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MAPS AND GEOGRAPHIC INFORMATION
IN A LIFELONG LEARNING PROCESS

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When the winds of change are blowing, some build windbreaks, while others raise windmills (old Chinese proverb)

This paper is based on the changes which characterise the Danish society at present by way of increased globalisation and regionalisation, a new structural reform and implementation of e-Government (digital management). All the mentioned changes will demand new competences which among other things may be acquired through a systematic supplementary and further education. This article focuses on what universities -- especially Aalborg University – as well as alternative learning methods such as distance education via the Internet can offer to Map and Geodata[1] people.

INTRODUCTION

Increased globalisation means great challenges to Danish society[2], especially within the business sector. Some believe globalisation leaves a negative impact in that other countries have become more capable, with a resulting increase in competition. Or manpower abroad is cheaper, which means that many enterprises choose to move their production abroad. But globalisation also leaves positive traces because we have to be even more capable, smarter and more innovative than the other countries.

The development within the map and geodata business (private as well as public) is like the development within other businesses. Here you may then choose a negative angle and consider the development as confused and alarming or you may choose a positive angle and consider the development as challenging and full of possibilities. A condition for handling the development in a positive way is readiness of the employees to learn new things and the ability to use existing knowledge in new contexts. The alternative is employment of more highly educated map and geodata people with an academic background.

Politicians and the two sides of business sector, management and labour, have a partial answer to the previously mentioned negative and positive effects and angles. They quite realise that knowledge in the form of ideas and creativity is the only resource we have to compete with. Consequently, we are all committed to *LifeLong Learning (LLL)* and *Continuing Professional Development (CPD)*. What you learn in youth unfortunately does not hold for life, even though your daily work is indirectly a continuous learning process. The goal is to create a basis for lifelong competence development, further qualifications and education for everybody in the labour market so that we can keep a little ahead of "the others" all the time.

But there are also regional and local challenges in Danish society which will influence the map and geodata sector. Besides the general technological development it is:

- EU's draft directive INSPIRE
- the draft of the government around e-Government and e-Governance and
- the coming structural changes in the form of a local authority (municipal) and county reform.

In our present society the use of maps and geodata runs across frontiers. This demands common initiatives like the current preparation of the EU directive for the *INfrastructure for SPatial InfoRmation in Europe* (INSPIRE) (www.ec-gis/inspire/). The INSPIRE directive will in time have a growing influence on the Danish map and geodata sector.

The goal of *e-Government* of the Danish government is an efficient and modern public sector close to the citizen and with extensive self-service solutions (www.e-gov.dk). In that context it is expected that all data with a geographic dimension (maps and geodata) will be an everyday tool for the public sector, enterprises, and the common citizen.

The public sector in Denmark has, as mentioned, been burdened with many new tasks and challenges, but both the state, county and local authority structures have not kept up. Many, especially local authorities, are simply too small to rise to the tasks that a modern digital society has to accomplish. The Danish government therefore does not think that the present local authority structure is prepared to handle the great expectations from, among others, the citizens about improved efficiency, better service and increased democratization in public administration. *"The new Denmark"* is Denmark's greatest social reorganisation during recent years. "The new Denmark" is a comprehensive structural reform (www.im.dk/publikationer/strukturaftale/index.html) which will be implemented in larger administration units, partly by closing down counties and establishing new larger regions with limited task handling, partly amalgamations to larger municipalities with corresponding increases in task handling.

LEARNING IS NOT FOR LIFE BUT ALL LIFE LONG

At the end of August 2004 the Danish government invited the two sides of business to a discussion of how, among other things, to prepare a strategy for Denmark to meet the moving-out of workplaces to low pay areas such as the Far East. Production is moved while the development departments are expected to stay in Denmark. The latter will demand a highly educated and competent manpower, but also a flexible enterprise or organisation that is capable both of attracting and keeping competent employees and of countering increasingly harder competition. We also recognize the situation from the map and geodata business /Symposium, Aalborg, 2004/.

GIS (Geographic Information Systems) is today a part of the IT strategy of many private businesses and public organisations. In future the need for digital geographic information (maps and geodata) will grow considerably, and new and different tasks in connection with the new initiatives of the Danish government will be created. In my view all this initiatives will demand a greater theoretical knowledge of the whole field of Geographic Information Science (GISc.), along with further education of many map and GIS employees. But the increased spread of geographic information also means that these employees are no longer typically people with a map and geodata background, but people with widely different backgrounds. Also the common citizen has to be trained to meet the demands in connection with e-Governance /Brande-Lavridsen, Hanne, 2003). Therefore primary and grammar schools have started introducing GIS and mapping in their timetables.

