Geoinformatics e-Learning in Egypt

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SUMMARY

The paper commences with a brief definition of geoinformatics as a basis for learning about surveying sciences, followed by an overview of e-Learning in Egypt. Next, the paper examines the current curricula of surveying sciences currently taught within the academic engineering institutions at both Cairo University and the American University at Cairo, in order to identify and prioritize themes within these curricula where e-Learning could be implemented. Finally, the paper presents some guidelines in approaching e-Learning along with cases and recommendations for e-Learning of geoinformatics.

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1. INTRODUCTION

Surveying sciences namely; surveying, geodesy, photogrammetry, remote sensing, and cartography, are means for geospatial data acquisition and processing methods (Konecny, 2002). Geographic information systems (GIS) technology integrates geospatial data acquisition and processing methods from these sciences for a wide range of applications that naturally includes engineering. Moreover, GIS technology manages, analyzes and provides visualizations of geospatial data. Konecny (2002) stated that in presence of GIS as a technological tool for geospatial integration and management, a new academic discipline is emerging worldwide, a discipline that is known as "geomatics", "geoinformatics" or "geoinformation". Typical applications of geoinformatics extend beyond traditional topographic and thematic mapping, into areas such as; engineering, agriculture, geography, urban planning, environmental science, oceanography, geology, geophysics, communication and socio-economy sciences.

E-Learning, in presence of geoinformatics and its growing numbers of current and potential learners, is a further integrative tool of survey sciences related information and a viable platform for learning about these sciences and asscoiated techonologies.

2. SURVEYING EDUCATION IN EGYPT

The higher education in Egypt is mainly government sponsored and regulated. There is a noted growth in the number of student population in higher education institutions who directly enroll after finishing basic education. Currently, surveying science courses are offered at fourteen Egyptian government universities, including Cairo University, and three non-profit private universities, including The American University In Egypt (AUC). Surveying education, both at the undergraduate and graduate levels, varies among Egyptian Universities and Institutes of Higher Education in terms of emphasis on the surveying and mapping content and respective applications, however, the basis for integrating topics and themes from these courses to introduce a course or more in geoinformatics exists.

Egyptian academic institutions for higher education, through the Higher Council of Egyptian Universities are in the process of instilling a new curricula review mechanism, through which a continuous update of curricula could be implemented, including curricula for surveying sciences education. This mechanism would guarantee the uniform exposure of students to current innovations and future trends occurring in the surveying sciences and related technologies (Baraka, 2003), and would encourage the curriculum design and delivery of geoinformatic course(s) within an e-Learning environment.

Established in 1926, the Surveying and Land Information Systems Division at the Faculty of Engineering – Cairo University is considered one of the oldest engineering academic units in

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all Egyptian Universities, and the oldest surveying division in Egypt. Faculty members within the Surveying Division teach different surveying courses to undergraduate students majoring in civil engineering. Core courses are offered for students in freshman and sophomore, while elective courses are offered to students in the junior year, and a surveying graduation project is offered for students in the senior year.

The Construction Engineering Department at the American University In Cairo University (AUC) was established in 1987. Since the focus of the Construction Engineering Department is in relation to the construction engineering market, a one core course in surveying is offered mainly for students freshman/sophomore years, with an elective course occasionally offered in the senior year.

At the Faculty of Engineering, Cairo University, courses dealing with advances in surveying sciences, with emphasis on satellite surveying and digital mapping, are being taught as well as at many schools of engineering in Egypt. Since 1989, GPS related topics were introduced as a part satellite-based surveying and digital mapping syllabi, at the graduate level, followed by their integration within undergraduate surveying courses in 1992 (Nassar and Baraka, 1994). GPS and GIS topics are taught at the undergraduate level include; GPS system elements and positioning concepts, GPS receivers' characteristics and operation, along with GIS system components and spatial analysis tools, and GPS and GIS -based surveying and mapping applications (in senior graduation projects).

