

6. eLearning



Electricity, electronics and environment - A web course for senior secondary schools

The number of women applying for jobs in technology is still not very high. Technology has always been considered a male industry and this is why women think it is very hard to choose technology as one's career. Information technology, for instance is considered the boys' world, which contributes to the fact that very few girls want to make a career in technology. Nevertheless, it is essential to involve women in the technology industry as they are the ones to bring a more down-to-earth viewpoint to the technological applications.

E-Girls – Towards technology project

The Laboratory of Electrical Engineering and Health at Tampere University of Technology (TUT) started a project called E-Girls- Towards technology in 2004. The goal of this three-year-long project was to increase the number of female students in technology by making it easier for them to seek their way, in particular, to the fields of electrical engineering and electronics. It also aims at promoting the girls' ICT skills and developing the policies of senior secondary schools and other schools in such a way as to promote the technical skills of girls.

An Internet-based web course, Electricity, electronics and environment, for senior secondary school students was designed in the E-Girls – Towards technology project. The web course was intended for both girls and boys but special attention was paid to the kind of things girls are interested in. It was our goal to make the material as practice-oriented as possible, because, as shown by research, women perceive technology mainly through its practical applications. Research shows that women concentrate on what the practical use is that they can get out of using a,

say, a computer, while men are interested in how the machine actually works. We tried to make the course as interesting as possible by developing it together with the senior secondary students: girls' opinions on the course content and its layout were taken into consideration.

The course was developed in cooperation with the students and teachers of Pirkkala senior secondary school. Seminars were held together with the students, where they created ideas for the content and assignments. Also the teachers contributed ideas and gave feedback on the course during its development. In addition, the cooperating companies developed the course content and the functionality of the learning environment.

The project was funded by the European Social Fund (ESF), The State Provincial Office of Southern Finland, and the state of Finland. The other partners in cooperation are: eTampere –information technology program (until the end of 2005), Fingrid Oyj, Finnish Energy Industries, The Federation of Finnish Technology Industries, the educational development services of TUT and the Student union of TUT.

The realization of the course in senior secondary schools

The first course was held at the Pirkkala senior secondary school in the spring of 2005, after which other senior secondary schools joined the project. The project was also further developed for the city of Vaasa. By the autumn of 2007 the schools having participated in the project include Pirkkalan yhteislukio, Tampereen lyseon lukio, Eurajoen lukio, Hatanpään lukio, Jalasjärven lukio, Valkeakosken lukio, Kauhajoen lukio, Kyrönmaan lukio, Teuvan lukio, Vaasan lyseon lukio, Rudolf Steiner –school in Vaaasa, Variskan koulu and Vähänkyrön yläaste.

A total of 107 students completed the course, 54 (50%) of them being girls. The students acquainted themselves with the practical side of electric systems and appliances and some health and environmental issues regarding them. The students were able to take the course while still studying in senior secondary school and if the student was to continue to study at Tampere University of Technology s/he would get credit for it in his/her study program. The course was also a part of the curriculum at TUT. After the project was over, the course remained part of the Open university education at TUT.

At the outset there was a kick-off meeting at the school for the students, in the form of conventional class instruction. The kick-off lesson was arranged at the senior secondary school of Pirkkala in 2005. The following kick-offs took place in the spring of 2006 and autumn 2006. The students completed the course as self-study and according to a predefined schedule. The course concluded with a test.

Internet lesson and tools

The web course Electricity, electronics and environment consisted of web material and assignments. The content was comprised of text and images and the different sections formed the lessons. The sections were: introduction, health effects of technology, use of electric appliances, electronic waste and how to reduce it, electric systems, electricity production and its emissions, and electric and magnetic fields and radiation. The exercise types were: memory game, crossword puzzle, combining of terms. In addition, there were true or false exercises at end of each section. A note-taking tool was available to the students, which they could use for taking notes during any of the lessons or exercises. A book written for this course was used in addition to the web material. This book included practical exercises that the students were able to do independently. The students also filled in a feedback diary in which they gave feedback and described how they had carried out the assignments. Figure 1 shows the front page of the web course. There are links to the curriculum, web lessons, feedback diary and personal details.

