

The ExCon Project: Advocating Continuous Examination

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Abstract

In this paper it is claimed that traditional examination often is destructive to the process of learning. It does not matter how good intentions educators have, it is the way they examine students that will have the strongest impact on how the students learn. The goal of the ExCon project is intervention in traditional examination. The paper discusses an alternative model for understanding assessment and examination of students. Product assessment is questioned as an appropriate approach. Instead it is argued that educators should, to a larger extent, provide the student with questions and other types of feedback during the ongoing activity and use communication as an important element of the examination. For this purpose, a software prototype for a mobile computing device to support the educator was designed and developed. An evaluation of the prototype was performed and the paper ends with some thoughts on the viability of the prototype in supporting alternative assessment and examination.

Keywords

Assessment, examination, feedback, Newton messagepad

Introduction

For many years, educators have tried to improve education with different technologies. The reason for using a specific technology varies, but it is not controversial to suggest that the main objective has been rationalization. Computing technology in education has been, and still is, a tool to rationalize teaching. Two approaches dominate: First, as a tool for the educator to distribute facts and information to passive students. Presentation software and recently the World Wide Web (WWW), offers an opportunity to present the lecture and course related information in an appealing format. Second, as an alternative to the teacher so the students can practice on their own. There is a growing number of educational software packages available. Most of them show strong similarities with Skinners behavioristic ideas about the teaching machine. These approaches will do little but speed up ineffective processes of teaching as they reflect an objectivistic model of learning

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When a new technology comes along, it is automatically integrated in the rationalization paradigm. In this paper, as a contrast to rationalizing, the ExCon project suggests that mobile computing can help educators assess students in a different way. We have designed and developed a software package for a mobile computer, Newton (www.newton.apple.com). The objective with the software is to enable the educator to keep notes about students and groups with the purpose of communicating the notes back to the students as feedback.

Keeping notes about individual students performance and group projects is nothing new. Neither is keeping the records in an electronic format, e.g., a small database on the desktop computer. Of course, the limitation with conventional computers is apparent. They are not mobile enough to easily bring along to seminars, on the train etc. The ambitious teachers start out with a well designed database and high intentions. However, after some time the record about the individual student as well as the different groups is a dispersed mass of database entries, manual notes, and mental notes.

ExCon is a part of a larger effort to create a collaborative learning environment. Computing and communication technologies such as electronic mail, bulletin board services, computer conferencing systems, and the WWW are having a profound effect on education [1]. Asynchronous learning networks (ALN) is a means to create this feeling of a true group of people who are learning together [2]. A central factor in ALN is the capability for learners to learn anywhere and anytime and still be part of a community of learners.

Methodologically, the ExCon project is intervention with the premise that examination in higher education must focus more on process and less on product, and that this can be supported by mobile computing. The paper is organized as follows: First a short methodological discussion. This is followed by a two sections, one about learning, and one about examination. Mobile computing is then briefly characterized. The software prototype, Tracker, is then outlined and the initial evaluation is described. The paper concludes with a discussion.

Research Method

The natural choice of method in an intervention is action research. In action research the researcher takes an active role as an interventionist and uses her own experience. According to Patton [3], the purpose of action research is to solve a problem here and now. A key assumption is that people in a setting can solve problems by studying themselves. The standard for judging action research is the

feelings related to the process among research participants and researchers about the solution generated. The viability of action research in education is recognized by Gibbs [4] who found that: "They were using research and research tools to intervene, often successfully, in their own courses. This is the kind of research which gets results" (p.27). Action research has two aims: to contribute to solving practical problems, and some specific research goal, such as the development of an approach, a method or a conceptual framework. Action research has been a major approach in Scandinavia, especially within participatory design (See for instance the special issue of Communications of the ACM (36:4) 1993).

The main objective with ExCon is intervention in examination in computing education. A second aim is to contribute to examples of good computing technology use in educational activities. That is, the integration of computing technology and a pedagogical idea that is easily communicated to other educators. The task of educating computing professionals is associated with a number of problems. Maybe the most delicate is the fact that the students, after graduating, will not only live in a time of accelerating change. But they will certainly contribute to the change. An important issue in computing education, as well as in any type of education, is the choice of appropriate models to guide the activities of teaching and learning.