At the Construction Engineering, American University In Cairo, the core course deals with uses and applications of surveying in construction engineering, with emphasis on digital mapping, the basics of GPS and GIS characteristics and operation are discussed briefly. An elective course is occasionally offered that further develop on the concepts and applications of GPS and GIS in construction engineering. The overall objectives of surveying courses taught at both the Faculty of Engineering, Cairo University and the Construction Engineering, The American University In Cairo may be summarized in the following:

- Understanding and applying the concepts of engineering surveying in relation to mapping and setting out activities in civil engineering and construction projects.
- Acquiring knowledge of the current status and trends in engineering surveying related technologies and utilizing it in relation to mapping and setting out activities in civil engineering and construction projects.
- Becoming familiar with the use and the selection of surveying equipment and meaurement procedures, in a manner consistent with standard practices in civil engineering and construction projects.
- Being able to conduct and control field survey measurements, analyze measurements and analyze results and enforce quality control as required in civil engineering and construction projects.
- Being able to perform and assess surveying computations, both manual and computer-based calculations and use of selected computer-based packages, to control engineering sites, produce surveying output and update maps and site plans.

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- Being able to function within multi-disciplinary teams, communicate technical information effectively and share common goals.

3. E-LEARNING IN EGYPT

In a recent nationwide investigation about Egypt readiness for large-scale e-Learning deployment, Beckstrom et al (2004) addressed Egypt's e-Learning priorities, barriers to e-Learning, critical success factors, and target audiences. The report presented a positive response to Egypt readiness and concluded with a set of recommendations relating to; shared vision, leadership support, technical infrastructure, content availability, stakeholder support, economically viability, regulatory environment and sustainability.

The report by Beckstrom et al (2004) also presented a summary of two significant government initiatives that should positively affect further the realization of e-Learning in Egypt; namely the Internet and Personal Computer Initiatives. Regarding The Internet Initiative, the Ministry of Communications and Information Technology is maintaining a free internet access nationwide since 2002, where more than 15,000 ports serving 2 million internet have been set-up, with users paying only for local dial-up phone tariffs. As for the Personal Computer Initiatives, affordable PCs and laptops have been made available to students and professional within a monthly installment plan that could be also financed up by a low interest loan.

E-Learning is considered as a mean of alleviating conventional educational problems that faces Egypt. In academia, e-Learning is currently the focus of piloting and prototyping to provide innovative solutions to problems such as over-crowded classrooms, high prices of traditional educational books, transportation problems, need for continued education and specialized training, interaction with the international educational community and the enhancement of the level of national education (Fayek, 2004). Fayek (2004) has reported on e-Learning projects under taken by the Ministry of Higher Education and the Ministry of Education. Examples were given of the Faculty of Engineering, Cairo University, with e-Learning related activities such as, conversion of text books to interactive CD-ROMs and pilot projects in virtual classrooms, as well as the American University In Cairo in using WebCT as a learning management system (LMC) and providing a center for helping faculty members to convert their materials to web-friendly format.

Kamel and Wahba (2003) presented Egypt's experience with the Global Campus project with objectives to deliver academic programs using a hybrid model of traditional and unconventional methods based on distance learning. The Global Campus was a partnership beween Middlesex University and a number of support centers worldwide, offering a Master of Science degree in business information technology in Egypt since 1998 and currently serving China and Singapore as well. Within Egypt, the Global Campus currently includes modules on CD-ROM and on the Web-based in a blended learning environment, in addition to local learning support centers such as the Regional Informaiton Technology Institute. On the Web; students aer provided with personal management tools such as a calendar, profile for grades and assessment, a communication tool to contact local and UK-based tutor and for discussion groups and access to online libraries.

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Since 2002, numerous e-Learning projects have been launched by a number of Egyptian government universities, including Cairo University. National projects such as HEEPFE, Higher Education Enhancement Project funded by the World Bank, UNESCO endorsed open source platform for higher education, MEDA and Tempus projects supported by European Commission Directorate General for Education and Culture, European Commission, were initiated. Programs within these projects addresses issues of e-Learning such as the quality of engineering education, professional training programs, developing new curricula and modifying existing curricula in ares of; engineering, medicine, pharmacology, science, environment and management sciences and finance education.

Furthermore, many of the universities within the Middle East region have pilot e-Learning projects. Al Karam (2002) mentions pilot projects relating to total quality management in Dubai, experimenting with concepts of virtual universities in Syria, and distance learning in Jordan.

