THEMATIC RESEARCH

FINDING THE "VIRTUAL" PROFESSOR

Results of a Research/Action Project[1]

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Abstract:
This article presents the results of an action research project carried out from 1999 to 2002, to determine if differences existed between the work of a classroom teacher and a teacher who taught a course "on line" (virtual teacher). Changes were made in three online courses offered during seven academic semesters, and the effects on teaching work were recorded. The results suggest that important differences exist between the two types of work, specifically the form of communicating with students (letter writing) and the relation with other teachers and specialists (holographic teaching). These differences are described, along with the implications for future research and teaching mediated by technology.

Key words: educational change, information technologies, teaching work, higher education, action research.

Introduction

At the present time, many institutions of higher education are adopting "online" teaching, by designing and implementing courses and programs that include, to a greater or lesser degree, components based on the Internet. This trend is most evident at the university level, as an important part of universities' strategic plans to "increase coverage", "reduce costs", "provide more options for nontraditional students", "improve the quality of student services" and "respond to the greater use of this technology in the market". A wide variety of changes in educational practice is derived from this trend, from "broadened" courses that provide additional materials and complementary activities on the Internet for courses with face-to-face interaction (at the same place and at the same time), up to courses that are completely "on line", in which students and professors never have face-to-face interaction at the same time and place.

Most of these change initiatives arise and are maintained by administrative mandate. Although some professors make changes of this type in their courses, the initiative almost always comes from the upper administration of educational institutions as part of strategic plans, oriented more to responding to problems of cost or to society's "demands", than to educational considerations. The administration may present an invitation, suggestion, requirement, or obligation, as the case may be, for professors to use, in one way or another, Internet-based technologies in their work with students. Such initiatives range from simply providing students and professors with E-mail addresses for them to communicate with each other, up to requiring online programs in accordance with university expansion or cost reduction programs.

Under such conditions, professors face the problem of incorporating these activities into their daily work. The literature on planning and operating change—technology-based change in particular (Bates, 2000; Burbules and Callister, 2001) or change in general (Fullan, 2001)—emphasizes the importance of including teachers in the process, so that they understand the meaning of change and are supported, along with the students. But including teachers does not reduce their problems in incorporating the use of technology into their educational practice, which has been formed through experience over the years and is often considered successful by the professor and others (students, administrators, colleagues, the community). Having to incorporate such technology because of administrative mandate, without perceiving a true educational need, makes the teacher interpret it as an irrelevant additional task, disconnected from his daily work.

Much of the work to date on change in educational practice comes from the field of "educational technology", which is centered more on the use of specific technologies in educational contexts and their effects on student learning. Although qualitative studies have been carried out on how the uses of technology are changing in education and associated processes (Davis, 1996; Macpherson and Smith, 1998), little empirical research has been done on how professor practice is changing. Since the current project began in 1999, research on the topic has begun to appear (Piotrowsky and Vodanovich, 2000; Rosenkrans, 2001; Paulson, 2002; Smith, Ferguson and Caris, 2002), but most authors continue utilizing the assumption that the professor's work does not change. Work can be "improved" by using Internet-based technology, but in essence it continues to be the same work.

Research from other disciplines does not share this assumption (Zuboff, 1988; Hammer, 1996; Sviokla, 1996; Castells *et al.*, 1999; Brown and Duguid, 2000). It presents evidence that suggests that the use of information technology *does* change the nature of work in an important manner. And although educational work can be different from other types of work, it is problematic to assume that it is not modified, in light of what is happening to other technicians or professionals. For this reason, it is reasonable to assume that the professor's work, like other types of "work with knowledge" (Sviolka, 1996; Ulrich, 1998; Mintzberg, 1998, Wenger *et al.,* 2002) *does* change, and becomes something different when information technology is incorporated into it, either by choice or by obligation. And if it changes, how does it change?

In an attempt to answer this question, in January of 1999, an action research project began on "virtual" professors at the graduate school of education (Escuela de Graduados en Educación—EGE) of Instituto Tecnológico de Estudios Superiores de Monterrey. This article describes the project and the results obtained from 1999 to 2002. First, a brief description is given of the organizational context in which the project was carried out, followed by an explanation of the initial thematic concerns of the research group—necessarily the first step in a study of this type. Then the method used and project development are described.