The means to meet the growing demands of society is to build a system of *continuing education*[3] (lifelong learning and supplementary education). This has to take place realising that experience and competences acquired through daily work cannot, as suggested previously, stand alone, but must be updated and developed to remain current. Lifelong learning is therefore a necessity, both to one's own execution of a profession, but also to the continued existence and development of the profession.

THE ROLE OF THE UNIVERSITIES

The Danish Minister for Science, Technology and Development declared in the summer of 2004: "*The enterprises of the knowledge society are deeply dependent on current updating of competences and supply of knowledge from the research of the universities".* At the same time he did, however, add that: "*Supplementary education must be easily accessible to a still larger extent and must be targeted at the needs of different trades and employees"/Jyllandsposten 2004/.*

The Danish universities actually have become aware of the serious need of the highly educated, in particular, to become more competent. At the same time the universities have become better at adapting themselves to these new tasks in cooperation with lines of business and the trade. However, the competition from foreign universities lies in wait because, based on the IT-based communication possibilities of today, time and place are no limitation. Universities may, in principle, be placed anywhere in the world at the same time as they can be open 24 hours a day, seven days a week.

In spite of the competition the number of persons who have completed master's and bachelor's degrees respectively, or other educational courses at a university, has increased strongly for the last five years. About 90 master's courses are now being offered, and one of them is the master's degree in Geo Informatics (MTM), to which I shall return. But first I will describe different principles for teaching and learning.

LEARNING METHODS

Education including supplementary and further education at universities can be offered according to different pedagogical principles. We all know the traditional *on-site education*, where people meet face to face with their teacher in a physical room, and where it is the teacher who draws and tells. It can also be called *teacher-controlled teaching*.

Learning has, however, for the last 15 years replaced the word *teaching*. The replacement reflects the pedagogical principle that it is the student himself who has to obtain and build up knowledge and not only the teacher who transfers his knowledge to the student (understanding before rote learning). Teaching and learning do, however, belong inseparably together, teaching being the activity that creates the frames for and makes possible the learning of the students. It is called *action- or activity-based learning*. The keywords here are communication, dialogue and co-operation. On-site education can also take place as activity-based learning.

Then we have *distance education* [4] or *distant learning* [4] options which today are inseparably connected with the use of the computer medium and the Internet. We call it *IT-, network-* or *web-based education* or *e-learning* [5]

Forms of education over the Internet are a varied crowd, from well-known and conventional to complex, dialogic forms. Within distance education three "standard models" can be pointed out:

- pure distance education,
- synchronous distributed education and
- the self-tuition model.

In the case of *pure distance education* the teacher and the student never are in the same room at the same time. Pure distance education options are mostly skill-marked courses (sort of letter courses over the Internet), where the tasks and exercises have to be returned at certain times. Otherwise the course is characterised by great flexibility in time and space.

Synchronous distributed education is characterised by the fact that certain activities are fixed in time and place in advance. The place does not necessarily have to be the same address. An example is online video conferences or lectures, where the students may either meet in selected places or use their own PCs with network access. This form does, however, demand investments in equipment and programs.

In the *self-tuition model* the student works, as in the case of pure distance education, alone with the subject matter and is therefore independent of time, place and persons. Self-tuition may be based on reading of relevant literature, often supplemented with reports of varying kinds, but may also include discussions via the Internet with fellow students. The self-tuition model may also contain group work and other forms of co-operation via the Internet.

While the first two models are mainly based on one-way communication, the last plans for a dialogue.

Pure network-based distance education is most common in most places, where education, task delivery and task solution is quite automatic. This form of education has, however, not gained much ground in Denmark, where a mixture of on-site learning and distance learning after the self-tuition model, collectively called *blended learning*, is regarded as the most fruitful learning and co-operation model.

WHAT CAN AALBORG UNIVERSITY (AAU) OFFER?

As I come from AAU (www.aau.dk) I will take the liberty of focusing on some of the services AAU offers. But other universities in Denmark practise additional arrangements.

Over more than ten years AAU has developed a distance education concept to offer a large number of supplementary and further education opportunities. These are available to people not only from Denmark, but potentially from the

whole English speaking world. Because of our present communication possibilities, place and time are, as mentioned previously, no limitation.