Assumptions About Learning

Research over the past ten years has established a distinction between surface learning and deep learning [5]. The distinction is basically one between rote learning and meaningful learning. In surface learning students memorize information to satisfy assessment criteria by reproduction. Whereas in deep learning, the intention is to relate previous knowledge to new, and to understand. It is obvious that students vary in their approach from context to context, and between different courses. Few students always take a surface approach, but most courses have students taking both approaches to some extent [4].

Three models of learning are commonly applied in this discussion, the objectivist model, the constructivist model and the cooperative model. The objectivistic model of learning is based on Skinner's stimulus-response theory. According to the theory, learning is an unreflective change in the behavioral disposition of an organism [6]. The goal of teaching is to facilitate the transfer of knowledge from an active expert to a passive learner. The lecture method of teaching embeds the pedagogical assumptions of the objectivist model as the purpose of teaching is to present as much of the right information as possible. It is a "learning by being told" model of instruction.

In the constructivist model, rather than being transmitted, knowledge is created by the learner. Individuals are assumed to learn better when they are forced to discover themselves rather than being instructed. It is also emphasized that it is only when learners are allowed to construct new meaning that the goals of constructivism are truly achieved [6]. The instructor is a mediator of the

learning process and provides tools in a learning environment.

The cooperative model share many assumptions with the constructivist model of learning. Whereas the latter is focused on the individual learner, the cooperative assume that knowledge is created as it is shared among learners [7]. In this way it is the process of getting two or more learners to work together to learn. And the more that is shared among them, the more is learned. Each learner is responsible for learning and helping others to learn. Of course, as in a constructivist model, the educator serve as a mediator and facilitator of the learning process. In this role the objective for teachers is to provide tools for the students so they can construct their own knowledge. Research suggests that students plan and write more thorough when they are cooperating with peers than when they are being evaluated only by an instructor.

Both constructivist and cooperative advocates non-criterion forms of assessing students [8]. It is also suggested that traditional competitive assessment strategies may disable learning as the learner may be motivated to withhold knowledge that otherwise would be shared with other learners [6]. My standpoint here is very clear, learning in higher education should be deep by definition. The constructive and the cooperative models of learning offer guidelines for how to organize educational activities. Research has shown that students tend to take a surface approach when the assessment system is perceived to demand, reward or tolerate memorization. But it is also suggested that it is possible to change the students approach to learning by changing the assessment system [4].

Assumptions About Examination

Examination is control. This is the dominating conception of examination. It is necessary to control if the students have learned what they are expected to. The instrument of choice is a written exam or a term paper. Preferably at the end of the course so the whole course can be examined. If the student pass the test, she is vaccinated and never have to take the course again. Understanding and analytical abilities are not really asked for in traditional examination. If so, the instructor would have problems in assessing the student. Both students and educator is more comfortable if answers can be considered as right or wrong.

From a control perspective, the outcome or a product of educational activities are assessed and graded. A single activity, or in best cases, the outcome of a number of activities make up the final grade after a course. Group activities are extra hard to assess, who did what? At group presentations, the teacher demands that all students in the group present their part of the work. The outcome is often a fragmented project where all the participants in the group complete their part of the work with very little interaction with the other students.

Unfortunately the requirement of a written exam is the main interest for many students. A control perspective restricts students from engaging in deeper learning and understanding and instead pushes them toward memorizing

ideas and facts. If applying a control conception of examination the students are forced into a grade oriented approach. Educators encourage critical thinking when they are teaching, but examine their students according to conformity in ideas and detailed knowledge about facts.

