INTERACTIVE LEARNING IN THE CLASSROOM – NOT A COMPETITOR BUT A PARTNER FOR E-LEARNING

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INTRODUCTION

Today all advanced and ambitious universities are developing virtual learning applications. Virtual university, e-learning is expected to solve many acute resource and substance problems in the academic world. However, Internet-based education seems to suit only for a certain part of learners and teachers and it seems to solve only a certain part of university problems. Also it seems to have some disadvantages in developing human communication towards something what we do not want. Internet is a wonderful tool in connecting huge amount of people and transferring amounts of data very fast. However learning and teaching is much more than those. Sometimes learning needs inspiration and enthusiasm as well as certain atmosphere that can be created only by human experienced lecturers and their personal presence. On the other hand sometimes students need more a team than a computer and more concentrated thinking than lots of new information. University students are in most cases young people who need very much good human models and tutoring.

Problem based learning (PBL) has also been introduced since several years and in many university courses it suits very well, it activates the students and give a natural learning motivation. PBL has been introduced in order to create an active learning process, at the same time it also releases teachers from routine lecturing and preparation of lectures. Sometimes in problem based project work students, however, feel that they are just left alone while the teachers want to use their time to something else - students would like to have more support. Also the experiences show that both problem based project work and Internet based individual learning suit very well to the most talented students while those who are less motivated or not so well oriented will lose track of the studies.

In this paper a short description about interactive learning methods in the classroom is given and also its role in the Internet-based teaching is outlined. Interactive learning in the classroom is problem based learning and also a version of project work. The difference between pure project work is that in most cases the teacher is available all the time, in the background. Also the “project” can be very short, sometimes lasts only one session. Internet based learning can be used, but it is only a data source, not the main method. The role of the teacher is emphasized. The argument is that those university teachers who have the ability and skill to be “real teachers” in the classroom should be encouraged to develop and preserve their skill. We want to show some examples in which interactive learning has given better results than other new methods.

PROBLEMS IN VIRTUAL ACADEMY EDUCATION

There are certain general problems in university education today that most universities have tried to solve by Internet-based learning. Virtual academy is the popular name for "an university which is based on information network". Haggrén and Munk Sörensen gave a good overview about virtual academy (Haggren, Munk Sörensen, 2000) in their Prague FIG Working Week presentation. In the following text there are some main points from this article:

- Efficiency is seen maybe the biggest advantage of virtual academy, students do not need to travel to the university and they can also reach courses given by foreign universities – all universities do not have to create education on some special topics.
- Virtual academy covers not only education but also research and administration.
- Virtual academy in most cases is understood to be global but it can also serve local needs like communication between students and teachers (e-mail, virtual office hours) and practical activities (management of exercises).

Maybe the first thing coming to mind when virtual academy is mentioned is, however, lectures and lecture materials in the Internet. The reason for this is that one of the biggest and most acute problems in universities is the lack of resources: not only lack of money but also lack of skilled people and good learning materials. Especially in new IT –based fields like Geoinformatics and Remote Sensing where both learning materials and skilled teachers are missing it seems to be a attracting idea to use learning modules in the Internet. The problems lies only in the production of those materials, it is extremely time and money consuming. By combining expertise and by networking between universities also in the material production good curricula can be provided. Haggrén and Munk Sörensen mention New Brunswick as an example. In Finland we have started with a Virtual Academy on Geoinformatics – project, where four universities (Helsinki University of Technology and Departments of Geography at Helsinki, Turku and Oulu Universities) co-operate. Of course there are also a lot of individual units which have provided materials and courses on their own topic as well as organized their teaching and learning completely in Internet. Our own example comes from The Institute of Photogrammetry and Remote Sensing (http://foto.hut.fi).

There are good examples of very good GIS-curriculum modules in the Internet. However some problems remain from the users side – and they are: the problem of language and culture, the problem of quality and the problem of learning process itself. In the following chapters these problems are dealt with in more detail.

The problems of language and culture

All people do not speak English. However, most learning materials in the Internet are in English. On the other hand, it is not economical to develop learning applications for small groups. Language is a minor problem also for those students who have fluent English but who are not native speakers. Learning in your second language is not as easy anyway and if the student only learns for example all terminology and definitions in English it is difficult to build strong conceptual structures and mental models in the

mind. The language problem can also exist in the interactive learning in the classroom, but further in this article we show how the problem can be managed there.

