidance module* for feedback, discussions and collaboration. In order to provide the fundamentals, an introductory course document was prepared including brief notes on subjects; introduction, fundamentals, GIS components, data, data model design, system design, applications, perspective and GIS Internet resources which also point available resources, books, tutorials and Internet pages.

The major component is the communication with students to get a feedback while working on a specific module. Communication techniques either are the asynchronous ones like email, mailing list or newsgroup or the synchronous ones like chat, audio- and videoconferencing. The data management is realized through the combination of a database and files of server systems. Complex elements such as flash animations, Web GIS applications, server side scripts such as PHP, JSP or Java applets will be anchored in the XML module file (Demirel, 2004).

In the course of the study, students are expected to follow the basic steps of spatial information design being (Demirel, 2004): identification of user requirements, exploration of available data and definition of the data, and requirements of the tool, design of the system architecture, design of the conceptual data model for the required purposes, implementation of the designed concepts, discussion and presentation of the results.

6. FUTURE PLANS FOR ELEARNING

eLearning is a contemporary application providing "learning through communication technologies". Distance learning, being used by many developed and developing countries, is a system for people of all ages and professions to improve their educational levels adjusted to their own learning speeds and capacities while keeping their productivity.

ITU is one of the leading organizations in GIS training while other universities, although offering GIS courses, lack eLearning studies. The current strategic plans for the department are made parallel to the strategic plans of the university which address eLearning as one of the steps towards the achievement of targets. The studies towards eLearning can be started based on the study of Demirel (2004) together with the experienced trainers. Particular attention should be made to the following three suggestions by Scuur (2003):
"In eLearning we need a choreographer in each person, organising his or her own learning performance. Secondly, we need to make easily accessible a variety of fragments or elements which can be used by and are useful for the learner. Thirdly, in a complex, ever faster changing environment it is virtually impossible to control data and facts. In a second order process of eLearning the data / information / knowledge / competences and even the learning process are of secondary importance. It is like preparing for an earthquake: it is impossible to create an escape route for everybody. You never will know when it will happen and you have to take action, where you are, according to the situation, time and place. But it is important to build self-awareness of possibilities, of potential and alternative solutions and opportunities, for each individual to act at that moment and place and in that context."

7. REFERENCES

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