

Rapid Prototyping as a Faculty-Wide Activity: An Innovative Approach to the Redesign of Courses and Instructional Methods at the University of Twente

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Abstract: At the Faculty of Educational Science and Technology (Toegepaste Onderwijskunde, T.O.) of the University of Twente a revolutionary process of institutional change is occurring. Under the banner of C@MPUS+, we have made a commitment to blend the best of our old values of good teaching and an attractive campus life with new didactics and advanced technologies so that we can extend our already unique curriculum and instructional practice over distance and time, as well as enrich it.

Abstract français: L'article décrit le processus révolutionnaire mis en place à la Faculté des Sciences et de Technologie de l'Education (Toegepaste Onderwijskunde, T.O.) de l'université de Twente où le curriculum a été étendu pour inclure l'enseignement à distance. Dans cet article, certains des aspects saillants de la méthode du TeleTOP qui concerne l'implication des enseignants de toute la faculté sont mis en valeur.

The programme

Beginning in September 1998, we will offer our entire first-year programme in an innovative way: integrating our students resident at the University with two other cohorts. One of these other cohorts will be first-year students remaining in another division of the University of Twente (Friesland); the second cohort will be mature students already in the working environment, attending primarily from their homes and workplaces and generally working during the day. At the same time, our Master of Science Programme in Education and Training Systems Design is growing rapidly, and many of our senior courses are also being redesigned so that students in the Masters' Programme can also participate in them, either locally or at a distance.

The key to making this increased flexibility happen is the integrated implementation approach that we have developed and are now using to re-engineer 30 of our courses for the C@MPUS+ initiative. The team responsible for the implementation is called TeleTOP (Tele-Learning at T.O.). Although we have remarkable technology, in terms of innovative tools, high-quality network access and facilities, and new, state-of-the-art interactive classrooms, the key to our process is

institutional change based on instructor engagement and commitment. New didactics for the instructors will help them in organizing and working with the variety of new ways of teaching, learning and making learning materials available. The TeleTOP team will support these new styles of teaching. In this paper, we highlight some of the key features of the TeleTOP method relating to faculty-wide instructor engagement.

An integrated approach to institutional change

Integrating information and communication technology into institutional practice throughout a faculty requires implementation success. Implementation success in turn requires many components: administrative vision and courage; the momentum and insight that comes from previous experience; a sound research-based educational framework to motivate educational change; extensive experience with the design, development, and use of computer-related and networked educational tools and environments; a design and development method utilizing powerful and locally attuned tools and database technology; a robust technical infrastructure with high availability to all instructors and students; a culture that rewards innovation and quality in teaching; and at its core, a strategy for instructor engagement and commitment for change. In addition to all this, there needs to be creative energy, and skilled staff to translate creative ideas into usable forms.

Given these requirements, it is not surprising that lasting implementation success regarding the sustained and integrated use of information and communication technologies to support teaching and learning across a faculty is difficult to achieve. In a recent inventory (Boon *et al.*, 1997) of higher-educational institutions in The Netherlands, only a handful of departments and faculties were found to have made substantial progress in terms of this sort of institutional integration of technologies into the teaching and learning process. The Faculty of Educational Science and Technology at the University of Twente was acknowledged as being in a leadership position with regard to implementation depth and breadth.

But we have now moved even further. We have moved from the pioneering phase, through what can be called the '1,000 flowers blooming' phase (Collis, 1997a), into a phase of managed change. Through the TeleTOP implementation method, all of the ingredients necessary for successful institutional change accompanied by the use of advanced technologies, are present. Table 1 summarizes the major aspects of these ingredients.

Staff engagement: The key aspect

Although we believe that all of the nine success factors need to be present, and integrated, for institutional change to occur in a swift and efficient way, it is the factor relating to faculty engagement which we see as the most complex and as the key. Our faculty are professional educators, most with many years of instructional experience, and most having evolved satisfying and effective methods of interacting with their students and of handling their courses. Technology is not a bandwagon novelty to them; because of our extensive technical surroundings, there is no particular novelty effect to propel our faculty to use new technologies, and in contrast there is so much knowledge of the research relating to the teaching and learning process, that our faculty are too well informed to be susceptible to vendor or visionary presentations that start and end with a technology push. The core of the C@MPUS+ approach is 'extending the good teacher', not reducing his influence or reducing her contact with her students. The TeleTOP method is most characterized by the time and effort spent on instructor interaction and involvement.