Another problem is the problem with culture, both in professional and private lives. Let us take an example first on the professional side. In surveyors´ curricula there are some topics like Real Estate Law that varies a lot in different countries – in these cases there is almost no sense to produce an Internet-based learning application for global use. Another example is on the private side of human life and deals with culture: in different countries there are also different learning cultures, the role between the teacher and students is not the same everywhere. It might be confusing for a student from a conservative and very respecting culture to use an application made in a "free-and-easy" way. For example, in many countries students must address teachers very formally – and vice versa. On the other hand for example in Scandinavia students may quite often call their teachers by the first name.

Quality of learning materials

Especially in the new IT –based subjects in surveyors´ curricula, like Geoinformatics , there is a lack of acceptable scientifically based learning materials. There are a lot of books on GIS as well as a lot of learning modules in Internet, too, but not very many are acceptable at all. University education should always be based on scientific theory and approach and in the new subjects there is not yet such a basis. If Geoinformatics is taken as an example here we can see that standards of terminology and data models is just developed. But standards and basic terminology is not enough. The complete approach must be generated and that is at the moment "under construction". My opinion is that we should be very careful in publishing learning materials that have not a solid theoretical basis. In the surveyors´ curricula there are a lot of fields like Geodesy and Photogrammetry that do have tradition and fixed theoretical basis – and those fields do not have this problem which we are dealing with in Geoinformatics.

PROBLEMS IN PROBLEM BASED LEARNING

What is learning? In this paper, which is more a manifest than a scientific article, I will not make many references to literature. However, we all know that there is a lot of recent research about the learning process. Problem based learning is one new approach which supports the new understanding of learning. Stig Enemark has given many presentations in FIG conferences and seminars on PBL and he have also a lot of practical experiences on PBL in Aalborg. He defines PBL as an alternative to traditional subject based education in which "traditional taught courses assisted by actual practice are replaced by project work assisted by courses" (Enemark, 2000). The method of PBL according to Enemark is "learning by doing" or "action learning" and the goal of it is "broad understanding of interrelationships and the ability to deal with new and unknown problems". As it was mentioned before, talented and mentally mature students will make better results in this learning method than in the traditional, passive lecture listening way. However, all results in PBL are not as good. Sometimes students complain that they have to use plenty of time just in searching source materials and selecting the suitable and best ones. They feels that the teachers have just skipped their responsibilities – some might ask why universities then exist if students can learn just by doing without teachers.

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This approach to learning happens in the traditional classroom. The teacher has made a syllabus for the course and the course sessions happen normally weekly, sometimes slightly squeezed, so that instead of two hours session there is a three-four hour session and the amount of the sessions is then smaller, respectively.

Students come to the sessions that we call as "studios" like to a normal lecture. Normally the session starts with a short introduction to the theme, the lecturer gives a short presentation of the theme and the problems in it, this lasts for example one hour. The lecturer might use for example PowerPoint slides that are also printed as handouts and delivered for the students before the session. If Internet is used this material can be available there.

The second part of the session is the working part. The lecturer has prepared material and problems for the students. Students work in small groups, 2-3 persons. Each group gets one problem with the required material, books or articles. Now they have 1- 1,5 hour time to read and solve the problem, as well as prepare an ad-hoc presentation about the results. During this part students are encouraged to move to another room if they need more silence, to have a coffee break and to discuss in the group as well as to make questions. The teacher is there available, as well as dictionaries and other source books. This short working period in often quite intensive and students really try to solve the problem, because they are expected to give the presentation.

The third part of the sessions is for the presentations. Each group of students give their solution to the problem, very informally but clearly. If they did not solve the problem, the teacher will be ready to present it. Each problem is presented and then the session is closed. It the time is too short the work can continue fluently next time.

Our experiences: "Spatial Data Algorithms" in the interactive classroom way

In Helsinki University of Technology, Department of Surveying we have used this studio-learning in some Geoinformatics courses, for example a course called "Spatial Data Algorithms", in which a wide scope of algorithms is dealt with. In every session there is a theme, for example "Variations of Voronoi-diagram and their use in GIS – applications". Every group gets an article and an algorithm to be studied and explained. The materials and problems are copied for each student and I the exam they only have to know as much as is explained in the sessions by other students or the teacher.

Learning results in this course have been amazing. For example the well-known Delaunay –triangulation algorithm which earlier was difficult to learn by some students was learned by all in this method. Learning is based not only on information but also on interaction, discussion, intensive reading, slight stress because of the presentation – and most of all the personal presence of support and guidance available all the time.

