Digit@l Did@ctics: Development of Teaching Staff Practical Instruments for Using ICT in Education

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Abstract:
This paper presents an innovative way of developing teaching staff: Digit@l Did@ctics. The Digit@l Did@ctics project was based on the following hypotheses: teachers prefer to learn and to receive support "just in time"; teachers prefer to learn at their own pace and in their own surroundings; the Web is the medium for imparting information just in time and for facilitating learning. Instruments and material referring to digital didactics was collected and made available for teachers through a knowledge-management system. By using the materials, teachers were offered assistance at the very moment they were confronted with problems in designing, practicing, or evaluating within this educational practical setting. They were also able to contact a didactic helpdesk to obtain assistance.

Introduction

This paper presents an innovative way of developing teaching staff which was carried out in the Digit@l Did@ctics project. One of the reasons for this project, which began in October 2002, was the national inventory study on the use of ICT (Information and Communication Technologies) in Dutch higher education (Veen et al., 1999). This inventory study identified several bottlenecks in the introduction of ICT in education: teachers must move in the direction of new education, but they lack time; teachers lack insight into ICT development; teachers lack ICT capabilities. Finally, these bottlenecks led to the recommendation to stimulate the development of teachers' expertise by means of an online learning environment. In addition, a proposal to enable this exchange of expertise and collaboration between institutions was put forward.

The project was based on the following hypotheses:

- teachers prefer to learn and to receive support "just in time";
- teachers prefer to learn at their own pace and in their own surroundings;
- the Web is the medium for imparting information just in time and for facilitating learning.

Instruments for and materials on digital didactics were collected and made available, in order to prevent the same activities aimed at developing teaching and learning that makes innovative use of new technologies from being carried out at different locations.

The three main Dutch partners in this project were the OECR (Educational Expert Center, Rotterdam) of the Erasmus University Rotterdam, EDUTEC of the Delft Technical University, and ECCOO and UCLO of the University of Groningen.

Definition of the Issue

Within the education centers of institutions of higher education, a great deal of material and experience is available in the field of digital education, both in designing, implementing, and evaluating education. Educational staff members of the different education centers and groups supporting education used their own material or material from others within their own consulting practice. Pioneering teachers had experience with online teaching and many of their methods were

evaluated either briefly or extensively. In addition to the pioneering group, many teachers were confronted with problems involving the use of ICT applications in their teaching. Not every teacher had easy access to the assistance of education experts at the moment that he/she was occupied with designing courses or offering instruction. This was due partly to the financial structure of the education centers within the educational institutions, but also to the lack of this type of facility within their own or other institutions.

The goal of this project was to encourage and broaden the use of ICT&E (ICT and Education) in higher education through staff development. Within this goal, the following components can be distinguished:

- Offering just-in-time support in the use of ICT&E to higher education teaching staff
- Gathering expertise on the use of ICT in higher education and making this expertise available to teaching staff
- Creating and maintaining a lively professional community in the area of ICT&E

An important additional goal was that the collection of expertise components in digital didactics should act as a catalyst for innovative processes in educational institutions. The results of this project helped teaching staff overcome possible reluctance to change.

Solution in the Digit@l Did@ctics Project

The *Digit@l Did@ctics: Development of Teaching Staff* project satisfied the aforementioned demand by offering a didactic helpdesk for ICT in Education (ICTE). Assistance was offered to the teacher at the very moment he/she was confronted with problems in designing, practicing, or evaluating within his/her educational practical setting. The project focused on offering help to teachers within 24 hours, seven days a week, in designing and practicing ICTE. To that end, objective knowledge was stored in a knowledge-management system and made accessible on a Web site. In addition, a call center was set up.

The project was founded on three key components. The most striking aspect of this project was experimentation with new ways of staff support and development. Additionally, new techniques were used (e.g., surfing together from different locations). Furthermore, the project carried out research on a system in which “publication by means of a knowledge database” was used as an incentive for authors and a system in which peer review was used as a means of quality assurance. In this project, careful experimentation, smart “trial and error,” and thorough evaluation were employed.

Staff development took place by gathering and storing the expertise of ICT&E experts and by allowing other staff members to use this expertise. Ultimately, the quality of education improved. The main characteristics of the expertise made available on line were flexibility in use and “just-in-time” availability.

In the first phase of the project, the educational expertise centers involved gathered and further developed their expertise and experience in Digital Didactics and made it available online (knowledge dissemination). From January 2003, education experts of other educational organizations were free to participate in the project.

