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viten.no –digital teaching programs in science education

viten.no is a web-based platform with digital teaching programs in science for secondary school developed by the Norwegian research and development project Viten (Jorde, Strømme, Sørborg, Erlien, & Mork, 2003). The Viten project is a collaboration between the University of Oslo, the Norwegian University for Science and Technology and the Norwegian Centre for Science Education. The Viten teaching programs are available for free, and no additional software is needed to use them. Students in grade 8-12 can work collaboratively on various science topics and each topic ranges in duration from 2-8 science lessons. Three types of programs are available, engaging students in: a) designing solution to problems, e.g. design a greenhouse for growing plants in a spaceship on its way to Mars, b) debating controversial issues, e.g. whether or not there should be wolves in the Norwegian wilderness, c) investigating scientific phenomena, e.g. radioactivity, gene-technology. Since launching viten.no with three teaching programs in winter of 2002, 14 teaching programs are available by June 2005, see Table 1 (Mork, 2006).

Data from the Viten server shows that 1853 unique teachers have run at least one Viten program in one or more science classes as of June 22, 2005, and that 63 083 unique students have answered at least one task in one or more Viten programs in the same period. Hence, the total number of registered student users reported in Table 1 illustrates that many students have used several Viten programs.

viten.no is well established within Norwegian schools, as illustrated by the high number of users in Table 1, and Viten has at several occasions been put forth as one of the good examples of digital learning resources in the Norwegian context. The translation of several Viten programs into Danish *(Radioaktivitet)*, Swedish *(Genteknik)* and English *(Gene-Technology*[1], *Global warming*[2] and *Rise of sea level*[3]*)* also confirm that viten.no has a good reputation.

Viten builds on ideas of exploring the effective uses of technology in supporting the way scientific information may be presented and used as students learn science. The research and design activities of Viten are based on a continuous improvement model (Table 2) combining development of teaching programs with classroom evaluation (Jorde et al., 2003). All Viten teaching programs are developed in teams consisting of teachers, science educators, ICT technicians and experts from the academic discipline. Once themes have been constructed using the Viten software toolbox,

1 viten.no/genetechnology
2 http://filarkiv.viten.no/?content=klima-1_eng&language=en
3 http://filarkiv.viten.no/?content=issmelting-1_eng&language=en

Table 1: Overview of the available Viten programs and corresponding number of registered student users by June 22, 2005.

Year	Program (Launched)	Student users by June 22, 2005
2002	Radioactivity (January)	25 586
	Wolves in Norway (February)	6 810
	Cycles of malaria (March)	4 508
	Sine-waves (August)	1 095
	Plants in space (September)	5 437
2003	Earth processes (January)	9 207
	Bears (March)	2 411
	Hydrogen as energy source (August)	5 008
	Gene-Technology (December)	24 102
2004	Cloning (August)	1 749
	Cloning of plants (August)	956
	Health up in smoke (August)	4 756
2005	Climate changes in the Arctic (February)	2 007
	Dinosaurs and fossils (April)	1 151
	Total	**94 783***

**This number does not represent unique student users, as some students have used more than one Viten program. To be counted as a student user of a Viten program; one must first get access to a registration code from the teacher and then use a program activated by the teacher.*

implementation studies are conducted in science classrooms where members of the Viten team participate as classroom researchers. In order to understand the challenges faced by teachers and their students while implementing Viten programs, one must take into account the realities of everyday life in science classrooms and school systems. Pre- and post testing is included as means of monitoring conceptual growth. Groups of students working in front of the screen or participating in debates are videotaped to better understand the role of social discourse in learning concepts. Responses collected in the Viten programs are used to analyse conceptual growth while students work with the programs. Students are interviewed before and after working with programs to provide information on their views on the use of ICT and their knowledge about actual science topics in contextual settings.

The Viten design model stresses the fact that students not only need scientific information when learning science, they also need to be able to apply that knowledge in actual situations. The model also emphasises the need to integrate scientific topics into other domains such as economics, history, geography and sociology, which may influence how society deals with scientific information in a broader context.

Table 2: Overview of components in the Viten design model and its specifications.

Viten design model	Specifications
1. Choice of topic	Types of Viten programs: Designing solutions to problems Debating controversial issues Investigating scientific phenomena
2. Establishment of expert group	Group members: Programmer Science educator Subject expert Teacher/student
3. Development of Viten program	Design principles: Making science accessible Making thinking visible Help students learn from others Promote autonomy and lifelong learning
4. Classroom trials/ Evaluation of results	Data collection: Pretest/posttest/delayed posttest Classroom observations/video Student/teacher interviews Student logs
5. Repeated revisions of program	Main revision after classroom trials. Revisions are also made as a result of feedback from students, teachers and others, and when new information in the field becomes available.

Students are encouraged to work in pairs in front of the computer while working on Viten programs. Some of the clearest benefits of classroom computer use arise from the fact that they lend themselves so well to collaborative modes of use (Crook, 1994). The Viten philosophy is that students must formulate and explain their own ideas to each other, and through discussion work out a common answer to tasks. Students like working in pairs, something that may also increase motivation. This work form can nourish confidence when students work on difficult topics, or if they are not comfortable with using computers.

Each student pair has their own electronic workbook, where the teacher can comment on their work at any time. All Viten programs are composed as learning environments providing a wide variety of activities like animations, note-taking tool, quizzes, video clips, interactive tasks, simulations, evidence pages, links to other web-pages, crosswords etc as illustrated in Figure 1.

Most Viten programs end with a final activity where students are challenged to apply information from the program in contexts such as; an offline debate, write a newspaper article, an oral presentation or even the building of a greenhouse to grow plants in space.

Figure 1: Screen shots from various activities in the Viten program Gene-Technology.

Figure 2: Viten student interface showing pop-up notes window.

Figure 2 visualises the Viten student interface by a screen shot taken from the Viten program *Dinosaurs and Fossils*, where the student mission is to go on a virtual tour to collect evidence that support or reject the theory of kinship between dinosaurs and modern birds. Students navigate through the program by following the steps in the menu on the left. Each heading in the menu is a unit consisting of several steps. The pop-up window is the student researcher's field note book, where they register evidence from each location they visit on their virtual tour.

In a research project on the use of the Viten program *Radioactivity* (Mork, 2006; Mork, in prep.), students from four 10th grade science classes were asked about their opinion about the program. 43 of 64 students characterised the program as *exciting, fun, engaging* or *interesting*. 40 students were positive to the design and pedagogical arrangements of the content, e.g.:

"Simple and easy to use."
"A good thing with a small quiz during the program, so that we can check what we have to practice more."
"Very good explanations."
"The content was presented in another way and was easy to read, so that most of us understood it well."

A lot of students thought that *Radioactivity* was informative and provided variation from ordinary science classes, whereas others described it as exciting to work with a case and have a mission to fulfil, e.g.:

"A good thing that the content was introduced as a journalist case, then it became more interesting."
"A lot of thinking, which was good because it was fun to find the answer."

Furthermore, several students emphasised the high degree of student control in the work process as positive, while some students also mentioned that it was easier to learn the content when it was visualised using animations and pictures, and that working together in pairs was positive.

From this, and other studies we have the impression that students in general are very postitive to teaching programs at viten.no. Do you want to try a Viten program?
We welcome you and your students as users of viten.no!

References

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