MORE TRADITIONAL INTERACTIVE LEARNING METHODS, PROJECT WORK

Interactive learning happens, of course, in all problem based learning processes. The traditional PBL is normally organized as a project work. Students make project groups which get their problems, make their project plans and proceed step by step by the support given by teachers. Working is normally quite individual and there might be only some office hours available for help. Project can also be controlled more tightly and lectures can be added to the schedule. At HUT we have experienced of both of these approaches. The more guided way seems to be suitable for 2-3 year students and the more individual way for the last year-long project.

Another example: "GIS design" as a project course

In "GIS Design" course students learn how to make a feasibility study in a GIS project. They get a topic and background materials from the real environment, a company or institute. They also have a contact person in the organization whom they can interview and question. The task is well scheduled in six steps and the project lasts six weeks. Every week there is a short-lecture, lasting only 45 minutes and introducing briefly the next week task. In addition to this briefing session each group have a weekly project meeting with the teacher. They have then possibility to make questions, show their project and discuss problems. In the end of the course every group gives a short presentation and the report is also copied for the organization. In this course the teachers experience is that the need for support and guidance is varying a lot between groups. The role of the teacher is very important and his or her attitude as a consulting person, not as a traditional teacher, is relevant.

Third Example: "GIS Software Engineering" as a Project

GIS Software Engineering is the last course for Geoinformatics students. In this course, which lasts two terms, they develop a GIS application – from the problem to a prototype. Normally they use some commercial GIS platform and make their own programming either by some regular programming language (C++, Java, VisualBasic) or by using some platform related environment (MicroStation´s MDL, ArcView´s Avenue). In any case they have to make the feasibility study first, as in the previous course and then start definition and technical design of the application. There are only few lectures which are more like additional information than direct guidelines for the work. The project is made in three proto-steps with three demonstrations. The group is responsible on the result. The teacher acts like the client but also the project leader. Extra technical help is quite often needed with software and programming and this we get directly from the vendors.

The main characteristics of this course is to be as real as possible. Students meet problems which they were not lectured on. They have to redefine their problem and update the schedule. They must contact technical experts individually and also organize the project work properly. They also own their work, so they are allowed to make it for example in a company. Teachers role is very "administrative", he or she does not solve any problems, only gives hints and offers sources for help. Students´ experience is that

they learn a lot in this course. From teachers side I have to say that the results of the project groups vary from excellent to poor. Not all groups are successful at all.

CONCLUSIONS

In this paper an alternative for pure problem based learning as well as pure Internet-based e-learning has been given. The difference between the two mentioned and our approach, which we call as "interactive learning in the classroom", is that the role of the teacher is strong and he or she gives his or her knowledge and experience totally for the teaching session. The main goal is to make learning process more effective and the problem solving quicker – by giving immediate help instead of showing the way to the library or Internet. Also in this method the learning session is well prepared and all material is selected for each problem. The learning session is very intensive and sometimes stressing but the results are amazing.

Interactive learning in the classroom suits specially to subjects in which the knowledge and experience of the teacher is relevant and for example material search is difficult. We have used it until this in teaching algorithms and it seems to be very good method there.

Interactive learning is very demanding also for the teacher because he or she must be all the time ready to solve minor problems, help with Mathematics and English as well as terminology. Sometimes the teacher has to do the reporting because the task was too difficult for the students. One of the main rules is that the problem is solved fast, sometimes the work can be continued next week but it never makes a long lasting load for a student.

As stated in the title of this article, interactive learning in the classroom is not a competitor to Internet based e-learning, but rather a partner which makes learning and teaching more effective and adds the human intelligence and experience as well as communication and atmosphere to the sessions. In HUT we are going to develop both Virtual Academy and classroom methods in a balance.

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BIOGRAPHICAL NOTE

The author is working since 1988 as Professor in Cartography and Geoinformatics at Helsinki University of Technology. She has been responsible of the development of Cartography and Geoinformatics educational program which now consists of 20 educational university courses (www.hut.fi/Units/Cartography). Her main interests have been on GIS design, systems design in general, spatial data algorithms and programming, geographical data management and visualization and GIS analysis. The author has developed some learning materials (Visualization) on CD as well as a couple of hypermedia based interactive learning applications (Introduction to Computer Cartography, exercises in digitizing). At the moment the author together with colleagues is developing a Virtual Academy on Geoinformatics. The author is the Chair of FIG Commission 2 (Professional Education) and also one of the Vice Chairs of ICA (International Cartographic Association).