Dissatisfaction with current assessment approaches has led to an exploration of feasible alternatives. Assessment needs to be transformed from conventional multiple-choice and memorizing facts into radical visions that attempt to measure academic abilities more directly than the traditional assessments. As an alternative, process based examination is advocated. Authentic assessment is an alternative which has been used to crystallize the growing movement of providing learners with active opportunities to demonstrate their abilities under more natural and authentic circumstances. Examination is the most powerful tool teachers have to facilitate a good learning process. If we teach students what to learn, we stimulate the desire to pass the examination. If we learn how to learn, we stimulate the desire to inquire and to learn more, the knowledge will come automatically. Examination is no longer a discrete activity at the end of the course, but imbedded continuously throughout the course.

From this perspective, assessment is feedback. The educator is supporting the learning by commenting and criticizing the learning process. This way, examination is embedded as an integral and natural part of the course. It has also been suggested that continuous feedback gives a dimension of reality to the learning process [9]. Dynamic assessment approaches encourage learners to engage with concepts and go beyond the simple recalling of facts. If more active assessment challenges the learner, it also challenges the educator. It was easier grading multiple choice tests and essays about specific issues. It was even easier evaluating projects that were generally uniform in presentation. It is important to stress the importance of an assessment and examination system which guarantees, to the extent that it is possible, high quality graduates.

Practicing alternative assessment, the number of students in the course will naturally affect the quality of assessment. With twenty students whom the teacher meets regularly it is likely that the students and teacher develop a deeper professional relation [10]. However, with 100 students in a course, knowing each student enough to give them high quality feedback becomes if not impossible, then at least very difficult for most teachers. The question is then how can computing technology be used to support alternative assessment?

Mobile Computing

In the early 1990s the Personal Digital Assistant (PDA) was introduced—a small hand held computer, with instant working capability. It could be used with a pen while standing or walking and had an unprecedented variety of built in storage and communication capabilities. The first versions were not very useful as many of the central functions worked poorly. Most people regarded them as toys. The handwriting recognition software installed in the PDAs did not provide the user with a reliable interface.

Getting the computer to interpret the hand written text was a tedious work. The performance of the programs required a great deal of patience of the user as even the smallest operation took what seemed to be forever. But now in the late 1990s, the technical limitations are overcome with the arrival of the latest versions.

New technology can make us view old problems and phenomena in new light. Mobile computers, and especially PDAs is an example of new technology that has successfully found its way into areas such as health care, military purposes and retail to mention a few. However, the applications in these areas are often an effort to standardize and computerize routine tasks. Only marginal change and improvement of the work is done, if any. But new technology is also a tool to implement changes. Computing technology obviously offers new ways of working and organizing [11]. At the same time, we can also see that the educational system is usually adopting a wait-and-see policy before new technology is integrated, and as mentioned earlier, it is often integrated into a rationalization paradigm.

Tracker

The ExCon project and Tracker is an attempt to use mobile computing and the WWW to implement some of the ideas in the model of alternative assessment described in a previous section. Tracker is a data storing and transferring application designed and implemented in a Newton PDA. At the current prototype stage, Tracker is integrated with several other applications, both commercial and shareware. At the early stage of the design, paper prototypes were used to refine the ideas and identify the functionality as well as the interface of Tracker. Many ideas are still only in the paper version.

Designing Tracker, the starting point, together with the theoretical discussion, was the vision of the educator leading, supervising, participating and observing different educational activities. During many of these activities, the interaction with the students are very intensive, while other activities are less intensive. In face-to-face activities, the teacher obviously communicates and establishes a dialogue with the students. Figure 1 below is an outline of the Tracker architecture.

The educator gives advice and provides feedback to a certain extent, but time is limited and often there are many students. The educator make short notes, often mental, about the discussion and try to get back to the students later. An additional design issue was a conviction that educators need to reflect before providing feedback on an educational activity [12]. That is, in the classroom the educator is requested to provide immediate feedback on for instance a presentation or discussion.

With Tracker the educator has the opportunity to reflect and provide more well thought-out feedback than in an on-line case. The idea was to design Tracker so that small notes could be penned into a database during the different activities. The interface was designed as general as possible but still capable of storing information about different educational activities.

The educator receives a list of students either electronically or on paper. In case of a paper based list, this must be manually entered into a database.