All education at AAU is research-based, in part making it possible to get a more professional overview, and in part allowing more in-depth study. It is frequently possible for students/learners[6] to get abreast of development within the fields of the teachers' research.

The educational form for distance education opportunities is generally IT-based blended learning in the form of self-tuition with incorporated weekend seminars, typically three to four times a year, where learners and teachers meet physically for introductory course sequences. In the time between seminars communication with teaching staff takes place via a web-based *Virtual Learning Environment (VLE).*

The major part of the course- and education offerings is *qualifying*, as the offerings are based on educational directives and study regulations *(Curriculum Based Continuing Education).* To maintain a certain level of achievement, a qualifying examination at grammar-school or bachelor level is always demanded. However, most courses set further admission requirements which vary according to the type of education.

Upon qualifying, study sessions of a *longer duration* include:

- full-time bachelor or master programmes organised as part-time (whole on half) and
- the part-time master educations

both belonging under the Ministry of Science, Technology and Development) and

- the part-time bachelor /diploma educations

belonging under the Ministry of Education).

The long-cycle sessions of study primarily apply to a small crowd who are prepared to invest both time and money to the benefit of their workplace.

Educational sessions of a *shorter duration* include:

- single subject packages (e.g. modules from the master educations),
- the Empty Place Scheme,
- the Lifelong Learning concept and
- user defined continuing education.

All forms of education at AAU have, since the start of the university thirty years ago, had problem-oriented, project-organised pedagogy *(Problem Based Learning (PBL))* as one of the main principles for their structure. This is also the case regarding the network-based master education sessions, where it is also expected that the project work takes place in groups of two to four people. The philosophy behind the problem-oriented project work is that through this educational concept the students' or learners' curiosity and motivation are "built into" the very process of developing knowledge. In this way learning is confronted with constant repetition of content. An offshoot of PBL is *Work Based Learning (WBL)* which is mentioned later under specially designed course sessions.

The following is a short presentation of *some* of AAU's lifelong- and supplementary education sessions.

The Master Education in Geo Informatics (the MTM Education) at Aalborg University

Some of the master educations at Aalborg University are specially developed with one supplementary and further educational purpose in view. The teaching is arranged part-time so that it is possible to study and work at the same time.

The Master Education in Geo Informatics is a qualifying education within Geographic Information Technology (GIT) and GISc. The programme lasts two years and is set to 60 ECTS, corresponding to one year of full-time study (www.aau.dk/evu/udd/msgeo.htm).

The programme, which builds on new study regulations from 2003, is based on e-learning combined with weekend seminars where learners and teachers meet physically. In support of distance education a VLE program called FirstClass is used, which is installed by each learner on his PC. The program makes it possible to establish a so-called *virtual*

classroom, where the teachers can be asked questions, literature can be commented on, discussions can be carried through with fellow learners, etc.

The MTM education primarily applies to people with various scientific background (surveyors, geographers, biologists, historians, cartographers etc.), but also people with other basic educations can be admitted. Common to all is having to deal with Geographic Information (map and geodata) or Geographic Information Systems (GIS) at a practical level at all times.

Admission at the master education implies a relevant advanced education at least at bachelor level. Moreover, you must have at least five years of relevant occupational experience, mainly from the map and geodata business, as well as good proficiency in English, because among other things most of the literature used is in English.

The study work can be divided into two different activities: course work and problem-oriented project work. The broad of the education is secured through *general courses* (*SE courses)* and the depth through the project work and *project-related courses (PE courses)*. SE courses are examination courses which are laid down in the study regulations, while PE courses may vary in number and content from year to year. Examples on SE courses are: Introduction to GI and GISc., GI and GIS applications, Data Quality, Data Modelling, Database Design and Advanced Analyses. Examples on PE courses can be Geo-communication (cartography), Geo-visualisation, Geo-statistics, GI in a social context (NSDI) and Standards and Specifications.

The first study year comprises introductory course lectures, succeeding periods with self-tuition, a study tour as well as a *problem-based project work* with the theme: "Geographic Information and Geographic Information Systems – theory and technology". The project is to be considered partly as an introduction to the problem-based project work, partly as a clarification which problem/topic you wish to carry on the second year.