The section of results is divided into two parts: the first refers to academic performance, student satisfaction, and student withdrawal from the courses designed and executed by the research-action group, in order to determine if the changes in practice were beneficial, or at least not damaging for the students. The second section presents the results related to the group's thematic concerns about the practice of the "virtual" professor, which support the argument that the "virtual" teacher's work is very different from that of a "real" teacher. The article ends with some implications for improving online teaching, along with future possibilities for research on this topic.

Face-to-face Teaching and Online Teaching

Before beginning this discussion, it is necessary to distinguish between two "modes" of academic courses that can result from introducing information technologies in the classroom. One is what we call "face-to-face": the professor and students interact in the same physical space at the same time. They can "see each other" and conditions allow them to interact immediately. We call the other mode "online": the professor and students are in different physical spaces, at different times. They cannot "see each other", and conditions do not permit their immediate interaction.

We consider these two modes (face-to-face versus online) distinctive for differentiating between the "real" professor who can be seen and heard by students, and the "virtual" professor who cannot be seen or heard, and in principle, does not exist for students. Neither mode is derived directly from the use of information technology in education. The face-to-face mode does not exclude the use of information y communications technology in the professor's work, and the online mode, as understood in this discussion, can occur without using information and communications technology in the professor's work (as in the correspondence courses of the 19th and 20th centuries). But the current development of Internet-based information and communications technology (ICT) has generated distinct conditions that make the differences in the professor's work more obvious, depending on the teaching mode he uses. We use this assumption in presenting the research work.

Organizational Context

Tecnológico de Monterrey, founded in 1943, is an institution of higher education that is fully accredited by Mexico's secretariat of public education (Secretaría de Education Pública), and by the Southern Association of Colleges and Schools in the United States. In late 2004, it had an enrollment of more than one hundred thousand students in its programs of higher education (75% at the bachelor's level and 25% in graduate studies) distributed among thirty campuses in the main cities of Mexico. The institution is consolidated, originally offered face-to-face courses, and continues to use classroom teaching for most of its students. Its use of available ICT did not have the purpose of increasing coverage or decreasing the costs of higher education, like Britain's Open University, Universidad Nacional de Educación a Distancia (UNED) in Costa Rica, or Instituto Latinoamericano de Comunicación Educativa (ILCE) in Mexico.

It is important to consider this situation since the Tecnológico de Monterrey, like many institutions of higher education in Mexico and other parts of the world, has developed programs based on ICT as a complement to its programs, which continue to be mostly face-to-face. Non-classroom courses represent a minority of the institution's total courses.

The incorporation of information and communications technologies in academic courses at Tecnológico de Monterrey began with the institution's strategic plan of 1985-1995, in response to external conditions and not to exclusively educational considerations. In 1985, the Tecnológico decided that its graduate programs throughout Mexico should be taught by professors holding master's and doctoral degrees. At that time, most professors with such academic credentials were concentrated in Mexico City, Monterrey and Guadalajara. Offering graduate programs with these characteristics in the rest of the nation would require professors to travel constantly, often for considerable distances, thus generating high costs and limitations in time and availability.

The institution's strategic plan also required all professors in the system to have at least a master's degree to give classes at the undergraduate level. This requirement was not common in Mexico at the time, but was indispensable for the institution to obtain international accreditation. At the beginning, programs were established to send professors abroad or to cities where graduate programs were offered, at tremendous expense for the institution. The decision was made to search for other options. Classroom programs for earning master's degrees, mainly in business, were established at the institute's campuses. Most of the students were professors at Tecnológico de Monterrey, since the demand for graduate programs was very low in the 1980s. Thus the institution was still covering most of the expenses for its professors to earn master's degrees.

The institution considered the use of technology as an alternate solution to sending its professors to other institutions in Mexico or abroad for graduate studies. At that time, communications based on satellite technology were the most adequate for achieving the institution's objectives; Internet-based technology was only beginning to develop. The institutional initiative, known at first at Sistema de Educación Interactiva vía Satélite (SEIS) was designed to contribute to these two strategic goals (increasing the supply of graduate programs in the nation and raising the academic credentials of the institution's own professors). The initial offering was a master's degree in education in 1989, the first academic program that used satellite-based communications technology that attempted to emulate the face-to-face format.

