Applying a Problem Based Learning Approach to Land Management Education

The Case of Aalborg University, Denmark

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The Integrated Land Management Institute (ILMI) is a centre of the Faculty of Natural Resources and Spatial Sciences (FNRSS) at the Namibia University of Science and Technology (NUST), committed to developing reputable and multidisciplinary research and public outreach activities in the fields of land, administration, property, architecture, and spatial planning.

The Land, Livelihoods and Housing Programme aims at deepening and expanding the focus on these key issues in Namibia. The Programme aims at deepening and expanding the focus on these key issues in Namibia. This thematic approach seeks to reflect the wide-ranging skills exiting at the FNRSS., and was developed to guide ILMI's activities during the 2014-18 period. The programme is organised in four aspects: institutional, environmental, fiscal and spatial processes.

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Working Paper No. 4

Applying a Problem Based Learning Approach to Land Management Education

The case of Aalborg University, Denmark

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SUMMARY

Land management covers a wide range of activities associated with the management of land and natural resources that are required to fulfil political objectives and achieve sustainable development. This paper presents an overall understanding of the land management paradigm and the benefits of good land governance to society. A land administration system provides a country with the infrastructure to implement land- related policies and land management strategies. By applying this land management profile to surveying education, this paper suggests that there is a need to move away from an exclusive engineering focus toward adopting an interdisciplinary and problem- based approach to ensure that academic programmes can cope with the wide range of land administration functions and challenges.

An interdisciplinary approach to surveying education calls for the need to address issues and problems in a real-world context. The combination of different disciplines can be taught through a "learning-by-doing approach". Problem solving skills can be taught through a project-oriented approach to surveying education with a focus on developing skills for "learning to learn". The basic principles of this educational model are presented using the surveying programme at Aalborg University as an example.

This paper is work in progress and draws from previous research. The paper supports the lecture on Problem Based Learning given at the Namibia University of Science and Technology (NUST) on 3 March 2016.

BIOGRAPHICAL NOTES

Stig Enemark is Honorary President of the International Federation of Surveyors, FIG (President 2007-2010). He is Professor of Land Management at Aalborg University, Denmark, where he was Head of School of Surveying and Planning for 15 years. He holds a M.Sc. in Surveying, Planning, and Land Management and before joining the University in 1980 he was a consultant surveyor in private practice for 12 years. He is Past President and Honorary Member of the Danish Association of Chartered Surveyors. He is a well-known international expert in the areas of land administration systems, land management and spatial planning, and related educational and capacity building issues. He has published widely in these areas and undertaken consultancies for the World Bank and the European Union especially in Eastern Europe, Asia and Sub- Sahara Africa.

For a full list of about 400 publications see: http://personprofil.aau.dk/100037?lang=en

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1. INTRODUCTION

The recent book "Land Administration for Sustainable Development" (Williamson, Enemark, Wallace, Rajabifard, 2010) explores the capacity of the systems that administer the way people relate to land. A land administration system provides a country with the infrastructure to implement land policies and land management strategies. Until 2008 the developed world often took land administration for granted and paid little attention to it. But the global economic collapse has sharply focused world attention on mortgage policies and processes, their related complex commodities, and on the need for adequate and timely land information. Simply put, information about land and land market processes that can be derived from effective land administration systems plays a critical role in all economies.

An overall theme in the book is about developing land administration capacity to manage change. For many countries, meeting the challenges of poverty alleviation, economic development, environmental sustainability, and management of rapidly growing cities, are immediate concerns. For more developed countries, immediate concerns involve updating and integrating agencies in relatively successful land administration systems, and putting land information to work for emergency management, environmental protection, economic decision making, and so on. There is a need to apply such a land management profile in surveying education by adopting an interdisciplinary and problem-based approach to ensure that academic programmes can cope with the wide range of land administration functions and challenges.

2. LAND MANAGEMENT

All countries have to deal with the management of land. They have to deal with the four functions of land tenure, land value, land use, and land development in some way or another. Land management covers all activities associated with the management of land and natural resources that are required to fulfil political objectives and achieve sustainable development. A country's capacity may be advanced by combining all the activities in one conceptual framework supported by sophisticated ICT models; or the capacity may involve very fragmented and basically analogue approaches. Different countries will also put varying emphasis on each of the four functions, depending on their cultural basis and level of economic development.

The cornerstone of modern land administration theory is the land management paradigm in which land tenure, value, use and development are considered holistically as essential and omnipresent functions performed by organised societies. The land management paradigm is illustrated in Figure 1 below.