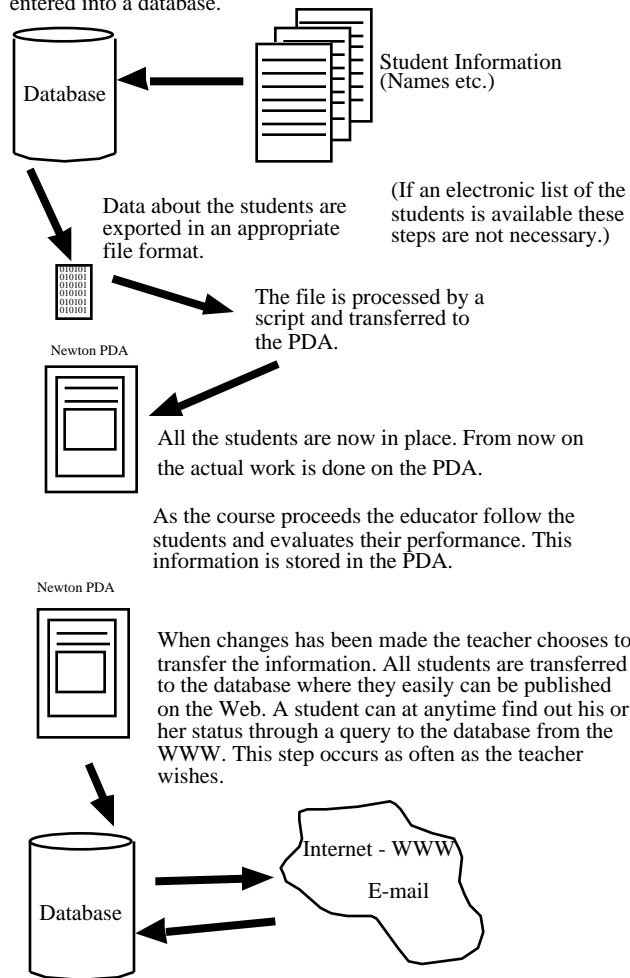


Figure 1: Tracker Architecture

As Tracker supports non-criterion assessment, most of the interaction with Tracker is via handwriting recognition. The interface of Tracker is mainly two different types of screens. Individual view (see figure 2), and group view. The individual view consists of a page, or record, for each student. It is divided in four sections. First there is a demographic section for name, e-mail, code and picture. The code is used when presenting the information and at the same time maintain anonymity. The second section consists of a number of A through F parameters. They are used to grade certain activities when this is appropriate. What to grade this way can be negotiated with the students. Next is the 'Public' section, where the educator enter notes to give feedback to the student.

These notes become public so all interested can take part of them. In other words, these are the comments and questions of common interest. The 'Private' section on the other hand, contains comments that are send only to the student via e-mail routing. Generally, the use of e-mail for communication is discouraged as only a few individuals are involved in the interaction, but here it is a suitable tool.

The group view is similar to the individual with a few differences. It contains the name of the group as well as the names of its members. The group view does not include the 'Private' section as the comments are not directed towards a single student.