The class sessions were transmitted two times per week, and students could interact with instructors during the transmission by telephone, or by using a computer system designed in the same institution. Thus students could ask the instructors questions, and instructors could respond "on the air". The students also interacted with the instructors by E-mail, but the problems with using this still incipient technology were an obstacle, and E-mail was considered a secondary component. Although the program initially included face-to-face classroom sessions in the summer, they were eventually eliminated because of the high cost of moving students physically to Monterrey.

In 1995, as part of the institution's new strategic plan for 1995-2005, the SEIS project was formalized institutionally as the virtual university, and was integrated as another rectorship of Tecnológico de Monterrey. In part, this decision was due to the apparent success of SEIS, in terms of its academic programs (which resulted in other courses with the same format, in other graduate programs) as well as its training programs, especially those directed to companies. Another important factor was the need to maximize the benefits of the institution's large investment in satellite transmission equipment and television production. In 1995, the "virtual model" of satellite transmissions began to be expanded to all of the graduate programs offered by Tecnológico.

Between 1999 and 2002, most graduate students were part-time students, and although some of the campuses in Mexico's major cities (Mexico City, Monterrey, and Guadalajara) offered all courses in a face-to-face classroom format in the graduate programs of engineering and administration, other campuses in the system offered graduate students in these disciplines 35% or more of their courses in the virtual format. On the smaller campuses or in cities lacking in local instructors with the required credentials, up to 100% of the courses could be offered in this manner.[2] Campuses were required to offer courses from the virtual university unless they had a local instructor with a doctoral degree in the discipline, except for the graduate program in education, in which all courses were given in virtual form.[3]

In 1995, the graduate program in education was offered mostly to professors from other institutions and to the community in general. The enrollment of the Escuela de Graduados en Educación—created formally as an academic division in 1996—was 500 students, and at least half lived in a city that did not have a campus of Tecnológico de Monterrey. These students had to travel to the nearest campus to see the transmissions. In the event of transportation problems, they would watch the videos of the sessions, which were recorded as a backup for students. In this manner, they were able to view the session content, but lost the possibility of interacting with instructors.

Conflicts also occurred between transmission times and students' work schedules. When the initiative was extended to all graduate programs, the scheduling of live transmissions became a problem. Preference was given to administration and engineering, with more students enrolled in cities that had Tecnológico de Monterrey campuses. Transmissions were preferably from 6 PM to 9 PM; Saturdays from 9 AM to 1PM were reserved for the graduate programs with most students, and the two graduate programs in education (the original master's in education, and the new master's in educational technology) were moved to a scheduled time of 4 PM to 5:30 PM.

To solve the problem of student access (due to physical location and the changed transmission schedules), in 1996, the EGE decided to take advantage of the relatively recent *.html* programming language for the design of Internet pages, and other technologies like discussion groups, chat groups, and more reliable, user-friendly E-mail applications by changing the format of its courses and depending more on "online" activities than on satellite transmissions of class sessions. Although courses still included three 90-minute transmissions during the semester, these sessions were optional. Most of the students' and professors' work was done online.

In 1997, with its formal integration as an academic division, the EGE decided to hire a minimum of ten full-time professors with doctoral degrees to comply with national and international accreditation requirements. Previously, all head professors of graduate courses had held doctoral degrees, but worked on a part-time basis with the help of full-time assistants with master's degrees (who did not have the academic credentials to be head professors, at least not according to the criteria derived fro the strategic plans at Tecnológico de Monterrey).

It is interesting to note that although the master's program in education, which later became the formal EGE, had been modified constantly since 1989, all these changes were implemented and sustained by the administration of Tecnológico de Monterrey, first as part of the institution's strategic initiatives and then as reactions to change in the internal and external contexts (mainly internal). The decision to offer programs with a "distance" format, emulating the face-to-face classroom mode, initially resulted from the need to obtain credentials for the institution's personnel. The idea of opening the programs to the community in general was based on the intent to increase the institution's coverage and take advantage of the investment that had already been made in satellite communications technology. Changing from a satellite format to Internet-based technology, and hiring full-time professors with doctoral degrees were due to administrative, rather than educational considerations.