Part of the project entailed researching and experimenting with an incentive system for teachers that offered expertise components and a peer-review system for judging these components.

Target Group

The primary target group consisted of teaching staff in higher education, both at universities and in higher vocational education. This included prospective and young teachers, as well as experienced teachers. A secondary target group consisted of teaching staff in other types of education, such as secondary and vocational education, and education consultants. The target group showed large differences in didactic expertise, as well as expertise in online education. Accordingly, expectations were that the available material would differ in type and level of detail. In addition to these target groups, the project was geared toward staff at educational expertise centers.

Results

This project resulted in an integrated product including:

- A knowledge-management system containing descriptive documents and educational materials and instruments. The user could use the content of this knowledge-management system in designing, practicing, and evaluating online education. The material was ready to be applied in a practical setting and adhered to the current educational categories, such as collaborative learning and self- regulated learning. Different users with different responsibilities could be distinguished, such as users, authors, reviewers, editors, and technical systems managers.
- A Web site (tool site) to be employed by users as an interface to the knowledge-management system and as a medium for synchronous or asynchronous communication with providers of educational support.
- A call center. For users who could not find the knowledge they were looking for in the knowledge-management system, a callback function was available, which provided educational support in the field of online education. This center would respond within 24 hours.
- Results of the research on and experiments involving the incentive system for teaching staff who contributed to this project by adding content to the knowledge-management system, which were supplemented by the results of experiments involving a peer-review system for judging these contributions. The setting up of an E-Journal will also be attempted, so that staff members will view contributions to the knowledge-management system as official publications.
- An innovative approach to teacher support, including the necessary organizational changes.
- Cooperation between many educational support centers.

During the project, a number of measures indicating the use of the knowledge-management system and the call center were employed. As for the knowledge-management system, interesting statistics included number of users, frequency of use, and evaluation results, such as user satisfaction. As for the call center, statistics such as number of calls and question categories were recorded.

Content of the knowledge-management system: knowledge components

The components in the management system were building blocks that teachers or educational developers could use in designing and creating educational initiatives. The system did not include complete products, such as handbooks or courses.

The knowledge-management system focused on the use of ICT in:

- different educational formats, such as lectures, practicums, field trips, and self-study;
- encouraging the use of educational formats, such as cooperative learning and self-directed learning;

- offering feedback and different types of assessment;
- adapting education to differences in learning styles or learning strategies;
- offering presentations.

New technologies evoked questions regarding the application of such technologies in education. This project helped users answer these questions. In fact, the users themselves largely determined the content of the knowledge-management system.

The material in the database was based on different formats. Examples of such formats were "how-to" outlines (e.g., "How to use an electronic discussion forum"), Frequently Asked Questions (e.g., a FAQ on electronic discussions), and lists of "Do's and Don'ts." Examples of knowledge components were: using electronic discussions with a large number of students, organizing feedback between groups of students, and online learning in groups.

Each knowledge component had the same structure and contained the same types of information: a title; the name of the author(s); the author's organization; a summary of the content of the component; the goal(s); an example from a practical setting; information on why to use ICT tools; information on when to use this component; guidelines for teachers on how to use this component in their own course; preconditions for use; background information on the component; its relationship to other knowledge components in the knowledge-management system; and an appendix. All knowledge components were categorized: general didactics; explaining; communicating; giving individual assignments; stimulating collaboration; providing support to students; assessing; and evaluating. Teachers could look up the knowledge components by using the categories or a search engine.

The Dutch Digit@l Did@ctics site can be found at http://www.digitaledidactiek.nl. An editorial staff made up of educational consultants of the three partners valued the quality of the knowledge components.

Pilot Phase

During the pilot phase, 32 teachers in higher education were involved in the project. Those teachers used the knowledge-management system for a limited time. After this time, the teachers were asked to answer a number of questions about the knowledge-management system, the knowledge components, and the didactic helpdesk.

In general, teachers most appreciated case studies and knowledge components that were immediately applicable to their own courses. Teachers did not like knowledge components that were more abstract. Most teachers who were involved in the pilot phase appreciated this new way of learning (on line and just-in-time).

Each knowledge component was structured in the same manner. Teachers indicated that this consistent structure was clear and helped them find the information they needed. The teachers would have liked having more information on the situation in which the component was used (e.g., how to set up an electronic discussion with students), and they would have liked seeing the experiences of fellow teachers with the knowledge components. Teachers who participated in the pilot phase said they would use the knowledge-management systems (with the knowledge components) now and in the future. They would use the system particularly to design their educational initiatives and to obtain ideas on how they could improve these initiatives using ICT tools. The teachers appreciated the idea of a didactic helpdesk, but they hardly used it.