Figure 1.
The frontpage of
the web course



The exercises test what has been learned

The web content consisted of several exercise types, i.e. crossword puzzles, memory games and combine terms -type exercises. These exercises were not obligatory but more for self assessment to find out how they were learning. In addition, there was an practical assignment for every theme in the book. The solutions to these practical assignments were then written in the students' feedback diaries. Three of the assignments were obligatory but the students were welcome to hand in more of them if they wanted to.

The planning of the assignments started by mindstorming for themes accordant with the subject areas of the TUT lectures. The assignments were to be safe, interesting, and the students had to be able to solve them without any help from the teacher. Because we wanted to involve students in the planning phase, we arranged a kick-off seminar at Pirkkala senior secondary school, where the students suggested topics within electrical engineering that they were interested in.

We started the selection process for the exercise types by listing familiar exercise types and then gradually eliminating some of them. Both university and senior secondary students participated in the process. The tasks had to be easy to create for the web, and the students had to be able to do them without any special tools or programs. In addition, we paid attention to the special criteria for web material, for instance that people feel that reading long texts on the screen is unpleasant. Consequently, we left out certain exercise types that would have included lengthy text excerpts. Different learning styles were also considered when selecting exercise types; the assignments enable learning either by doing or reading. One of the criteria was that the exercise types should already be familiar to the students.

After choosing the exercise types, a kick-off seminar was arranged with students from Pirkkala senior secondary school. The students were then divided into groups. Each group got two tutors from the students of TUT (male and female), some of whom were former students of Pirkkala senior secondary school. The groups were then given the descriptions of the exercise types. The groups acquainted themselves with the exercises and their pros and cons. They also rated them based on their quality. To

conclude the seminar, the opinions of each group were discussed together. The most popular exercise type was the memory game while the ‘identify the research’ exercise was the least popular. The final decision about the exercises was done at TUT, based on the comments from the groups. The exercises to be used were: memory game, noughts and crosses and “combine terms”-exercise. To conclude each lesson there was also a true-false statement exercise. Figures 2 and 3 show some of the exercises and the note taking tools.



Figure 2. An example web page with a memory game and note-taking tools.

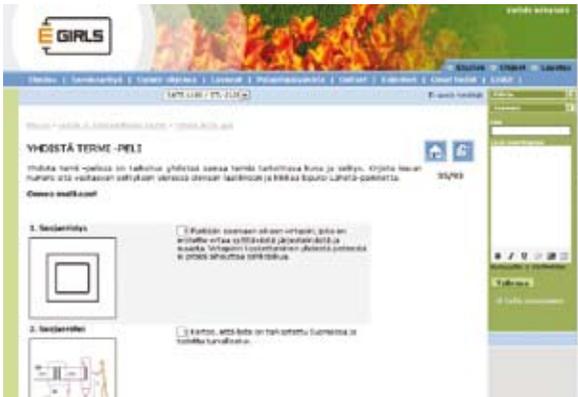


Figure 3. An example web page with a Combine terms –game and note-taking tools.

Feedback from students: an interesting and useful course

Keeping a feedback diary was a part of the course. The feedback diary was there so that the students could write what they were thinking while studying; the feelings they had or if there were confusing issues. The students were able to fill in the feedback diary after each lesson. However, it was obligatory to fill it only three times during the course. The students also answered the book's practical assignment in their feedback diary.

The students were asked to assess statements like: "It is nice to study on this web course" and "The content of this course is easy to learn". The alternatives were: I totally agree, I agree, I cannot say, I disagree, I totally disagree.

Figures 4 and 5 depict the answers given to the statements "It is nice to study on this web course" and "It is easy to learn this course content".