The preponderance of administrative considerations does not mean that no educational considerations existed at the time decisions were made, and especially when confronting the problem of how to implement change adequately. Yet educational considerations were secondary, and appeared once decisions had been made; questions and resistance from EGE

professors abounded, but the changes were carried out regardless of the educational doubts expressed.

At the end of the 1997-1998 academic year, 60% of the full-time personnel of EGE (including the author of this article) were new, and with the exception of one professor, the head professors of courses had never taught a predominantly online course based on Internet technology. No research literature was available on this type of work. Not even documented cases of similar initiatives could be found, since the *.html* language for designing Internet pages had been used for only a couple of years for relatively generalized purposes, and for mostly commercial rather than educational ends. We professors had at least fifteen years of classroom teaching experience at the Tecnológico or at other institutions of higher education in Mexico and abroad. Since the EGE enrollment had increased to 800 students in August of 1998, and the decision had been made to start a new master's program in educational administration in 1999, we expected a marked increase in enrollment the following year.[4]

Initial Thematic Concern

The thematic concern that gave birth to the project of the "virtual" professor in the fall semester of 1998, was several professors' recognition that although we were all working on one or two online courses at EGE, our experience as professors in graduate school was exclusively as "real" professors who teach students face-to-face. None of us had done graduate studies at a distance, much less in an "online" program. And with the exception of two of our colleagues, whose research interests were related to educational technology, the rest of us were relatively familiar with Internet-based technology but were involved in other lines of educational research. Technology in our case was simply the means to give classes, and an uncomfortable means at that. In my own case, my line of research was and continues to be educational change and its relation to teachers' work and the structural conditions under which it occurs. This perspective orients all the research that is included here.

Most of the institutional guidelines for teaching these courses essentially repeated what was considered "good" teaching in the classroom—a focus that was shared by the literature on educational technology of the time. Guidelines were centered on practices for using Internet technology to encourage group interaction and cooperation, provide information in a meaningful way for students, concentrate more on educational activities than on the simple transmission of information, and so on. The guidelines reflected primarily the constructivist focus that was (and continues to be) common in educational literature, regardless of the type of teaching in a course (face-to-face, classroom or televised, or online).

The group—professors who were experienced in the face-to-face mode but were novices online—believed that researchers and professionals in educational technology supported using Internet technology to emulate the conditions of face-to-face teaching, with an emphasis on the importance of using well-designed instructional material. This focus continues to be the most common in much of the current literature on educational technology. However, when the group's instructors attempted to follow the above guidelines, and began to make decisions as a function of our experience in face-to-face teaching, many problems were generated in the online courses, with a negative effect on our students' learning and willingness to learn.

Such problems obligated us to dedicate an enormous amount of time and resources to teaching online. And with little success. For most of us, the first semester taught online was a complete disaster; some of our colleagues left the EGE and returned to face-to-face teaching. And we discovered that our situation was not the exception. More than 75% of the professors

hired to give courses at the virtual university for one semester did not want to continue, mainly because of the courses' online components. Instructors simply refused to participate, or limited their online teaching to the transmission of only one class per week, while other employees were responsible for the remaining course activities—ranging from designing materials under the instructor's supervision, up to answering student questions received in forums or by E-mail.

Why was this happening? The institution was explicitly supporting the project of the "virtual" university. Ample resources were assigned to the change initiative, including privileged work conditions (fewer courses to teach, fewer advising and administrative responsibilities), in comparison with graduate school professors who taught in face-to-face programs. We had access to state-of-the-art technology, and numerous training programs for its usage. All of us had the best equipment available to carry out our work (computers with specifications beyond strict need, a broadband Internet connection, the newest versions of software, and unrestricted E-mail for receiving messages and files).

A team of technological assistants was assigned to each course to ensure that professors had all the support we needed. In addition, we were a highly experienced teaching group, with doctoral degrees in education. What was happening made no sense. We concluded that although the conditions and support were apparently ideal for teaching online, there was an evident contradiction between what we were doing and the results we expected to obtain. And that contradiction could be resolved only through practice.