The findings of the pilot phase resulted in several changes to the knowledge-management system user interface and the structure and content of the knowledge components.

Broad Implementation

In November 2002, the broad implementation phase was begun. In this phase, the Digit@l Did@ctics project was further implemented in the three institutions taking part in this project. Together with teachers, more knowledge components were developed that were made available to other teachers through the knowledge-management system. For this phase, a communication plan and a plan for implementation was drawn up. The project was integrated in the services of the education centers and in the policies of the faculties.

In the broad implementation phase, new experiments with an incentive system (to challenge teachers to develop knowledge components themselves) and a peer-review system (to challenge teachers to value other knowledge components) were carried out.

Besides implementing the project within the three institutions that initiated the project, other institutions were also asked to participate in the Digit@l Did@ctics project. Additionally, these institutions were asked to develop new knowledge components, whereby the process of collaboration and exchanging knowledge and experiences is to be developed further.

In November 2003 more than 800 teachers and educational consultants in The Netherland and Belgium are using the site http://www.digitaledidactiek.nl in their own practice on a regular basis. More than 1000 persons are visiting the site each week.

Future Directions

In 2004 the idea to set up an E-Journal for Digit@l Did@ctics will be explored. An E-Journal might give the teachers more of an incentive to contribute to the site. Setting up an E-Journal will be discussed with the digital libraries of the three partners.

In other European countries like Belgium, Germany, the UK, and France, similar ideas exist to launch projects like Digit@l Did@ctics. During the project period, we will explore the idea of producing an English version of Digit@l Did@ctics, in which institutions of higher education from other countries will be involved.

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Example 1: Knowledge Element On-line Learning in Groups

Knowledge Element On-line Learning in Groups
by W. Veen & M.J. Verkroost

Organisation:

TU Delft, Section EduTec

Based on:

Veen, W. & Verkroost, M.J. (2001). *Building Virtual Communities for Professional Development*. Paper presented at the Bite Conference 2001, Eindhoven.

Goal

The goal of this element is offering tips and guidelines for teachers to design educational formats in which students collaborate at distance in performing group assignments.

When to use

Situations, in which students and/or teachers are not able to meet at the same time and on the same place, are suited for working in virtual groups. Examples are foreign practices or part time studies.

Why ICT?

ICT and Internet offer new opportunities for mutual communication and for distribution of information at distance. Examples of these are exchanging files for collaborative writing at distance, e-mail for sending messages, chat for synchronous discussions (same time) and discussion boards for a-synchronous discussions (different time).

How to design this as a teacher?

1. Define the entrance level of your students and teachers in the field of collaborative learning and using computers.

One could, for example, find out where in the curriculum attention has been given to these skills. Or one could consult colleagues about the feasibility of such plans.

2. Design a organisational format.

The organisation of on-line group learning needs to be thought out and worked out carefully. The following questions need to be answered:

- How large are the groups of collaborating students? Eight is a maximum.
- How will groups be composed?
- Who will steer the groups?
- Who is responsible for the group functioning?
- Will one of the group members be assigned as a moderator (discussion leader or manager)?
- Will the other group members have particular roles?
- Where will which matters be discussed? (For example, will different channels be used for subject matter and for social talk?).

An example of an organisational format is the following: Students will be placed in groups of 8 students. To each group a moderator and a teachers are assigned. The task of the moderator is to structure the group processes and to keep these processes running. The teacher supports the group from a distance. Teachers and moderators meet each other in a separate group, the support group. In this group experiences are exchanged and strategies for the next period are decided upon.

3. Develop suitable learning activities.

Just as in face-to-face education, one needs to think of assignments, learning tasks and a schedule for students and groups. One could, for example, give each individual an preparation task and then discuss and comment upon these results groupwise. By creating small groups with specific assignments and tasks, students feel more committed to the group activities. Larger groups might easily lead to anonymity and hanging-on.

4. Develop a rich environment.

In order to let students perform their assignments independently it is important to set up the learning environment with relevant resources, documents, tips, Internet links, etcetera. (Unless, of course, this is one of the assignments for the students).

5. Create a sense of being present among the students.

It is important that students are aware of their mutual presents in the environment, although they can not actually meet each other physically. This can be achieved by:
· Offering a list of students that are logged in at a specific time.
· Letting students (and teachers) present themselves on individual homepages including a photo and a description of their interests.
· Using videoconferences. (Only suitable for experienced users, since many technical problems should have been solved at beforehand.)