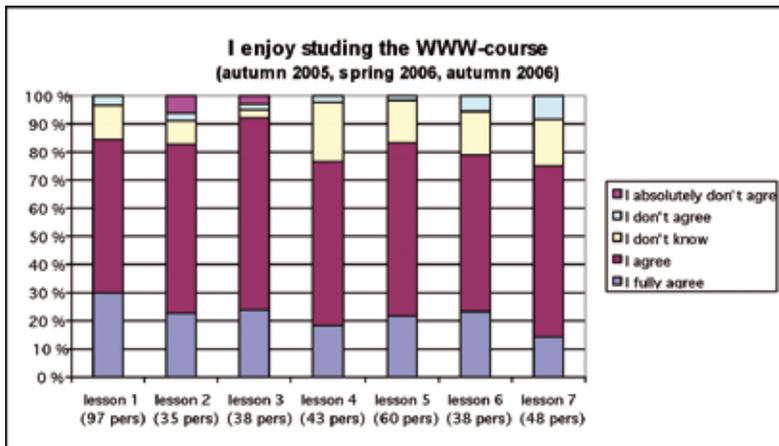


Figure 4. The answers to the statement "It is nice to study on this web course".

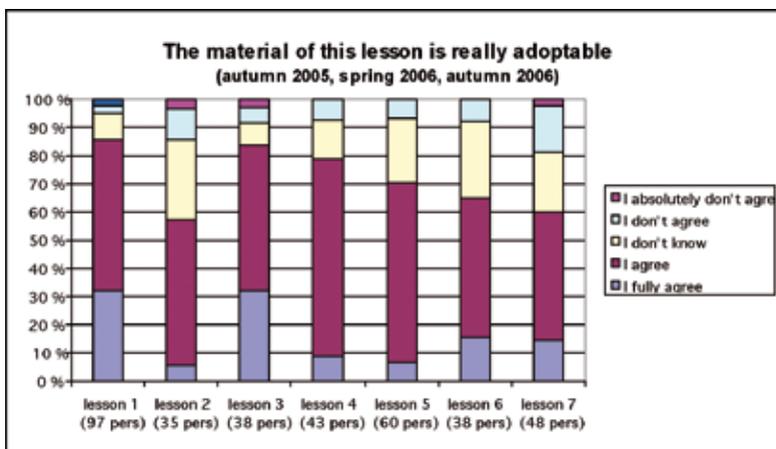


Figure 5. The answers to the statement “It is easy to learn this course content”.

The statements “It is nice to study on this web course” and “It is easy to learn this course content” got quite positive comments. As the figures show, almost 60 % of the students agreed or totally agreed with the statements.

In addition to the statement assessments, the students gave free feedback. They thought that the course was interesting and the themes were considered useful. Particularly the memory games and the true-false statements were considered efficient from the point of view of learning. On the other hand, some people had problems with completing the course and they had hoped for more assignments per lesson.

In addition, a questionnaire concerning technical issues was sent to 25 students of Pirkkala senior secondary school who had completed the course (15 girls and 10 boys). 20 students answered it.

According to the students who answered the questionnaire, the course increased their interest in technology and it also made technology look more practical. It did not, however, significantly affect their career choices or make them include mathematics and physics into their curriculum as the students had already made their choices before.

Further development in Vaasa

As a whole, creating the course was an interesting and challenging process. Studying in a senior secondary school and studying at a university differ from each other in certain ways. We attempted to take this into consideration.

The course will be developed further in the E-Girls project of the Vaasa region. Local viewpoints will be added to the course together with the senior secondary schools and the industries in Vaasa region.

The E-Girls project of the Vaasa region aims at making it easier for girls in particular to start studies in electrical engineering or electronics. Our goal is to increase the number of female students in technology and, with time, also the number of women working in technology industry.

We also aim at making girls more interested in industry as such. It is common knowledge that the proportion of women working in technical jobs in industry is very low at the moment.

The project was funded by the European Social Fund (ESF), The State Provincial Office of Southern Finland and the state of Finland. Other partners include Vaasan lyseon lukio (The senior secondary school of Vaasan lyseo), Pirkkalan yhteisluukio (The senior secondary school of Pirkkala), Nicefactory Oy, The Federation of Finnish Technology Industries, Wärtsilä in Finland, and Tritonia Learning Center. ■

Professor Leena Korpinen is still searching for a dream course on the Internet

"You can learn on the web, but how do you keep up wisdom there?"