The notion of using technology to emulate face-to-face teaching was considered problematic in operative and conceptual terms. Operatively, the group believed that Internet technology was a poor emulator of face-to-face interaction. It was designed for a different form of communication, which must be learned, just as people have learned to communicate by using the telegraph, radio, telephone and other communications technologies that we now take for granted. While the classroom has the possibility of maximum utilization for face-to-face interaction (although such utilization is not the case in most classrooms), Internet technology does not generate the same working conditions as a classroom. Its conditions are not even similar.

Conceptually, the use of technology to emulate face-to-face teaching was also problematic. On reviewing the literature during the stage of project recognition, we found that although many authors emphasize the importance of interaction, there was practically no empirical evidence to support the statement that interaction could be generated by Internet technology, or that using interaction would result in improved student learning. It should be mentioned that when the project began, online courses were almost nonexistent. Those described in the literature varied widely, by combining face-to-face, classroom or technology-mediated encounters (video linking or telephone conference calls), with very different results.

Literature in disciplines other than education (Zuboff, 1988; Bower and Christensen, 1995; Sviokla, 1996; Burris, 1998) provided evidence on the effects of technological innovation on work: the result could be continuity, allowing a person to carry out his usual work more effectively or efficiently; or rupture, the creation of different work that requires the acquisition of new knowledge and skills. Information technology (including Internet technology) normally has more of an effect of rupture than of continuity because workers are forced to make decisions in the light of information not previously available.

If information technology based on the Internet has this effect of rupture, then we can understand that the emulation of face-to-face teaching is hindered by using a technology that is

not designed for face-to-face interaction. This fact justifies, in educational terms, the design and implementation of new forms of online teaching instead of attempting to emulate forms of face-to-face teaching. Thus the project began with the real concern of determining what a "virtual" professor could do (in contrast with a "real" professor) to contribute to student learning by using Internet technology, and to take advantage of new technology to carry out educational activities that could *not* be done in a classroom in a face-to-face teaching mode. Instead of trying to emulate "real" teaching and teaching poorly, the more logical and ethically correct solution was to use technology differently and take advantage of it to work with students in ways impossible to use in face-to-face situations—ways that at least in principle could result in improved learning.

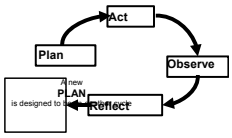
Method

This concern resulted in an attempt to improve online teaching at the graduate level by using action research to improve practice, in addition to contributing to knowledge of the discipline. Action research has been used for years in many fields focused on professional practice (Reason and Bradbury, 2001), including education (Noffke, 1990; Flores, 1994; Noffke and Stevenson, 1995; McTaggart, 1997; Fierro, Fortoul and Rosas, 1999; Reason and Bradbury, 2001; Zeichner, 2003). Different forms of this research exist: one is emancipating action research (Carr and Kemmis, 1986; Kemmis and McTaggart, 1988), which attempts to improve educational practice in specific contexts and the conditions it which it occurs, as well as to generate knowledge of relevance for education in general, beyond the particular context of improved practice.

The object of study of emancipating action research is the educational practice of an individual or group *who is carrying out the research*. This research is on one's own practice, not that of others. The research is carried out in a collective and collaborative manner, known as an action research cycle (Chart 1). The basis is the assumption that social practices or the conditions in which they are carried out must be changed in order to improve understanding. The members of the research group make informed decisions to modify their practice and establish an action plan, which is then implemented by the group. The group members observe systematically the effects of the change on themselves and others, and reflect critically on the results, to ensure that practice has improved in ways that are technically correct and socially fair (Carr and Kemmis, 1986; Noffke and Stevenson, 1995; Atweh, Kemmis and Weeks, 1998).

