

SUMMARY OF MODELS OF SURVEYING CURRICULA AROUND THE WORLD

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ABSTRACT

Key words : curricula, assessment, competencies, and trends.

1. INTRODUCTION

Commission Two, Working Group Three is University Curricula – Content, Trends, Assessment and Competencies. In the process of collecting information for the report that we plan to have ready by the end of 2001 we have had paper presentation sessions at a Commission Two symposium held at the Wuhan Technical University, China in October, 1998 and at the 1999 FIG Working Week at Sun City. There will be additional papers adding to the information pool during the FIG 2000 Working Week in Prague and at a planned Commission Two symposium to be held in Rosario City, Argentina in October 2000. I would expect that the area would be further explored in papers presented at the FIG 2001 Working Week in Korea.

2. PRESENT STATUS

We are finding that surveying education curricula is dictated by the norms of practice in each country. Different discipline areas from one country to another conduct the various elements of the profession. We see that the education of surveying practitioners needs to follow that of the various disciplines involved in the total arena. These areas of surveying education are in a rapid state of change. The education models of the past and even those in current use do not necessarily fit the evolving future of our profession. So we must look at and analyze the past, present, and conceivable future education models, their problems and the various potential solutions to these problems.

3. FUTURE REQUIREMENTS

Practitioners in the surveying and mapping fields are moving rapidly from being collectors of data to being managers of both data and business. They will continue to make intricate measurement and evaluate boundary evidence, for which they will need sound technical education, but they will also have to exhibit superior management skills. The advent of Geographical Information Systems technology and the development of new tools and methods such as global positioning require intensive study to encompass theoretical, practical, and management skills necessary to operate productively in today's environment. We need to encompass curricula that are adaptable to the ever-changing requirements of the information age that we are now progressing into. This puts a new level of importance on our curriculum design and assessment. As new methods of teaching strategies are designed and implemented, the assessment of their effectiveness must be undertaken. We must continue to change our scheme of education as the profession that we are preparing graduates to enter evolves to fit the changing requirements of society.

PRESENTATION

During the Wuhan China Conference we had presentations that reflected various education models in Australia, China and Northern Europe.

Kirsi Artimo of Finland presented discussion on how “the use of computers and information systems has changed the contents of university courses and that new tasks of the surveyor also require more space for new contents like economic and business matters.” She stated that “The development of computer assisted learning methods has concentrated very much on technologies like development of interactive learning environments, hypermedia books, use of course information systems and data bases as well as e-mail and WWW.” She also related that “education is not only technique and methods, an important part is also the substance. The information technology as well as other changes in the societies and the entire world have caused pressure to change the substance of surveyors education. For example in Europe surveyors (CLGE) aim to a common core of geodetic surveyors curriculum, because of needs of European co-operation.”

Stig Enemark of Denmark discussed an instructional model that is closely aligned to the classic engineering problem solving approach. “The surveying and engineering programs at Aalborg University are project-organized and problem-based from the day the freshmen arrive until their graduation. Through this program Aalborg University has grasped the opportunity to meet the voiced need for education to be more closely aligned to an engineering problem-solving approach.

Project-organized means that traditional taught courses assisted by actual practice is replaced by project work assisted by courses. The concept moves the perspective from description and analyzing into synthesizing and assessment. Each semester has a basic structure of - in principle - equal distribution of lecture courses and project work. The project work is carried out in-groups of four to six students having a teacher appointed as supervisor.

Problem-based means that traditional textbook-knowledge is replaced by the necessary knowledge to solve theoretical problems. The concept moves the perspective from understanding of common knowledge into ability to develop new knowledge. The aim of the project work is ‘learning by doing’ or ‘action learning’. The project work may be organized by using a ‘know-how’ approach for training professional functions, or it may be organized by using a ‘know-why’ approach for training methodological skills of problem-analysis and application.