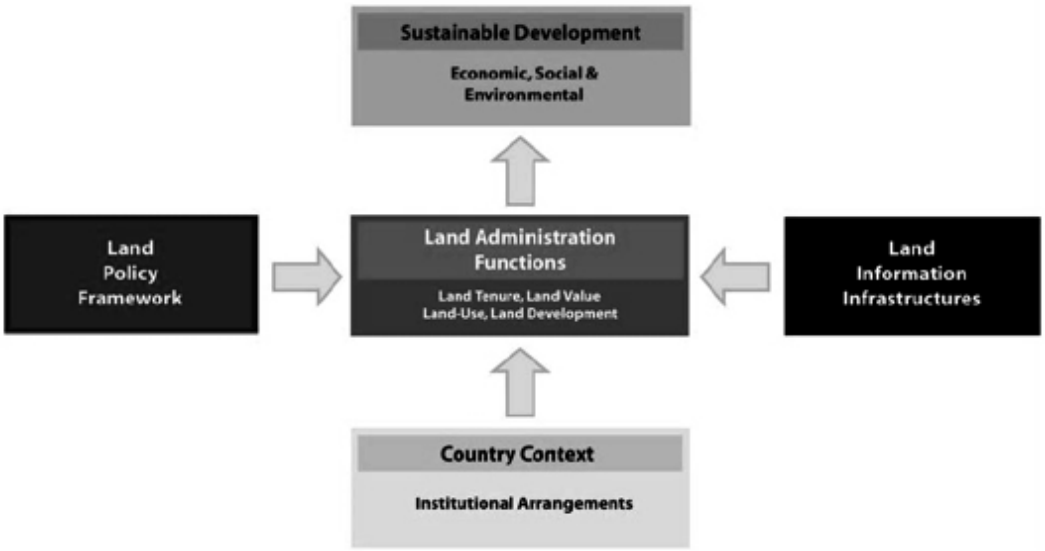

Figure 1: The land management paradigm (Enemark, 2004; Williamson, Enemark, Wallace & Rajabifard, 2010).

The land management paradigm allows everyone to understand the role of the land administration functions (land tenure, land value, land use, and land development) and how land administration institutions relate to the historical circumstances of a country and its policy decisions. Importantly, the paradigm provides a framework to facilitate the processes of integrating new needs into traditionally organised systems without disturbing the fundamental security these systems provide. While sustainability goals are fairly loose, the paradigm insists that all the core land administration functions are considered holistically, and not as separate, stand-alone exercises.

Land policy is simply the set of aims and objectives set by governments for dealing with land issues. Land policy is part of the national policy on promoting objectives such as economic development, social justice and equity, and political stability. Land policies vary, but in most countries they include poverty reduction, sustainable agriculture, sustainable settlement, economic development, and equity among various groups within the society.

Land management activities reflect drivers of globalization and technology. These stimulate the establishment of multifunctional information systems, incorporating diverse land rights, land use regulations, and other useful data. A further driver, sustainable development, stimulates demands for comprehensive information about environmental, social, economic, and governance conditions in combination with other land related data. The operational component of the land management paradigm is the range of land administration functions (land tenure, value, use and development) that ensure proper management of rights, restrictions, responsibilities and risks in relation to property, land and natural resources.

Sound land management requires operational processes to implement land policies in comprehensive and sustainable ways. Many countries, however, tend to separate land tenure rights from land use opportunities, undermining their capacity to link planning and land use controls with land values and the operation of the land market. These problems are often compounded by poor administrative and management procedures that fail to deliver required services. Investment in new technology will only go a small way towards solving a much deeper problem: the failure to treat land and its resources as a coherent whole.

3. A LAND MANAGEMENT APPROACH TO SURVEYING EDUCATION

The changes in the surveying profession and practice and especially in the development of new push button technologies has voiced the need for including the core discipline of management as a basic element in today's surveying education. Traditional specialist skills are no longer sufficient or adequate to serve the client base. Surveyors need to have the skill to plan and manage diverse projects, including not only technical skills, but those of other professions as well. The modern surveyor has to be capable not only of managing within change but managing the change itself.

Technological developments take the skill out of measurement and the processing of data. Almost any individual can press buttons to create survey information and process this information in automated systems. In the same way, technological developments make GIS a tool available to almost any individual. The skill of the future lies in the interpretation of the data and in their management in such a way as to meet the needs of customers, institutions and communities. Therefore, management skills will be a key demand in the future surveying world.