DIAGRAM 1

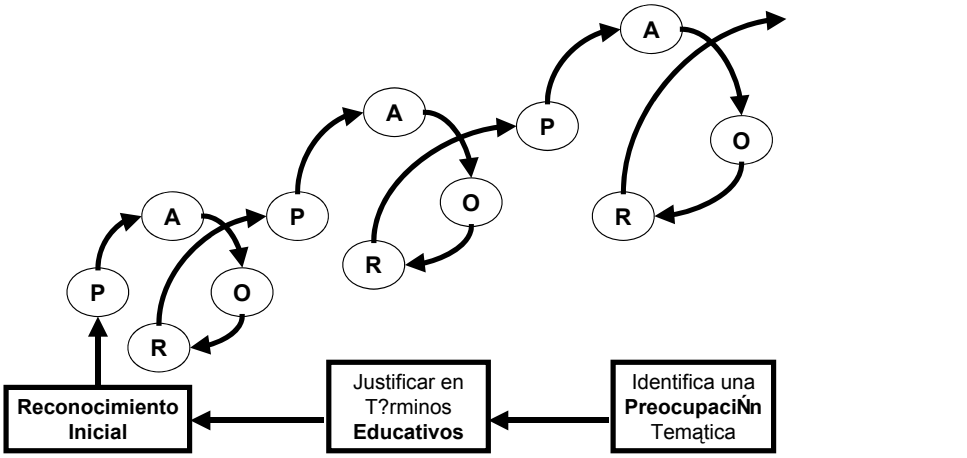
Cycle of Action Research (Kemmis and McTaggart, 1988)



The results must also contribute to increasing knowledge about education and improving the conditions of practice for researchers and others (mainly students and members of the school community).

Reflection leads to a new action plan and starts another cycle of action research. The process repeats indefinitely for the time that the group decides to work on research and improve practice. An action research project is the total of one or more cycles completed by the group (Chart 2).

DIAGRAM 2
Action Research Project



Initial Recognition Justification in Educational Terms Identifies a Thematic Concern

The initial problem for design in the first plan of action was how to change educational practice using Internet technology to contribute to students' learning in *ways that could not be done face-to-face*. The plan would focus on developing a different type of educational practice, which we would refer to as "virtual" teaching, to contribute to student learning and teach in different ways, instead of emulating face-to-face teaching as the "only" way to teach "well."

The project also included forming teaching teams of instructors and technological assistants *not* from the same location. Most of the literature on distance and online courses assumes that students are at different locations while the teaching team and technical personnel are at the same location in a face-to-face work setting. This practice was common at EGE before the project began. Could we talk about online teaching for students and still have instructors working with other personnel in a face-to-face setting? The group believed that such a situation represented a contradiction in practice, with an effect on the design and implementation of courses. As a result, we decided to form teaching teams that would also work predominantly online, as an additional factor for contributing to student learning in ways that could not be carried out in face-to-face settings.

According to the methodology proposed by Kemmis and McTaggart (1988), the three principal objectives of the project were to improve: *a)* the educational practice of a group of instructors at the graduate level as "virtual" instructors; *b)* the knowledge of changes in

educational practice derived from the extensive use of Internet technologies in courses; and *c)* the conditions under which online courses were taught.

The action research project was carried out from January, 1999, to May, 2002, with the completion of nine cycles of action research in seven academic semesters. The group of instructors changed over the project, as professors, tutors, instructional designers, technical support personal, and graphic designers were assigned to other courses in educational administration. Only the author of this article and two instructors remained in the project for seven semesters, although twenty-five different people were team members for the courses included in the project from 1999 to 2002.

Three courses were offered in different semesters from 1999 to 2002: Theory and Design of Educational Organizations (TDO), Strategic Planning of Educational Institutions (PEIE), and New Trends in Educational Administration (NTAE). During each and every semester, at least one of these courses was offered as part of the project. In the fall semester of 1999 and the spring semester of 2002, two courses were taught each semester, making a total of nine courses in the project. The course enrollment was 600 students between 1999 and 2002; at least 30% of them took the three courses in the project, and some students were included as part of the action research group during various semesters.

Information was collected during the cycles. Changes in practice were logged in the field diary and in course documentation. The results of the change were analyzed in the written work of students either in the same or different courses. Data were also obtained by comparing interaction within or between groups in discussion forums, and longitudinal information collected by students participating in the three courses. This information included student profiles, data on student withdrawal from courses and programs, student satisfaction (through surveys and interviews), and the analysis of the incidence of the main problems faced by both students and instructors. Information on changes in professors' practice and working conditions was collected during the seven semesters through interviews.