4. APPROACHING E-LEARNING

There is an increasing demand for convienience to be realized in 21st century education, this is backed up by research support. Surveying education should accommodate this demand and be amidst the change taking advantage of e-Learning where according to Aggarwal and Bento (2002), such convenience in education is delivered through being;

- Independent of time and space
- Oriented towards goals and outcomes
- Centered in the student/learner
- Geared to active, hands-on learning
- Able to accommodate differences in skills and language

Palloff and Pratt (2001) delineates the desirable characteristics in an online course, in:

- Establish guidelines for class and participation with adequate structure and flexibility
- Encourage participation and include it in student evaluation and grading
- Promote collaborative learning in assignments and case studies
- Post student assignments and encourage feedback
- Include in the site a place for student reflections and socialization
- Encourage students to bring case studies from their surrounding
- Provide outlines and give reading material relating to the outline
- Provide timely comments and additional questions, a play the role of the facilitator
- Be familiar with e-Learning technology to provide solutions to students

A proposed model for e-Learning is presented by Figure 1, where the model depicts the student/learner, the environment, the activity and the outcome with their desirable characteristics. According to Beetham (2004), the relationship between the learner and the environment is characterized by prior experience of learner(s) with tools, environments, services, match of learning style and affordability of learning environment. The relationship

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between the learner and the outcome is characterized by prior subject knowledge and skills of learner(s), prior conceptions, motivation to achieve specific outcomes, match of style and approach to content. The relationship between the environment and the outcome is characterized by knowledge represented in specific media and formats, skills facilitated through specific tools, impact of learning environments on the meaning of knowledge and skills.
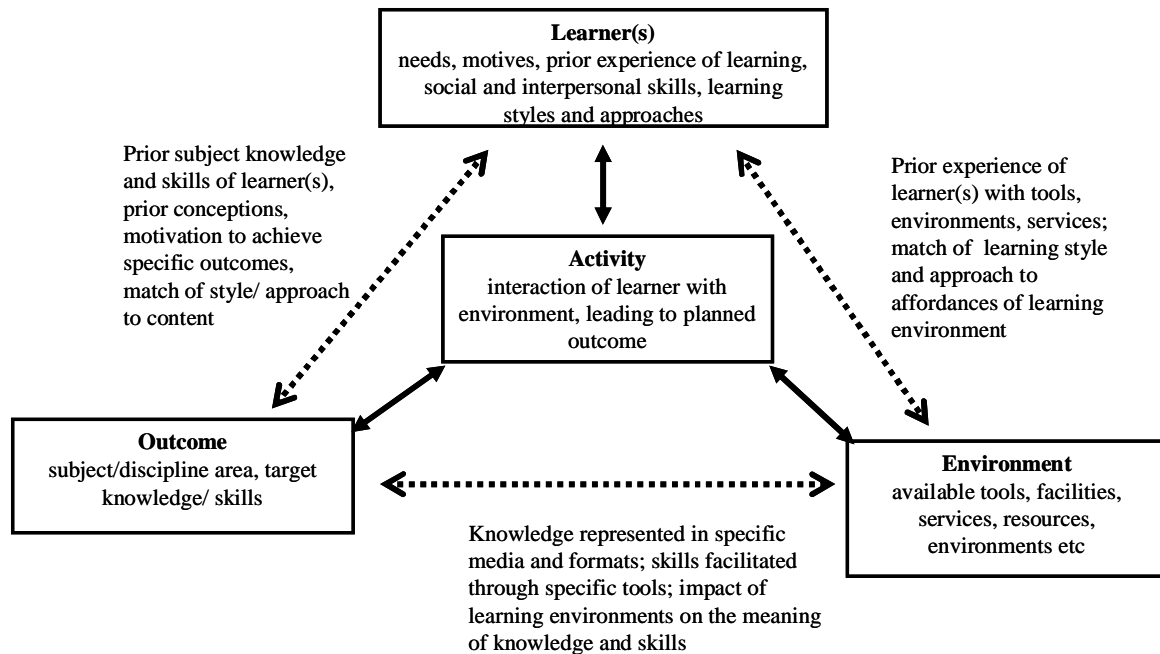

Fig. 1: Model of the Learner, the Environment, the Activity and the Outcome
After Beetham (2004)

5. E-LEARNING OF GEOINFORMATICS

Of interest is an observation presented by Ormeling (2004), where he noted that surveying engineers, could be "overestimating the human ability to grasp the meaning of geospatial data", a situation which could result of loss or degradation of information intended to be relayed. Based on this author experience, situations of difficulty in reading maps as wel as appreciating geospatial data is often met during the teaching of surveying and mapping. Also, similar situations of misperception and/or ambiguity is often met in business interactions with professionals from overlapping and neighboring disciplines. Nevertheless, the result is wasted efforts and lost knowledge. Ormeling (2004) points out that geospatial information could be correctly perceived when visualized. Hence, there is a need for e-Learning to be directed at the students, the professionals and the general public, in relation to e-Learning course design, with considerations of visualization tools, used for the benefit of both students and professionals.