The second study year again comprises course activities and project work. The project (*the master thesis)* is prepared under the theme "Geographic Information and Geographic Information Systems – design and development" and now has the character of a proper development project. Learners base their projects on a specific problem (cf. the project of the first year) within the geodata field, preferably with roots in their own subject area, and prepare a specific proposal and an action plan for an information system. The projects often do not stop with the proposals - the information system becomes functional "in business".

Single subject packages

It is the plan of the Danish government that as many as possible continue in supplementary or further education with a bachelor or master education as the goal. But it must also be admitted that it may be difficult to persuade especially a small business or public administration to set aside half of working time for regular study activities. The alternative is that the employee receives education in his spare time and that is hard!

For many years it was only possible to follow the full master course in Geo Informatics, but during recent years it has, in light of the above, also been possible to follow packages of two or three courses (one course ~ 1 ECTS). This, naturally, attracts those who cannot spare time and effort for a full master course.

The empty place scheme

If you have the possibility of daytime study *the empty place scheme* can be a relevant supplementary and further education option. Under this scheme you can, for example, follow a course or a semester. This is undertaken equally and together with the ordinarily matriculated students. The condition of being admitted is that there is a free place at the desired education or course module and that you have the necessary professional and study qualifications. A relevant semester under this scheme could be SIM (Spatial Information Management), the new specialisation in GIS at the master studies of Surveying and Land management or Geography.

Lifelong Learning

A good example of on-site education is Aalborg University's special "lifelong learning" concept which last year could celebrate its 10-year jubilee at Aalborg University. Every year at the end of August 400 to 500 participants meet for a week to listen to the latest news of the University's the research. Earlier the arrangement was primarily for graduates of

the university, but lately it has also been possible for other interested persons to participate. In this way the participants represent many trades and functions.

The professional dimension in LLL is of course the most important, but the possibility of meeting old fellow students is also an important part, as is the opportunity to establishing new or strengthening old networks.

The communication of knowledge is, however, two-sided in the sense that the researchers also learn about what is happening outside the walls and in this way may adapt future research and teaching to the needs and wishes of the workplace. The lifelong learning concept is, contrary to the other mentioned educational offers, free of charge. Still a token amount is paid to cover meals and course materials.

User defined Continuing Education or Work-based Learning (WBL)

If a firm, a company or an organisation is in need of specific competences it is possible to draw up a contract to provide a specially adapted course, which is based on the practical and theoretical abilities and needs of the participants. The supplementary and further education will in this way be more specific and directly integrated into the organisation. The very learning process takes place as part of the daily work, and an immediate use of the new knowledge takes place in work-defined tasks. Such courses have been held, for example, for map and GIS employees in the road sector as well as for employees at Greenland's surveying and mapping. The courses can either be held at the workplace, at the University or through distance learning.

Geodata library

One of the conditions of being able to offer supplementary and further education within the map and geodata field is that relevant educational resources are available. This applies to both data sets and programs. The geodata library of Aalborg University (www.geodatabiblioteket.dk) today has at its disposal nearly all national geographic data sets and digital maps for use in connection with area, nature, resource and environmental management. The data sets are all available to researchers, students, learners and course participants attached to the university.

Practical courses at the Internet

Even though this article deals with the offerings of the universities (and especially AAU) to map and GIS people I shall also draw attention to the use-oriented courses offered, partly by software suppliers, partly over the Internet. One of the best visited is ESRI's Virtual Campus, which offers a wide range of GIS courses, many of which are even free. The pedagogical approaches here reflect that the courses are not aimed in particular at people with an academic background, but also to people with a practical background.

FROM BRICK TO VIRTUAL CLASSROOMS

The conditions of co-operation and communication in virtual rooms are of course marked by the possibilities and limitations of the virtual surroundings.

It is not a natural law that you can just jump out into a network-based distance education. Quite special demands are made on both teachers and learners. First of all, you have to learn to communicate without physical contact, but primarily by means of the written word. Apart from being more time-consuming it is also a general experience that it may be difficult to get on in writing in a virtual environment, because the communicative means of expression are greatly reduced. You lose the advantage of the face-to-face situation in the form of gestures, eye contact, body carriage, etc. when you wish to express yourself and to interpret a teacher's or a fellow learner's statements and intention. Therefore you must be tremendously careful about the usage of your written messages. Irony is, for example not always understood as you intend.