Taking a land management approach to surveying education, there is a need to change the focus from being seen very much as an engineering discipline. There is a need for a more managerial and interdisciplinary focus as a basis for developing and running adequate systems of land administration.

Surveying and mapping are clearly technical disciplines (within natural and technical science) while cadastre, land management and spatial planning are judicial or managerial disciplines (within social science). The identity of the surveying profession and its educational base therefore should be in the management of spatial data, with links to the technical as well as social sciences.

The systems of land administration have moved away from being "provider" driven to now being "user" driven. They are interdisciplinary by nature and they will require skills for management and problem-solving in order to serve their clients. The ability to access, to interact with and to contribute to a wide range of public and private databases at a distance will become the norm in many areas of surveying. Again, this will change the skill-base of the surveying workforce, the structure of the organisation and, especially, the tasks of those surveyors holding managerial responsibilities.

There is no doubt that the main challenge of the future will be that the only constant is change. To deal with this constant change the educational base must be flexible. The graduates must possess skills to adapt to a rapidly changing labour market and they must possess skills to deal even with the unknown problems of the future. The point is, that professional and technical skills can be acquired and updated at a later stage in ones career while skills for theoretical problem-solving and skills for learning to learn can only be achieved through the process of academic training at the universities.

4. EDUCATION, RESEARCH AND PROFESSIONAL PRACTICE

A successful educational system depends on a comprehensive interaction between education, research and professional practice. This dynamic interaction is shown in Figure 2 below.

Practice may be defined as specific fields or tasks within society that conform professional functions which are carried out by academically trained persons, e.g. surveyors or civil engineers. In a society of increased complexity one has to continually face new problems and new challenges in practice. The traditional way to deal with these challenges is through in-service training, professional seminars, publication of articles, etc. However, this method of development is a rather slow process. The answers, or even the problems themselves, may no longer be of current relevance when the solutions are found. And, at the same time, society is still developing new problems which require new solutions. The answers to the challenges are no longer to be found only within the profession itself.

Therefore, in order to make improvement research and education should be involved in the development process in order to establish a dynamic interaction as shown in Figure 2. Research is needed to produce theoretical answers, and interplay with education is needed to produce graduates who are capable of producing practical answers by applying new knowledge and skills when dealing with the new and unknown problems of the future.

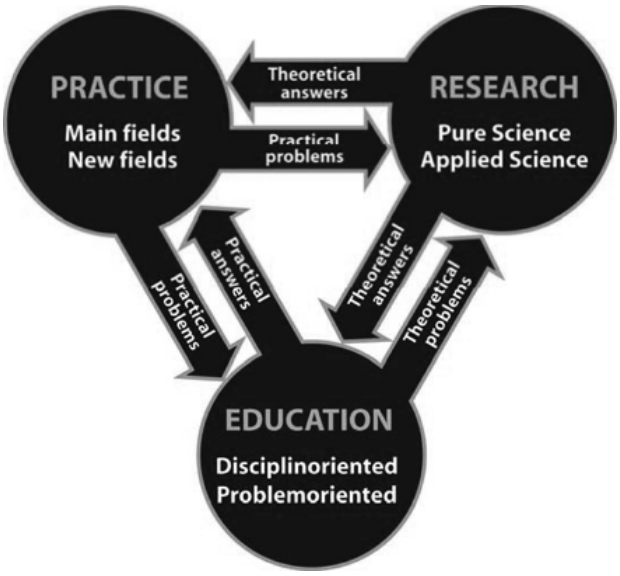

Figure 2: The interaction between education, research and professional practice (Enemark, 2007; Kjaersdam & Enemark, 1994).

4.1 Educational innovation

Traditional higher education has been focused on rule-based disciplines with independent identities in their own contexts. In the discipline-oriented education, the special disciplines and theories, which are considered necessary / relevant for the specific subjects, are normally taught by means of set textbooks and lectures. The students become experienced in the use of these disciplines and theories through the exercises and case work that support these theories. The aim is specific knowledge in certain fields and standard solutions to standard problems. This system functions reasonably well in a stable society where the individual functions and tasks are reasonably standardized.

Problem-oriented education, however, is based on working with relevant, current and unsolved problems from society / industry / real life. By analysing the problems in depth the students learn and use the disciplines and theories which are considered necessary and relevant to solve the problems posed, i.e. the problems define the subjects and not the reverse. Organizing problem-oriented education through project work allows groups of students to choose problems and to try to analyse and solve them. Through the project work the students should acquire the necessary basic knowledge by means of literature and lecture courses and, at the same time, develop the ability to formulate, analyse and solve relevant problems. In principle, it can thus be ensured that the graduates are capable of handling also the unknown problems of the future.