In view of the need to deal with real world cartographic representations such maps and life like presentations such as satellite images, one has to exploit the interactive graphics and

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visualization capabilities within the Web. An innovative e-Learning approach was presented by Katterfeld and Sester (2004), the Institute of Cartography and Geoinformatics, University of Hannover – Germany, where they utilized the potentials of the Web to the benefit of students within the surveying and mapping sciences which emphasizes learning about GIS. The proposed approach in e-Learning focused on allowing the learner with increased interactivity and experimentation through "Virtual Landscape", which allows to the learner landscape with diverse possibilities. Within this setup, students learn about the relationship between digital data and landscape form evolvement, and they examine the interrelated processes, representations and analyses using learning materials and basic principles from GIS.

As reported for the Virtual Landscape, it was designed according to rules for creation of ergonomic with concerns for, namely; avoidance of learner's eye exhaustion, provision for better orientation using text and assurance of meaningful outlines. Furthermore, no Learning Management System (LMS) was used, the approach was a blended e-Learning approach based on top of the course content, with most cases accessed from the learning materials. In presence of a Web map server, exercises allowed for

- Ease of data access to distributed data sets
- Visualization of data in 2D and 3D
- Basic analysis tools in 2D (and 3D)

Another e-Learning involving theme from geoinformatics was presented by Mooney and Martin (2004), The Department of Geomatics at the Dublin Institute of Technology, Ireland, where a distance e-Learning course was developed for 'Co-ordinate Reference Systems for Spatial Information' as part of the learning resources for the continuing professional development of staff of geographical information organizations. The course used WebCT was used as the LMS of choice providing; interaction, evaluation and assessment using; discussion board postings, e-mail, chat room and calendar. The course contained six themes:

- Describing position with coordinates
- Defining and realizing coordinate reference systems
- Calculation in a two-dimensional Cartesian coordinate reference system
- Transforming from local to global co-ordinate reference systems
- Position in Ireland
- Customizable specific reference systems pertaining to other countries

At the Faculty of Engineering, Cairo University there are ongoing efforts to design and deliver a geoinformatics course for graduate students, along with experimentations regarding the possiblity of providing related themes to this courses within a blended e-Learning environment using a freeware Learning Management System (LMS). Themes to be addressed within the e-Learning environment relates to concepts and trends in the following;

- The Global Positioning System (GPS) and Global Navigation Satellite Systems (GNSS)
- Remote sensing (RS) and high resolution satellite imaging (HRSI)

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-   Geographic information systems (GIS) and Land Information Systems (LIS).

At the Construction Engineering, American University In Cairo, the current core course of surveying is being currently supplemented by WebCt course material to present a blended e-Learning environment in presence of classroom disucssions and field activities.

6. CONCLUSIONS

E-Learning presents a viable solution to Egypt's needs to meet future requirements in higher education. Recent nationwide investigations about Egypt readiness for large-scale e-Learning deployment revealed encouraging results, along with significant government initiatives provided to support infrastructure for e-Learning. Egypt's experience with the e-Learning such as the Global Campus project, HEEPFE, Higher Education Enhancement Project, MEDA and Tempus projects pave the way for quality of education through e-Learning.

Surveying sciences courses currently offered in Egyptian government universities and non-profit private universities are compatible with international higher education standards. There is a noted trend to introduce goinformatics course(s), considering that geoinformatics, as an emerging science, integrates surveying sciences namely; surveying, geodesy, photogrammetry, remote sensing, and cartography. Consequently, learning about geoinformatics would provide an integrated approach to learners concerning the status and advances in geospatial data acquisition and processing methods prevailing within surveying sciences, as well as management, analyses and visualizations of geospatial data within GIS. Designing and delivering a geoinformatics course(s) within an e-Learning environment, preferably in a blended mode to account for culture, is recommended for Egypt.

E-Learning cources pertaining to surveying should accommodate the demand for convenience in education as well as the desirable characteristics required for online courses. Handling geospatial data, including maps and images, warrants special attention to provide for visualizatoin tools in relation to e-Learning surveying/geoinformatics courses, allowing for ease of geospatial data access, 2D and 3D visualization and spatial analyses tools.

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