The difference between traditional subject-oriented education and this project-oriented educational model may be expressed in short by an old Chinese proverb:

‘Tell me and I will forget

Show me and I will remember

Involve me and I will understand

Step back and I will act’ “

John Parker of Australia presented a paper on *Managing Change Utilizing A Quality Approach*. He stated that “A total quality approach has now been adopted for the

training of cadastral surveyors. This involves the educational institutions, the master surveyor, the trainee and the Surveyors Board, and conforms with the FIG Draft Charter for Quality.” He related that “The master surveyor is responsible for the preparation of the detailed training agreement, which specifies a Total Quality program to ensure the trainee surveyor obtains the knowledge, skills and attitudes required for the practice of surveying. Following graduation with a degree in surveying or equivalent, the training program consists of on the job training over an 18 month period, including fieldwork from which a folio of complex cadastral surveys, a cadastral law assignment and an oral examination in professional practice must be taken. The Surveyors Board audits the training program in order to determine whether quality principles are being followed.

In adopting a quality approach to education, the educational institutions and the Surveyors Board work together to develop appropriate course content for undergraduate surveying students. The Surveyors Board accredits courses which provide quality education for future cadastral surveyors.”

Zhan Changgen, Liu Yaolin, and Cao Xinhua of China explained a model of cadastral survey practice teaching. “Through cadastral survey practice teaching, students' comprehension on cadastral survey can be deepened theoretically, technically and methodically, their perceptual and rational knowledge can be merged together, and their ability to solve practical problems be enhanced. Cadastral survey is a job that requires not only technical ability but knowledge about legal, policy and social as well. These non-technical aspects are as important as technical aspects to the students, and form part of cadastral survey practice teaching.

The practice teaching deals with wide-ranged activities and covers most content of cadastral information collection. Cadastral survey is a governmental action, which reflects both the policies and laws of the government with real estate, aspects. Through the practice teaching students master's necessary knowledge of cadastre, and have sense of responsibility for their jobs.

Cadastral survey requires both technical skills and social intercourse ability. Through the practice teaching students must deal with various people and apply what they have learned in class into practice to solve various problems so as to enhance their comprehensive quality.

To well organize a cadastral survey practice teaching, the theories and technical methods of cadastre, as well as government policies, regulations and laws must be taken into consideration, and we must give students idea and experience of hardship and complexity of cadastral survey.”

This is accomplished through a Team Operation Mode. “One team consists of several squadrons and has a team leader, several deputy team leaders and other persons in charge of general technical matters. Associate professors or teachers who have both rich theoretical knowledge and rich practical experience usually hold these positions. They are in charge of general work in the practice teaching. Each squadron consists of four to five groups. A squadron has a leader and a deputy leader. They are professional teachers in charge of day-to-day work during the practice teaching. Four to five

students constitute a group. Each group has a group leader from students, and one or two technicians from Land Administration Bureau who will assist and instruct.”

Robert Hodgkinson of the United Kingdom presented the need for *Quality Assurance in Surveying Education*. He defined quality assurance as being “usually demonstrated by documented systems comprising policies and procedures, linked to those formal monitoring processes provided by each institution. Its purpose is to provide a sense of order, continuity and confidence that issues impinging on the quality of the students' learning experience have been addressed in an orderly and formal manner which is reflected at all levels in the institution. It is often rooted in common approaches and standard ways of both undertaking and discharging activities, which facilitate comparison and benchmarking between university departments and programs.”

“Examples of these provided by FIG members in higher education include the following:

Internally Imposed Initiatives

- Central Assessment Regulations
- Standard Accreditation procedures for new and existing programs
- Procedures for monitoring program changes and developments
- Academic Codes of conduct
- Formal systems for staff appraisal and development
- Teaching observation of lecturers
- Formal processes to promote quality-enhancing activity

Externally Imposed Initiatives

- Quality Assessment by government bodies
- Prescribed entry standards for students
- Definition of syllabus content and duration of programs
- Appointment of external examiners
- Conditions of appointment, job specifications and tenure for academic staff, including external assessment for posts above a certain level.
- Government induction programs for new employees.”

During the 1999 FIG Working Week at Sun City I presented *Surveying Education Curricula Design In the USA*.