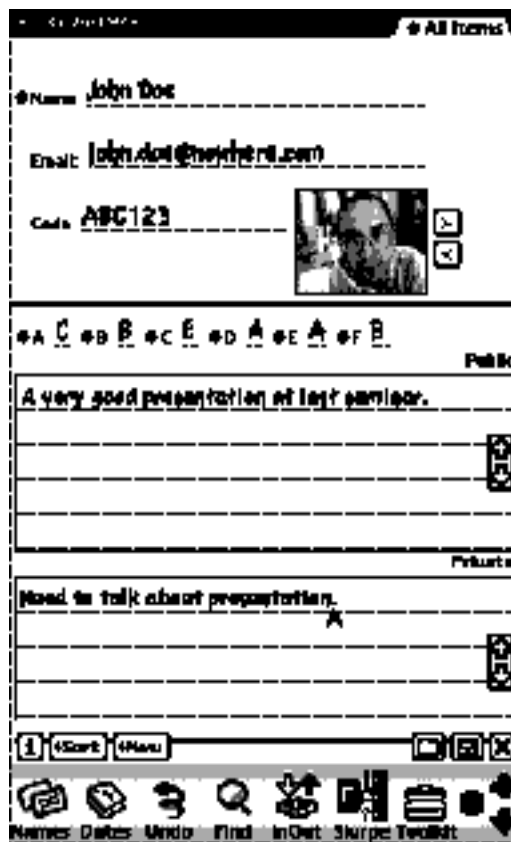


Figure 2: Tracker Interface

After an educational activity the teacher retires to reflect on the work of the students and on her own work. The short notes made earlier in the Tracker database are expanded. The aim is to formulate substantial feedback in the format of questions or comments. When appropriate, the teacher makes a connection to the local network and upload the data stored in Tracker. The uploads is easily conducted by connecting a cable from the Newton to a networked computer. A script controls the transfer to the database on the WWW server. When uploaded to the server, feedback to groups and the public section from the individual comments are available for the students. The interface towards the students is standard WWW based forms. A number of predefined queries are made but the students are free to define queries according to their own interest. When browsing the feedback, students are encouraged to provide comments and additional questions. This way, students are able to follow the instructors assessment and they are also able to question the teachers grading during the progress of the course. Comments from the private section are filtered out when downloaded from the Newton and sent out via e-mail to the individual student.

Tracker in Action

Tracker was tested in an experimental setting. The purpose was to validate the principle of alternative assessment and to test the functionality of the prototype. A senior professor and eight undergraduate students were invited to participate in the testing. To prepare for the test, the professor was equipped with Tracker installed on a Newton. He received a short instruction on how to operate Newton. He then spent a few days becoming comfortable with the pen-driven interface and the Tracker application. For this purpose, Newton has several built in tutorials.

The session took place in a regular lab where the students were equipped with a personal computer. The notion about product and process oriented assessment was introduced to the students. Also the functionality of Tracker was explained to the students. Screen shots of Tracker were presented and they had opportunities to ask questions. A short discussion followed. The students were then asked to articulate their feelings and spontaneous comments about Tracker during the actual testing.

To make the testing somewhat close to reality, two scenarios of educational activities were developed. The first scenario described an activity, divided into three phases. The first phase involved discussions in smaller groups where the students presented their idea of project. The second phase was the guiding of the first outline of the paper. And the third phase was the professor walking around the poster session looking at the different posters. The professor was asked to think out loud while listening to the scenario and penning in the notes. After each phase, the professor were asked to comment the phase using Tracker and then connect and upload the feedback to the Web. The students were asked to read, discuss and comment on the feedback they received. This was repeated for all phases in the scenario.

The second scenario involved a group project. The first phase described a lecture where the assignment was handed out. The second phase described the groups working during the week and how they were facilitated by the teachers. And the third phase described the group presentation at the end of the week. The same procedure as in the first scenario was repeated here.

From leading scenario and observing the session it is obvious that Tracker is working. The evaluation experienced no technical problems. The professor as well as the students were impressed by this fact. The professor concluded his testing by stating: "Contemporary assessment system is based on the notion of negative feedback. This tool is certainly a reaction to this." The students agreed on the usefulness of Tracker. During the discussion they stated that the open feedback is lacking today and that it is welcomed. But, the students participating in the evaluation also raised some concern about the necessity of engagement among the students.

Discussion

In this paper I have discussed an alternative model to traditional assessment and examination in higher education. A mobile computing software, Tracker, was described and

presented as a tool to facilitate the implementation of the alternative model. Tracker was evaluated in an experimental session. The evaluation was successful and resulted in additional issues for the future development of Tracker.

Whereas rationalization is central to current application of educational technology, it should be obvious that Tracker is not an effort in this direction. On the contrary, the ExCon project suggest a migration towards a more complex and demanding assessment system. It is claimed that Tracker can support the strive to influence grade-oriented students to become more learning oriented. To the objectivist and control oriented educator, Tracker probably makes no sense. But to those who subscribe to the ideal of the constructive and cooperative model of learning it probably does.

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