Educational innovation can then be achieved by being aware of the necessary dialectics between discipline and problem oriented education. The disciplines and their related theories are necessary for the graduates´ fundamental academic and professional basis. On the other hand, the problem oriented project work is necessary in order to understand the interdisciplinary character of the problems in real industry / society / life, and to enable the graduates to deal with the new and unknown problems of the future. The aim is broad insight into and understanding of the connections between different fields and skills in order to be able to function in an ever-changing and increasingly more complicated society.

4.2 Learning to learn

A main challenge of the future will be to accept that "the only constant is change". To deal with this constant change the educational base must be flexible. Graduates must possess skills to adapt to a rapidly changing labour market and they must possess skills to deal even with the unknown problems of the future. Professional and technical skills can be acquired and updated at a later stage in one's career while skills for theoretical problem-solving and skills for "learning to learn" can only be achieved through academic training at the universities.

A number of research studies (e.g. Coleman, 1998) have confirmed that students retain only 10 per cent of what they read and only 20 per cent of what they hear. However, if a problem is simulated, then up to 90 per cent of the lessons learned may be retained. This finding is behind the shift in the pedagogical doctrine toward project work and problem- based learning. It emphasizes learning instead of teaching. Learning is not like pouring water into a glass. Learning is an active process of investigation and creation based on the learners` interest, curiosity and experience and should result in expanded insights, knowledge and skills.

A consequence of this shift from teaching to learning is that the task of the teacher is altered from the transferring of knowledge to facilitating learning. Project work also fulfils an important pedagogical objective. Student must be able to explain the results of their studies and investigations to other students in the group. This skill appears to be vital to professional and theoretical cognition: Knowledge is only established for real when one is able to explain this knowledge to others. In traditional education the students restore knowledge presented by the teacher. When the project organized model is used, the knowledge is established through investigations and through discussion between the student members of the project group, and mainly without the presence of the teacher.

5. PROJECT-ORGANIZED AND PROBLEM BASED LEARNING

The Problem Based Learning (PBL) approach applied at Aalborg University is both project-organised and problem- based. In order to provide for the use of project work as the basic educational methodology the curriculum has to be organised into general subjects or "themes" normally covering a semester. The themes chosen in a programme must be generalised in such a way, that the themes in total will constitute the general aim or professional profile of the curriculum. The themes must provide for studying the core elements of the subjects included (through the lecture courses given) as well as exploring (through the project work) the application of the subjects in professional practice. (Enemark, 2007; Kjaersdam & Enemark, 1994). The principles of project- organised and problem-based learning are shown in Figure 3 below.

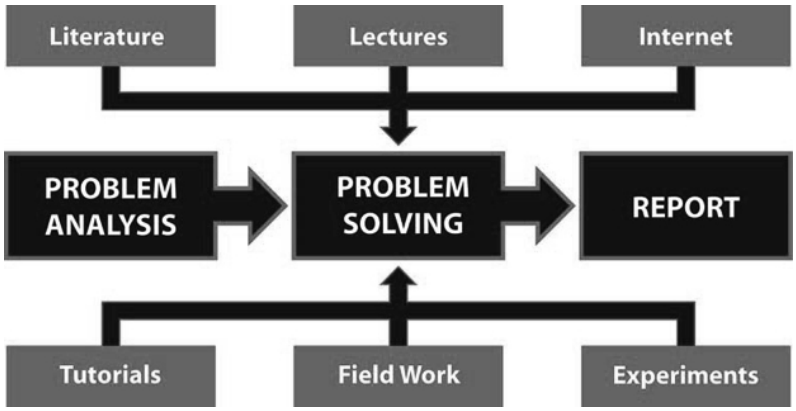

Figure 3: Principles of project-organised and problem-based learning (Enemark, 2007; Kjaersdam & Enemark, 1994).

Real life problems are not defined in surveying / engineering terms. Therefore formulation of the problem in surveying / engineering terms is important before starting the problem solving problems. Through this process the students also develop skills for communications and documentation of the results – as is the case in real life.

Project-organized means that traditional taught courses and labs is replaced by project work assisted by lecture courses. The project-organized concept moves the perspective from description and analysing into synthesizing and assessment. The concept is based on a dialectic interaction between the subjects taught in the lecture courses and the problems dealt with in the project work. Each term has a basic structure containing, in principle, equal distribution of lecture courses and project work. But the study-time is dominated by lecture courses at the beginning of the term and by project work at the end. The project work is carried out by groups of four to six students having a teacher appointed as their supervisor.