6. Create a digital group space.

To be able to contribute to group assignments from a distance, a digital group space is necessary. In this space group members can exchange files and discuss all kinds of topics.

The use
· Spend much time on learning in groups during a first lecture, by showing the digital learning environment and the group spaces within. Give clear guidelines of what you expect of them.
· Prepare colleagues for the necessary changes in the teachers' role. Teachers should support students from a distance, while they might only be familiar with face-to-face teaching.
· Check the progress of the groups on a regular base and if necessary ask questions about their progress to the group leader or the group moderator. Let the groups report their progress.

Constraints
· Technical support during the set up of the digital learning environment is important. Consider hiring a student assistant.
· Setting up the digital environment for the first time will take extra time compared to traditional education.
· Students and teachers should have some experience with computers and with collaboration.
· A computer system for building digital learning environments is necessary.
· Teachers and students should have access to computers, Internet and the required software.

Background

The six steps and tips described in this knowledge item are based upon experiences in a series of six online workshops organised by EduTec (TU Delft) and the European Schoolnet.

References

· Beer, V. (2000). *The Learning Fieldbook. Using the World Wide Web to Build Workplace Learning Environments*. San Fransisco, CA: Jossey-Bass Pfeiffer.
· Salmon, G. (2000). *e-Moderating. The Key to Teaching and Learning On-line*. London: Kogan Page.

Example 2: Knowledge Element Self-diagnostic Tests

Knowledge Element Self-diagnostic Tests
by G. Verheij & J. Folkert Deinum

Organisation:

Rijksuniversiteit Groningen, Eccoo/UCLO

Goal

Be able to design tests that students can use to assess their learning progress and to redirect their learning processes on the basis of the feedback on the test results.

When to use

· If a course demands much independence of the students.
· In courses that offers much learning content (e.g. a 12-week course with weekly lectures).
· In a course without a practical. (A practical offers ample possibilities for offering feedback).

Why ICT?

By using these tests students themselves can control and steer their learning process, independent of their lecturer. The computer offers immediate feedback on the testresults of the students. The content can be adjusted fast and easy. Pools of questions can be used to create individual tests. Furthermore, these tests could offer multimedia material such as video.

How to design this as a teacher?

1. Divide your learning content into assessable parts (one paper, one chapter of a book, one weeks' content, and one learning goal).
2. Decide for each part what a student needs to know or be able to do (learning goals). Think of the balance between reproduction questions and questions appealing to insight.
3. Formulate test questions. Formulate feedback per question or group of questions.
4. Be sure all learning goals that belong to a particular content part are tested, because a student should be able to control his progress for each learning goal. This is different from a final exam.
5. Be sure the level of difficulty of the questions in this test is equal to this level in the final exam.
6. Think of the knowledge that a student lacks when he answers a question wrong and describe this in the feedback on particular answers (multiple choice questions) or questions (other types).
7. Let a colleague take the test and check the final details.
8. Put the questions in the digital learning environment.

Tips
· Check for the steps described above if student assistants can do the job.
· Give students the assignment to write test questions with feedback, that you could use the following year. This is a good strategy to let students think about the content.
· If the development time available is not sufficient to cover all content, choose the parts that students consider being difficult. Do not test a limited set of the learning goals that go with a course part, because these tests seem to suggest that the complete content is covered.

The use
· Announce to the students that the tests are available.
· Stimulate students to take the diagnostic tests by offering a bonus point for the exam.
· Reflect regularly during the lectures on the test results. Pay extra attention to parts that students fail.
· Examine how many times students take these tests.
· Ask student to evaluate these tests and the experiences with them.

Constraints
· Creating this type of tests takes lots and lots of time.
· Assessment software should be available.
· Sufficient computer facilities for students to take the tests are needed.

Background

An extensive meta-analysis by Black and Wiliam (1998) shows that on many situations formative (diagnostic) tests have a positive affect on learning results of students, if they receive feedback on their answers. It is important that students not only receive insight in their relative position with the group, but also in their shortcomings (Dousma, Horsten & Brants, 1997).

An important advantage of diagnostic tests according to Dousma a.o. is that the student is able to re-direct his learning process in an early stage, for example by putting in extra effort. That can only be made possible if the test offers specific and immediate feedback on good and on wrong answers. Another advantage is that these tests are responsive to individual differences in study pace.

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