The meaning of an "online" course as understood in this project must be explained, since the term is used to refer to a wide variety of courses that utilize information and communications technology. In this study, an online course is a formal academic course that is part of a graduate program, in which one hundred or more students participate. It does not require that students share the same physical space with their classmates or professors; it uses Internet technology as the main means of communication and interaction among participants; and interaction is asynchronous. All of these characteristics were required for a course to be considered an online course in this project. Chart 1 shows a summary of the courses included between 1999 and 2002.

During the three and one-half years of the study, many changes were implemented in these three courses. They caused modifications in the processes of operational aspects and the teaching team, which required new practices in the design of learning activities and communication. Such is the nature of action research. The specific changes are not presented in this article, but can be consulted in Flores (2002).

CHART 1
Courses Considered in the Project from 1999 to 2002

Semester	Course	Enrollment
Spring 1999	Theory and Design of Educational Organizations	130

Fall 1999	Theory and Design of Educational Organizations	110
Fall 1999	Strategic Planning of Educational Institutions	140
Spring 2000	Theory and Design of Educational Organizations	115
Fall 2000	New Trends in Educational Administration	270
Spring 2001	Theory and Design of Educational Organizations	105
Fall 2001	Strategic Planning of Educational Institutions	175
Spring 2002	New Trends in Educational Administration	120
Spring 2002	Theory and Design of Educational Organizations	185
7 semesters	3 courses	1 350

Results in Relation to Students

The results are presented in light of the thematic concern: Is the work of a "virtual" professor the same as that of a "real" professor who simply uses new technology to work more efficiently, or is it different work? Nor can student learning be ignored, although it is not the main purpose of the project; changes that improve educational practice are justified only if they contribute in some manner to learning. Thus three sets of available data were monitored, in relation to student performance and satisfaction. Apparently, the actions and changes resulted in improvements in students' academic performance, a notable increase in student satisfaction with online courses, and a decreased rate of student withdrawal from courses.

The information on academic performance was generated by evaluating the written work presented in a course and comparing this work with that presented in following semesters, especially in the course on Theory and Design of Educational Organizations, offered in five of the seven semesters from 1999 to 2002. The other two courses were each offered two times during the same period. Student work was reviewed and evaluated in an independent manner by two readers, who used a seven-point scale to evaluate academic content and writing skills. The mean scores were compared to determine if significant differences existed in the same course (beginning and end work). The total scores of one course were also analyzed by comparing them with the following course; although the scores increased within a single course between the beginning and end work, the differences were not statistically significant. However, on comparing a course's mean with the following course, such differences were observed (Chart 2). We can assume that academic performance improved from one semester to the next when the same course was offered. This phenomenon occurred with the three mentioned courses, at least in terms of the student work presented.

CHART 2

Comparison of Mean Scores of Written Work in the TDO, PEIE and NTAE Courses

Semester	**Students**	**Average Scores (5-35)**	**T-test**	**Significance (a = .005)**
TDO				
Spring 1999	130	18.78	N/A	N/A
Fall 1999	110	20.14	1.441	No
Spring 2000	115	21.52	3.362	Sí

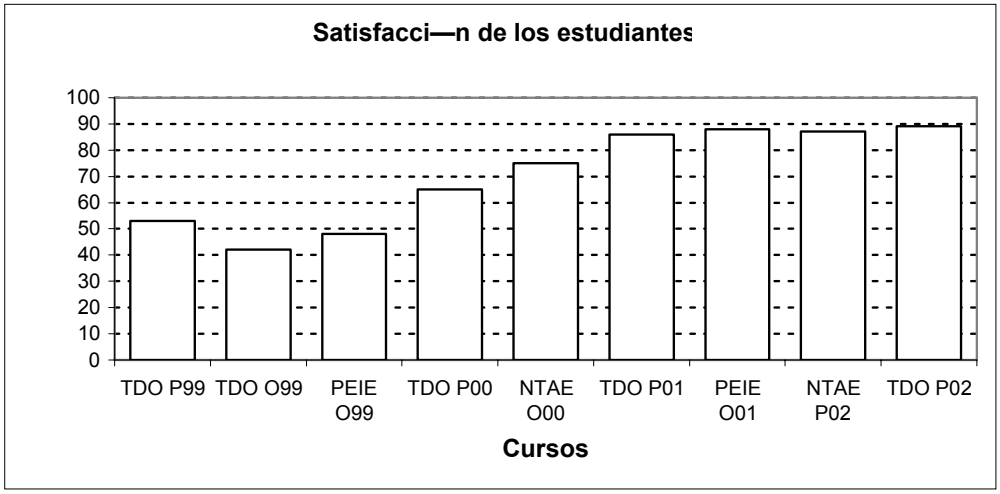
Spring 2001	105	22.81	2.453	Sí
Spring 2002	185	24.06	2.490	Sí
PEIE				
Fall, 1999	140	26.35	N/A	N/A
Fall, 2001	175	28.91	2.067	Sí
NTAE				
Fall, 2000	270	24.73	N/A	N/A
Spring, 2002	120	27.46	3.859	Sí