How this is operationalized (Peters, 1998)

The members of the TeleTOP team interact intensively with the instructor whose course is being re-designed, trying to identify which ideas and approaches are most likely to be acceptable and interesting to him or her, and to respond with ideas and suggestions, as well as to skip suggestions with which the instructor does not seem comfortable. A decision-support tool (the DST) has been built and used within our own version of a rapid-prototyping process (De Boer, 1998). The DST tool is designed as a tool for support of a structured interview involving the TeleTOP chair, at least one of the design team, and each instructor whose course is being re-designed.

The aspect of decision making about specific design choices for a course is an important element in the process of building a WWW-based course. The tool makes it easier for instructors to make decisions with regard to the components that they need in their WWW-based learning environment. The instructor

needs to decide what he thinks is appropriate for his course. But at the same time, the instructional designer responsible for designing and building the WWW-based environment needs to be well informed about the instructor's wishes and decisions. The members of the TeleTOP team interact intensively with the instructor whose course is being re-designed, trying to identify which ideas and approaches are most likely to be acceptable and interesting to him or her. A few days after this interview, the TeleTOP team members visit the instructor in his or her office, and walk through the first prototype of the course WWW site, further discussing ideas and reactions.

The second phase of the faculty engagement aspects of the TeleTOP Method occurs over a period of about three months, (February to April 1998) and consists of three parallel activities. One of these is continual staff involvement and professional development, based on weekly hands-on sessions for TeleTOP instructors only, in which the instructors learn to work with their own prototype sites and gradually modify and fill them while discussing options and seeing examples. Parallel to this, is the ongoing development of the course WWW sites, evolving from the first to second prototypes. Linking these activities is the device of using the instructors' own evolving sites as the media for their hands-on activities. Based on what options the instructors are most interested in, we tailor each week's session to focus on those options and how the instructors can be comfortable with using them within a WWW site and for teaching.

The second of the parallel activities is also important: we have invited instructors who are interested in debating and working together to develop new approaches to lesson presentation, especially approaches that make use of real-time collaboration and interaction among students both here and at a distance, to join us in a 'Working Group - New Didactics' to study together the new didactics that we want to use. The discussions have been spirited. But we know that instructors will need time and practice to be comfortable with these techniques (Northrup, 1997).

Thus the third aspect of our faculty engagement strategy is to demonstrate these new didactics and the use of the technology involved through approaching the weekly instructors' sessions as a demonstration course itself so that the instructors can have the experience of both teacher and learner. The weekly sessions with these instructors are organized and supported by a Web-based environment, which will enable instructors to get experience working with a Web-based environment and get used to the new possibilities of it. The 'Wednesday course environment', which has many similarities with the first prototype environments.

Also the instructors will be all invited to observe a full

Table 1 Success factors for institutional change involving technology and the TeleTOP method

Success factor	TeleTOP
1. Administrative vision, leadership, and courage	1. All aspects of the initiative involve the full informed and supportive involvement of the faculty Dean and Director; extensive funding has been made available; commitment also shown via the building of the <i>interactive classroom</i> * and the launching of the C@MPUS+ approach via a commitment to quality service to the new part-time cohort and the new Friesland cohort
2. Momentum and insight from experience with use in regular instructional situations	2. Four years of experience with teaching many of our regular courses via innovative WWW environments and other computer-based systems (Collis, 1997b)
3. Research-based educational framework for new didactics	3. Research-based 'pedagogical re-engineering' (Collis, 1998) based on key principles of good teaching and learning in higher education and new didactics (Verheij, 1998) and on key principles relating to the implementation of change in teaching in higher education.
4. Experience and skill in the design, development, and use of computer-based tools and environments, and telematics applications	4. An international reputation in research and development of innovative computer-based and telematics-based tools and methods; a close relationship with Informatics faculty through involvement in the university-wide CTIT and the national Telematics Institute
5. Appropriate design methodology	5. An innovative approach to rapid prototyping, involving a WWW-based decision-support tool integrated with a database (De Boer, 1998; Fisser <i>et al.</i> , 1998)
6. High-quality technical infrastructure and convenient access for all instructors and students	6. All students have network and Internet access from their rooms on the campus and local dial-back access from beyond this; for years, all students and instructors have had their own Internet accounts and make extensive use of e-mail and the WWW; instructors can have subsidised ISDN connections from their homes to the network; in September 1997, 64 new multimedia computers for the students to join the two full laboratories already available; one set of these new computers in a specially designed project room to support group-based learning
7. An institutional culture that rewards both technical innovation and good teaching	7. Being a Faculty of Educational Science and Technology, using technology for teaching and learning is our research area as well as our instructional practice; the students in the faculty have chosen instructors making innovative use of telematics for teaching as 'instructor of the year' for both 1996 and 1997; members of the faculty are regularly recognized nationally and internationally for their innovative teaching and learning approaches involving technological tools; at the University level, 'tele-learning' was chosen as the focus for the 1997 Diesviering, a Task Force Tele-learning is initiated and chaired by the Rector, and a Projectbureau Tele-learning funded
8. Staff engagement and commitment	8. Through the rapid-prototyping method (De Boer, 1998; Peters, 1998), each instructor has well-structured and intensive personal sessions with members of the TeleTOP team, and also is involved in the ' <i>Wednesday Class</i> ', an instructors-only meeting every week in which the rapid prototyping continues but in a way that optimizes peer interaction among the faculty (Collis, 1998a)