Problem-based means that traditional textbook-knowledge is replaced by the knowledge necessary to solve theoretical problems. The problem-based 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 former is normally applied in first half of the curriculum where the necessary disciplines are taught in the lecture courses. The latter is applied in the second half of the curriculum and is supported by lecture courses presenting the necessary theories within the specific professional areas. 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"

5.1 Curriculum design

In order to provide for the use of project work as a basic educational element the curriculum should be organised in general subjects or "themes" normally covering a semester. The themes chosen in a programme must be generalised in such a way, that the themes in total will constitute the general aim or professional profile of the curriculum. The themes should provide for studying the core elements of the subjects included (through the lecture courses given) as well as exploring (through the project work) the application of the subjects in professional practice. The curriculum for educating chartered surveyors in Denmark (Figure 4) may be used as an example to illustrate the selection of themes as well as to explain the adaptability of the educational model.

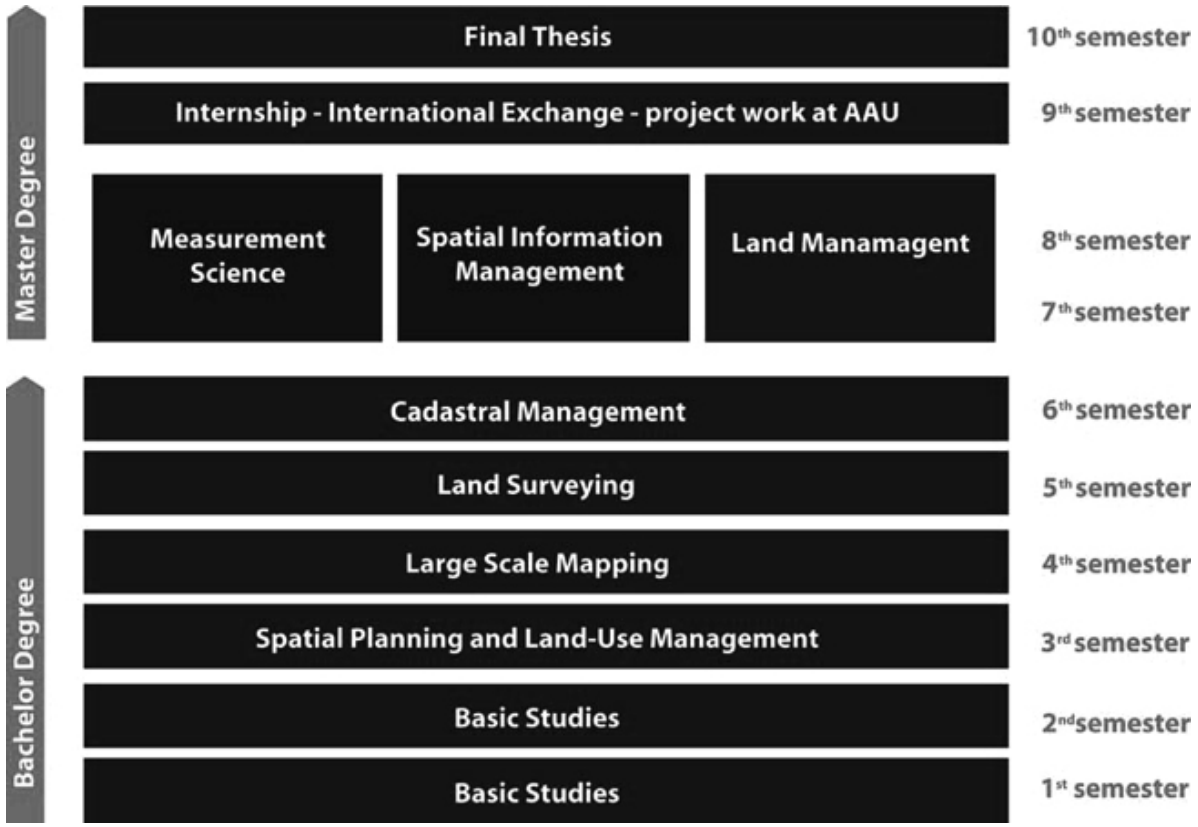

Figure 4: The curriculum for educating chartered surveyors at Aalborg University, Denmark (Enemark).

The professional and discipline oriented approach dominates the lecture courses given in the undergraduate studies, while the theoretical and scientific approach dominate lecture courses given at the graduate level.

