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Bridging the gap between theory and practice in Dutch vocational education

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Teachers and students in vocational education often state that it is difficult to link knowledge gained in school with new insights and experiences met with in practice. Time lacks to report on problems that occurred and to discuss solutions. There is also no time available to go back to theory concerning a given topic, the moment students attend school. In most instances students do not even hear about others' traineeships and teachers are not able to give proper feedback to everyone. In this project students in vocational education were provided with facilities to communicate with each other during their traineeships and collaborate on similar assignments by means of a computer supported collaborative learning environment. Students mentioned they have benefited from the opportunity being confronted with all kinds of new impressions, like reading reports of others, which broadened their perspectives. They felt being closer to school during periods of practical training at their internship locations. Teachers had a better idea of their students' experiences and could more easily refer to these during classroom lessons. Teachers also stated that they could better monitor the students, and when necessary guide them in their learning process.

Introduction

In 1996 in the Netherlands, the law on vocational and adult education was enacted. In this law strong emphasis is put on learning from practical experience. Because of this emphasis, the place in which the on-the-job training takes place has become more important. Context based learning in a situation in which the student has to deal with authentic problems is related to constructivism (Duffy & Jonassen, 1992). In accordance with this theory, students learn in practice, in a real world context. In Dutch vocational education graduates from lower general or vocational secondary schools of about 16-20 years of age, can choose two different routes:

- in the first route, students attend school, and work during some practical periods, like on-the-job training or traineeships;

- in the second route, student start working in a company and add theoretical knowledge by attending school one day a week, like in an apprenticeship scheme. In both ways they have the possibility to elaborate the knowledge they gained in practice and vice versa do they have the possibility to use school knowledge in authentic situations.

The focus of this exploratory project is on how to facilitate students to communicate and collaborate with each other whilst they do not at school on the one hand, and how to optimise the link between theory and practice, on the other hand. Because students spend a vast amount of their school time outside the classroom, a solution must be found to

keep the students ‘together’. By using a computer supported collaborative learning (CSCL) environment it is possible to create a virtual classroom while the students work at different companies. School and work are actually linked to each other.

The possibilities of CSCL

Research by Hewitt (1996) and Scardamalia and Bereiter (1996) in which CSCL classrooms were compared to traditional classrooms, showed that working with this kind of environment had positive effects on intentional and collaborative learning. As well as in the described project, they used WebCSILE, a problem centered, collaborative workspace accessible via the internet. WebCSILE is based on CSILE, a computer supported intentional learning environment designed by Scardamalia and Bereiter (1989). Besides WebCSILE some classes in this project made use of webKnowledge Forum (WebKF), the successor of WebCSILE. The CSCL environment is supposed to give students the opportunity to describe their experiences and start discussions. Communicating with each other like this can take place in an asynchronous mode, while at work or at home. In addition to this, by sharing experiences and discussing problems, students can start to work and learn together. Exchanging ideas and building arguments is expected to enable students to gain deeper insight into the matters they are discussing; by describing what they think, the students become more aware of how they solve problems and, consequently, they gain both cognitive and metacognitive knowledge. According to Scardamalia & Bereiter (1996, b), when knowledge building starts to be the goal, the students will be capable of recognising what they need to learn. After some time they will take more active roles in learning and take more responsibility for the things they want to learn.

Knowledge building with CSCL can begin in the classroom with an introductory lesson. After this lesson it must be clear to the students what the final learning goal is, for instance; solving a problem on growing crops in a very dry climate. They also need to know by then whether the topic has to be subdivided into several (sub) areas. Each of these sub areas can be explored by formulating questions that will be answered by means of a collaborative attempt to gather and exchange relevant knowledge. To build knowledge on a specific topic all kinds of resources can be explored: books, newspapers, television, experts, and so on. A learning culture has to evolve in which knowledge building becomes the responsibility of each participant in the class (students and teachers). Everyone gathers information in order to write in the database, and they write to share their knowledge with the others.

While working and learning together using CSCL, students interact via the computer. The database keeps track of what is being written, it keeps the files up to date, making it possible to study the process of knowledge building. The data can be analysed for links between messages students write. These messages are referred to as notes. Analysis of the patterns of notes shows who writes what messages to whom. Teachers and students have to agree upon roles both students and teachers in such a process. In this project an attempt has been made to find answers to the question as to how to implement the environment within the educational context, and how collaboration between students via a CSCL environment can be enabled and sustained over a certain period of time. Also, attention was paid to whether and how school knowledge and practical experience were integrated.

Research process

Below, an overview is given of the research process. This overview will be elaborated in the next sections of this contribution.

Overview 1 The research process

Procedure

After two pilots in which information was gathered about several conditions (for example the facilities the students would need to be able to log in from their home addresses); 76 students from both routes mentioned in the introduction participated in the project. Groups of about ten students attended different ten week courses and every group was monitored by at least one teacher. Only students who had access to a computer at home could participate.

When they did not yet have access to the internet, they received a trial subscription paid for by the school. To keep telephone charges under control, the students were instructed not to work over thirty minutes each day (they were reimbursed for these expenses).

Teacher training

Before the experiments started, the teachers were offered training which focused on the collaborative learning and learning communities, how to use WebKF and its possibilities (both technical and process oriented), how to start and sustain a collaborative learning process, and how and when to intervene. A framework consisting of several steps was offered to the teacher as a guidance to make assignments. This guidance consisted of four steps leading to a final assignment (based on the Maastricht PBL, Van Til & Van der Heijden, 1998). If problems occurred, teachers and researcher discussed them and if possible solved them collaboratively.