“Commencing at the beginning of this decade (1990) the American Congress on Surveying and Mapping (ACSM) conducted a major national study on the status and recommended future of surveying and mapping education. "A panel of educational leaders representing industry, government, and academic professionals in surveying and mapping met to discuss and study surveying and mapping education in the United States. Significant changes in surveying and mapping sciences brought about by major technological developments and a concomitant demand for new products and services provided the impetus for this study. These changes have created a growing demand from industry and government for graduates with new knowledge and skills. But in order for colleges and universities to produce quality graduates, concerns relating to the

vitality and health of existing surveying and mapping programs must be resolved.

The four objectives for this study were:

- (a) to review the evolution and current status of surveying and mapping education in the USA;
- (b) to examine current and emerging requirements for graduates in surveying and mapping disciplines;
- (c) to review innovative approaches to surveying and mapping education which have been introduced in the USA and elsewhere; and
- (d) to develop strategies for further development and enhancement of surveying and mapping education in the USA.

The first three objectives (a, b, and c) are investigative activities that led to developing strategies for further development and enhancement of surveying and mapping education (objective d)."

"The Report of the American Congress on Surveying and Mapping National Study on Surveying and Mapping Education was promulgated in February 1993. This report describes an investigation into developing a shared vision for survey and mapping education in the USA. It is an attempt to describe some of the educational policy issues, which face surveying and mapping education in the information age. It provides a framework for institutions and professionals to build agendas for the future."

"Vision is critical to the long term success of educational institutions that support the surveying and mapping professions. In these economic times, automatic program funding is a dream of the past and educational institutions are facing new competition. The private sector such as publishers, software firms, and consultant groups are offering extensive course work. University extension programs often compete with degree programs. In some cases, public agencies have developed surveying and mapping curriculum to meet agency education needs."

"Each institution will form its own agenda and will adjust to local and regional needs and conditions. A common vision for all institutions means that each institution's efforts will contribute to a greater whole; the professions themselves. Just as all states work together for federal democracy, each state has its own flavor and importance within the common structure."

"New education curricula should be carefully designed to provide:

- (a) broad general education which gives basic understanding of the world, its institutions, and its cultures (communications, literature, humanities, social sciences, basic sciences).
- (b) comprehensive education in the technology of spatial information: data gathering technology (field surveys, photogrammetry, remote sensing) and data management technology (GIS).
- (c) basic exposure to many areas where spatial information may have applications: law, real estate, environmental studies, sciences, economics, engineering, geography, anthropology, forestry.

- (d) application course work where societal problems are identified and spatial information is applied toward a solution: environmental assessment, land development planning, land ownership and administration, economic planning of operations and facilities, and physical planning of facilities. All these subjects should be taught from a spatial information orientation.

Professional surveying & mapping courses should be more "open-form" where a large range of scientific, societal, legal, and economic issues are debated.

Surveying and mapping programs need to find ways of networking with industry and government to supply needed current and detailed applications for the students. In return, the profession needs to create positive programs of assistance for schools to provide exposure to the newest methods. For example, internships or cooperative education, required as a part of a degree program, expose students to many detailed hands-on applications that can not be taught in school. Equipment suppliers and manufacturers may place equipment in schools through grants or loan. Items to teach field operations may be leased or rented for use in school during a time period each year. Data sets from industry may be shared with schools for reduction and analysis.

Specialty instruction need to be provided by government-industry-academic exchange programs whereby faculty are placed in industry or government in exchange for a practitioner coming to the university for a short period."

It should be noted that this report was not well received by either the surveying and mapping practitioners or by academic teachers in the USA. Indeed it was widely criticized. It seems that necessary change is seldom welcomed.

CONCLUSION

We have barely begun in our quest to review existing surveying and mapping curricula from all areas of the world. There are many more regions that are not represented in our data than those that are. It is hoped that there will be many more papers presented at the planned Commission Two symposium to be held in Rosario City, Argentina in October 2000 and at the FIG 2001 Working Week in Korea that will expand our information pool of existing curricula. While we see much diversity in the content of curricula from different countries and even from within each country, it is very evident that all areas of the world are finding an urgent need to revise that now used to reflect the rapidly changing parameters of our profession.

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