We are on the Internet while at work, at home and even at school, where they even talk about eLearning now instead of just learning. Professor Leena Korpinen has taken a thorough look at online learning while developing her web courses and entire learning environments.

The emphasis in her latest web-based course, 'Electricity, electronics and environment', aimed for senior secondary school students, was on how to inspire girls to study technical sciences.

E-learning has established its position as a technique and a learning environment.

- But I still haven't found my dream course, says Leena Korpinen who has a vast experience from using the net to assist learning.

Her doctoral thesis in medicine in 1993 dealt with computer-aided decision-making and one of her later programs was even available for purchase. Korpinen has designed several online courses. One of them, a course for senior secondary students, called Electricity, electronics and environment was introduced in the previous article.

Using the web to support learning did not initially get Korpinen's unconditional acceptance.

- A web course where all the material is on the Internet is not good from the student's point of view. If it offers self-study without the interactivity of the web, then how is it better than a book? Or, if you will, is it any less efficient to lie on a sofa and listen to tapes or watch a video?

Discussion is necessary for learning

In the simplest mode of e-learning, the web works as a distribution chan-

nel for information. Studying with the help of mere web material is often not very interesting, even if the material is of high quality. In its broader sense e-learning means learning that takes place through interaction on the web. At its best a web-based learning environment can promote understanding and creation of new information by giving us an opportunity to share our thoughts, get answers and alternative solutions and information, and consequently assess our own skills and knowledge.

“You can get the basic information on the net, but to learn you also need to discuss and ask questions based on your own ideas.”

Korpinen sees interaction as very important for learning. It is also wise to meet your teacher face to face every now and then.

- Web-based self-study can of course be efficient, but individual skills play a big role here. You can acquire extensive basic knowledge on the web and then deepen it by participating in discussions and debates.

But to learn you need to discuss and weigh your own thoughts and views. It is all right to self-study the all-round subjects, but in mathematics for example you need to meet a real life teacher who answers your questions and gives you advice right there.

- Many professors know things that cannot be found on the net and never will, Korpinen adds, bringing up an important thought.

- How is wisdom sustained on the Internet? Is it even possible?

There must be choices

E-learning is challenging and requires more from the student than reading a book. The vast amount of information on the web is both an advantage and a disadvantage.

- The web’s basic idea is to let the person use her/his own intelligence; searching is efficient because the user can decide what information s/he will accept. But because the web is full of material it is easy to get lost, which in turn impedes focused learning. The updating of information is also a challenge. Information goes out of date and might not be credible anymore.

- Moreover, the web has some instrumental assets. However, it is not

enough to command the web as a tool; you must have command of the subjects and know the target group. Different subjects and various situations require different approaches and affect the design of the learning material and the methods of study.

Based on her own experiences, Korpinen regards multiform instruction as the best way to teach as it combines the web, a book and classroom instruction.

- It is essential to have choices. The web cannot be an end in itself. People are not alike as learners.

Girls on the web as learners

Girls are just as gifted in mathematical and scientific subjects as boys, but still they study these subjects less often.

When developing learning material, Korpinen has weighed the question of what girls are like as learners and how we could make the learning environments more suitable for their learning styles.

- The reason for the small number of girls as students is not lack of interest, but an incorrect teaching style which does not support the natural learning style of girls. Girls will get interested in technology if it is tied together with the things in their own life, says Korpinen.

- Education needs to be more practice oriented. Girls value understanding the substance, the fact that it has some kind of impact on them, and that it can be put into practice. Girls also value a sense of community. They want to work in groups, asking, experimenting and wondering about things together with their friends. The learning atmosphere must support this.

In her 'Electricity, electronics and environment' learning environment Korpinen has paid attention to girls' different learning styles. Instruction is illustrative and practice oriented and it starts from familiar, ordinary things.

- The web course 'Electricity, electronics and environment' also includes more creative exercise types like memory games, association exercises and crosswords. The course feedback showed that studying had been pleasant and learning had been made easy. It also made girls more interested in technology. ■