The aim of the project-work is "learning by doing" or "action learning". The professional skills are established during the discipline-based project-work, which is dominating at 3-6 semester, while professional cognition and the methodical skills are established during the problem-based project-work at 7-10 semesters where the ability of carrying out independent investigations on a scientific interdisciplinary basis is trained. Also the ability of presenting independent conclusions and the ability of finishing the project in time is trained. In fact the process of the project-work at this stage is very similar to the problem-solving process in practice.

6. THE EDUCATIONAL PROFILE OF THE FUTURE

The developments as discussed above have a significant educational impact. There is a need to change the focus from being seen very much as an engineering discipline. There is a need for a more managerial and interdisciplinary focus. The strength of our profession lies in its multidisciplinary approach.

Surveying and mapping are clearly technical disciplines (within natural and technical science) while cadastre, land management and spatial planning are judicial or managerial disciplines (within social science). The identity of the surveying profession and its educational base therefore should be in the management of spatial data, with links to the technical as well as social sciences.

The future educational profile in this area should be composed by the areas of Measurement Science and Land Management / Administration and supported by and embedding in a broad multidisciplinary paradigm of Spatial Information Management. Such a profile was promoted at the FIG / CLGE seminar on Enhancing Professional Competence of the Surveyor in Europe, held in Delft, November 2000, and increasingly it seems to become generally accepted worldwide. The profile is illustrated in figure 5 below (Enemark & Prendergast, 2001).

The universities should act as the main facilitator within the process of forming and promoting the future identity of the surveying profession. Here, the area of GIS and, especially, the area managing geographical and spatial information should be the core component of the identity. This responsibility or duty of the universities, then, should be carried out in close co-operation with the industry and the professional institutions.

Both in Europe and in USA there are examples of surveying programs being closed down due to the fact that they have insisted on maintaining the traditional technical focus and have not changed to comply with a more interdisciplinary approach. On the opposite, programs that have changed to comply with a broader and more interdisciplinary approach seem to flourish.

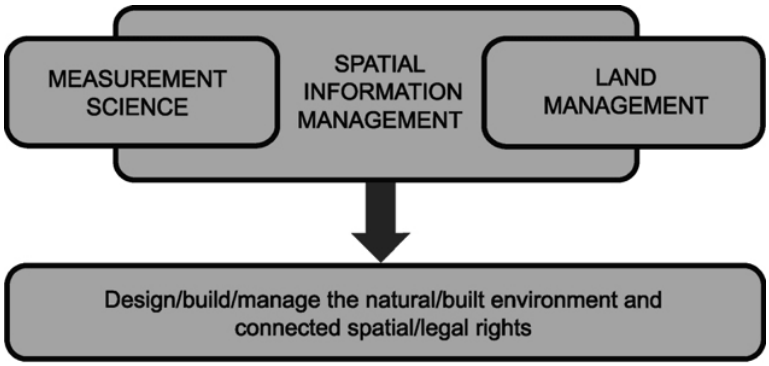

Figure 5: The educational profile of the future (Enemark & Prendergast, 2001*)*.

The affiliation with engineering science has served the surveying discipline well. However, the future will possibly rather point at an alliance with Geography based on Spatial Information Management and focusing on Land Management. There will still be a need for teaching the basic skills within measurement and mapping, and it should still be possible to specialize within these areas. We must, however, be aware that the GPS technology makes these disciplines available also for many other professions and for non-professionals as well.

7. FINAL REMARKS

Land administration systems, in principle, reflect the social relationship between people and land recognized by any particular jurisdiction or state. Land administration activities are not just about technical or administrative processes. The activities are basically political and reflect the accepted social concepts concerning people, rights, and land objects with regard to land tenure, land markets, land taxation, land-use control, land development, and environmental management.

Sustainable land administration systems provide clear identification of the individual land parcels and land rights attached to these parcels. This information on the people-to-land relationship is crucial and plays a key role in adaptation to climate change, management of natural disasters, alleviation of poverty, and management of rapid urban growth. By applying this land management profile to surveying education, this paper suggests that there is a need to move away from an exclusive engineering focus toward adopting an interdisciplinary and problem-based approach to ensure that academic programmes can cope with the wide range of land administration functions and challenges.

It should be recognised that the only constant in the future is change. To deal with such significant change the educational base must be flexible. The graduates must process skills to adapt to a rapidly changing labour market and they must process skills to deal even with the unknown problems of the future. Therefore, skills for learning to learn have become increasingly essential.

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