Table 1 *continued*

9. Creative and skilled implementation team	9. Five full-time designers, all graduates of the faculty, and all with the experience of technology design and development in professional settings (see for example, Remmers, 1998); Team is under the leadership of a scientific chair and the Director of the faculty multimedia and network facilities with an extensive background in project management; also 2.5 new technical personnel, and part-time services of network staff, graphics designers, multimedia and video specialists, and secretarial support
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* A state-of-the-art teaching room, involving 24 networked multimedia computers all with graphic cards to handle real-time video and audio communication and also connected to the Internet; theatre-type videoconferencing equipment including document camera and two instructor controlled cameras, a control system for the instructor to distribute and integrate all the video-, computer-screen, keyboard and mouse information from any computer in the classroom to any other, including a similar interactive classroom in the north-west part of the country to which we will be connected by either ISDN or ISDN over ATM; a webserver and video server capable of delivering 1.5 MB bandwidth streams; and new custom-made tools to capture real-time presentations and collaborative-working sessions from instructor and student computers, store them in a multimedia database, and make them available via the WWW as streaming synchronized multimedia segments whenever students wish to review what went on during real-time sessions in the classroom. Our associated interactive classroom has a subset of this equipment, but enough so that we can emphasize group work involving Enschede and Friesland students as part of our new didactic.

course (from March to May 1998) with 35 students, some of which are entirely at a distance, and which will make use of the new interactive classroom as well as a WWW-based course environment and the new didactics. Faculty will be invited to participate, to drop in, to take part in de-briefings, and to discuss among themselves which of the pedagogical approaches they find most feasible for their own styles and subject areas.

Conclusion: Can the TeleTOP method generalize?

We are already being asked by other faculties at the University of Twente, other institutions in The Netherlands, and other institutions from other countries, to share our tools and methods, our approach and ideas. One of our practical questions and also one of our major research issues is the generalizability of our TeleTOP method. We believe that it is the integrated approach which is the strength of the method, particularly the faculty engagement. We also know that faculty engagement takes time, requires close knowledge of the local culture, and mutual respect among all those involved. The personal as well as the group sessions will enable the instructor to create a Web-based learning environment which will be based on his ideas and his way of teaching. Building and working with the new Web-based environment and the new interactive classroom will give the instructor the opportunity to think of extended ways of teaching. This can only happen when the instructor gets professional help from a professional team. Thus we doubt any 'buy the box' or 'buy the service contract' approach, selling only the tools and technology and perhaps some help-desk support.

However, we are taking care to work epistemologically; researching ourselves in on-going self-reflection and dialogue, as well as planning more-formal external evaluation. We are also engaging our students to join with us in the shaping and exploring of our new didactics and new technologies. (Several of our current courses making use of WWW-based environments have been extensively evaluated by the students in them, and the opinions and comments of the students have a significant affect on how we proceed (Collis and Van Rennes, 1998). If other faculties, with less of some or all of the nine success factors shown in Table 1 try to start where we are now, we would be very interested to see the results. In any case, we believe we engaged in pioneering work with respect to implementation across the institution. Based on the quantity and quality of collegial interaction and engagement we are already enjoying, we believe that we are engaged in a faculty-wide learning experience in which the sense of being a learning community working together is emerging as one of the most important outcomes of TeleTOP.

Will telematic support, as we now see it before us, articulate certain aspects and styles in teaching, or does it just bring a greater versatility in all directions?

For further information see the TeleTOP site, at [_HYPERLINK "http://teletop.to.utwente.nl/"](http://teletop.to.utwente.nl/) [_http://teletop.to.utwente.nl/](http://teletop.to.utwente.nl/).

For access to a list of theoretical papers relating to the project, see [_HYPERLINK "http://www.citit.cs.utwente.nl/~fisser/Teletop/teletop.htm"](http://www.citit.cs.utwente.nl/~fisser/Teletop/teletop.htm) [_http://www.citit.cs.utwente.nl/~fisser/Teletop/teletop.htm](http://www.citit.cs.utwente.nl/~fisser/Teletop/teletop.htm).

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Bibliographical note

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