Student training

Most teachers participated more than once (both in pilot experiments and follow up experiments). When it was the first time for the teacher to get involved in an experiment, the student training was taken care of by the researcher. Every second or next experiment the teachers themselves instructed and trained students. At the beginning of the training students were told about the research project. They were told that this research was conducted to provide an answer to the question as to whether CSCL could optimise the link between theory and practice. Also the idea of collaborative learning was explained, and how collaborative learning can be facilitated using an electronic learning environment. The most important goal of the training was to make the students familiar with the environment so that they would be able to use it at home.

Evaluation

To analyse the databases the analytic toolkit (ATK) was used. This toolkit is a set of programs that are designed to give overviews and summary statistics of the notes, views and activities in a (web)KF database (Burtis, 1998). The ATK can provide quantitative information of the databases.

To inquire after the experiences of students using WebCSILE or WebKF an evaluation form was used. Students could describe findings on the environment and internet, support of the learning process (training, assignments, interventions, and technical and motivational support during the experiment), collaboration with classmates, and some questions on linking theory and practice. The teachers were asked to complete an evaluation form too. They were asked to describe their idea of collaborative learning, their expectations about the use of CSCL in order to make collaboration possible while the students were out of school, their experiences and their ideas for the future.

Results and conclusions

The ATK provided a huge amount of information. All participants together (students and teachers) produced 764 notes (teachers produced 107 notes). From these notes, 46% were first or new notes, meaning they represent communication that was started on a topic; other notes were isolated. In fact 197 notes were isolated; when just looking at the threads in the database, nobody seemed to react to notes of others, nor to build on debates of reactions of others. They seemed to be separated remarks of various kinds. Of course, a closer look at the content of the notes may change this perspective, because a visually isolated and seemingly not building on note can appear to be closely related to another one when the content of the notes is taken into account. Nearly every log in started with reading contributions of others. Notes that were read most were those of the teachers (especially assignments were read over

and over again, sometimes up till ten times spread over the total length of the experiment), and notes students produced themselves.

Collaboration in groups is related to collaboration in an electronic learning environment

Looking at the groups, differences appeared. Students from groups who knew each other from class, and had to work on similar assignments, read and wrote on a regular base in the learning environment. They exchanged information and experiences and worked together on solving practical problems. Students attending school just once a week, and who hardly knew each other, did not feel the necessity to collaborate. They were not used to do this, and felt no need to do it now. Other students made use of the learning environment already within the classroom working on an assignment in order to get to know the functionality of the discussion platform, and to get used to collaboration before leaving the school for their internship. They preferred to communicate verbally instead of writing in the database. This leads to the conclusion that there seems to exist an optimal level between face-to-face and computer supported collaboration; the CSCL environment offered the possibility to collaborate with classmates all working in different firms and being confronted with authentic problems. Students who did collaborate were very enthusiastic about this possibility. They mentioned they learned from the others contributions (these provided new information, created new ideas and perspectives), and felt more motivated to explain their own strategies and findings. But students being in the same room and working on relatively easy problems, felt the computer not providing a relevant opportunity. And also when collaboration is hardly done before, the mere presence of the electronic learning environment does not make a difference.

Time investment - teacher and student perspectives

Both students and teachers were asked to invest a significant amount of time in the experiment. They had to log in regularly to keep track of all the contributions. The students felt it was no additional effort however; they did not have to submit an essay on their internship afterwards anymore. Furthermore, they felt better prepared for practice. Teachers now (more then before) knew what the students met within practice and could therefore better support them. They perceived the environment being supportive, although they also felt the need to put a lot of effort in sustaining the collaboration. This effort, though, seems to be necessary. Based on both evaluation forms and the data gathered from the databases and the ATK, a connection was perceived between the role of the teacher in the database, the amount of notes the students wrote and their reports about the amount and the quality of the collaboration. The less a teacher participated, the less activity the students showed. This relationship is elaborated in aother paper (Lutgens, Biemans & De Jong, 1999).

Connectivity

Another positive effect was students having felt closer connected to the school then before during these practical training periods. They said to have used school knowledge more often then before while at work and because of discussing problems with others having learned more from their experiences.

Advantages of the opportunity to use ICT

Although collaboration was not always that fruitful, having the opportunity to use information and communication technology as means to learn and work together as such was perceived as being valuable. Consulting others, knowing when and how to address others when knowledge is not sufficient, combined with the development of several competencies (to communicate, to search and collect relevant information and knowing how to use knowledge and experiences from different perspectives to transfer to new situations), are a positive side effects of the use of CSCL.

In spite of the obstacles which had to be overcome in the beginning (such as poor computer infrastructure, make teachers willing to try new pedagogical concepts, spending a lot of time to implement software, train users and support the learning process), almost everybody who participated in this project stated to be interested to use this or a similar electronic learning environment during internships again. Teachers stated they had better possibilities to monitor students, students said they could communicate and collaborate with each other. They felt more closely related to school during internships.

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Overview 1

The research process

2 Pilots - about conditions
2 x 76 students participated; one group for each study route
Teacher training
Guidance of teachers
10-week courses, followed by groups of about 10 students
Student instruction about research project
1 monitoring teacher per group
Analysis of notes with ATK
Student and teacher evaluation