The technology of today has, however, given us new possibilities of communicating via the Internet by means of sound, images, videos, etc. In the MTM education, for example, online, synchronous video conferences are used in connection with course activities led by foreign teachers. Until 2003 video conferences were based on the relatively expensive ISDN telephone technology, but in 2003 a shift to the nearly free IP Internet technology took place. At Aalborg Univer-

sity we have, during recent years, also been experimenting with courses based on asynchronous video conferences/streamed video (combinations of PP-slides, speech, text, film, etc.), which are controlled interactively by the user and therefore can be played at one's own speed and convenience. Access to the courses requires an access code or password. This type courses has met with such success that more supplementary and further educational courses will be offered according to that model.

At the MTM education group work has a high priority. However, group work makes heavy demands on the ability of the learners to co-ordinate, co-operate and share knowledge. Experience shows that group-based project work is not a success straightaway in the virtual room and that a great deal of energy must be used to make network-based co-operation in a group work. More MTM learners are also experimenting with network telephony, use of web cameras, etc., but it is still written communication that dominates study. To meet face to face at regular intervals is therefore very important. It is much quicker to make a decision and you learn to know each other in quite another way. With this background we must realise that some learners work best on their own and that is of course all right – but it costs extra resources from both the learner and the supervisor to complete a project and reach the goal.

In good distance teaching there is a higher degree of interactivity than in traditional teaching at the same time as the learner is more responsible for his own learning. At the MTM education we use, as mentioned, a conference system in daily communication. But, while the efforts of learners in the conference are often ideal at the beginning, unfortunately the level of activity falls quickly, and discussions via the network stagnate. This does not mean that the learners do not follow what happens in the conference (this can be read from the historics in the conference system), but proper contributions are few and they often come from the same persons. This does not always imply discontent with the study, but most often a pressed everyday life outside the study.

Not all are equally motivated for supplementary or lifelong and supplementary education. I have often stated that there are large differences in the ambitions of learners. Some are eager to learn and curious, while others are only interested in that which affects their profession and their everyday life. This may be due to the fact that they do not have the expected level of methodological or scientific background.

But it is not only the learners who are to learn to learn through distance education. The teachers also have to learn to use the medium in his teaching. Here most teachers (my selves included) must look nearer home and admit that we have been pedagogically autodidact. It is only recently that courses are being established in distance teaching/distance learning. But it is no secret that it can be a difficult process to adapt from old and rooted habits to new behaviour patterns.

In spite of these beginner difficulties and limitations in connection with network-based teaching (*e-teaching*) I think that this educational form is one of the ways ahead, partly to reach the goal about "being a little ahead of "the others" all the time" and partly to meet the wish of the Minister of Science that "*supplementary education must be easily accessible ...*".

CONCLUSION

In concluding I cannot help but quote one of my previous learners (and teaching colleagues), in the magazine "Målebladet", after finishing the master education in Geo Informatics: *Life has not been quite the same since ... You get another impact as human being, teacher and colleague, when you build on your professional knowledge. My self-confidence has got an enormous lift and my personal development a kick in the pants. I have become a happier person and in the wake of this a better colleague and teacher.*

So the lifelong learning process does not have to be a miserable duty, but can also be a rewarding experience!

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FOOTNOTES

[1] Geodata/geo-information is often used as synonym of geographic data/geographic information or (geo)spatial data/(geo)spatial information. Data is raw facts (numbers, letters etc.). Information is adapted and structured data. Maps are visual forms of geo-information.

[2] With an area of 43,080 sq. km Denmark is the smallest of the Scandinavian countries. The great majority - about 85% - of the country's 5,3 million inhabitants lives in towns or urban areas, and approximately one third of the total population lives in the metropolitan region of Copenhagen.

[3] Continuing education is defined as: courses, programmes or organised learning experiences usually taken after a degree is obtained to enhance personal or professional goals.

[4] Distant education or distant learning is the method of teaching in which the learners (students) are not required to be physically present at a specific location during the term. We can use regular mail to send written material, videos, CDROMs and similar to the learners. Nowadays Virtual Learning Environments (VLE) as e-mail, conference systems and the Web are mainly used.

[5] E-learning is defined by the EU Commission (2001) as: The use of multimedia technologies and the Internet to improve:
- the quality of teaching,
- make access easier to teaching resources and services,
- exchange of knowledge and
- cooperation via information and communication technology.

[6] Within LLL, CPD etc. the word *learner* is used for adult students.

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Latest her research activities have been centred around e-Government with special emphasis on Spatial Data Infrastructures and Citizens use and understanding of map and geoinformation on the Internet.

Additional information: http://www.land.aau.dk/~hbl/