Information on student satisfaction was collected by using a questionnaire with twelve questions designed by the project team. The students were asked to assign a score between 0 and 100 to the following course elements: *a)* academic content; *b)* individual learning activities; *c)* group learning activities; *d)* work load; *e)* interaction with instructors; *f)* help in understanding content; *g)* help with technological problems; *h)* evaluation proceedings and criteria; *i)* clarity (instructions); *j)* clarity (feedback on academic performance); *k)* course relevance; and *l)* general satisfaction with course.

An analysis of the totals showed that student satisfaction with the course increased in a considerable manner after the Spring of 2000 (Graph 1), from an average of 53 in the Spring of 1999, to 89 in the semester of the same period in 2002. Considering that the percentage of student response increased from 47% in the Spring of 1999, to a relatively consistent 67% during the Fall semester of 2000, we can state that the changes made in the project contributed to improving student satisfaction with online courses, or at least, they did not affect satisfaction in a negative direction.

GRAPH 1
Student Satisfaction with Online Courses (Spring 1999 to Spring 2002)

Student Satisfaction



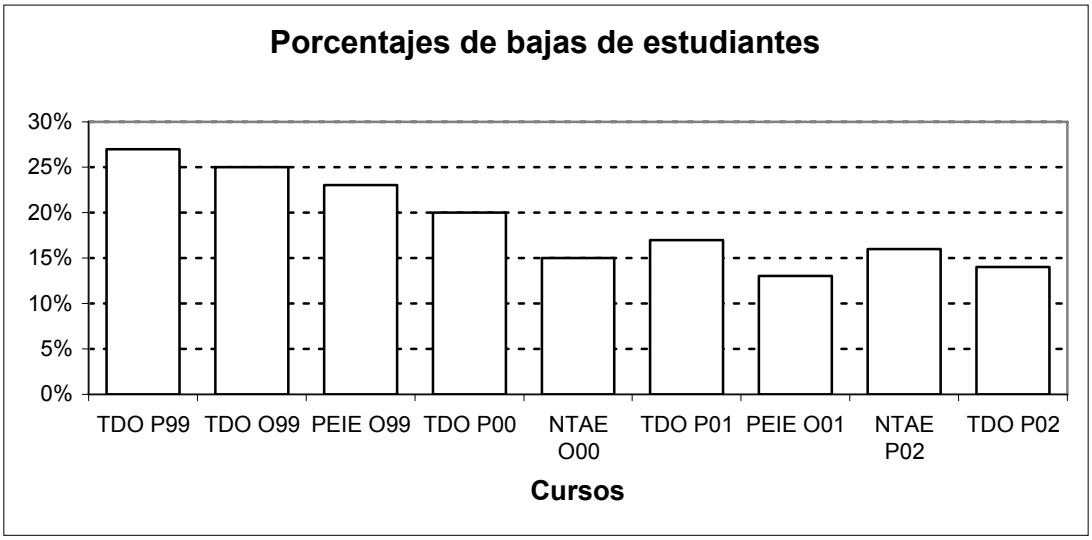
Courses

Information was also collected in relation to the rate of student withdrawal from the seven courses. When the research project began, the number of students withdrawing from courses, especially new students, represented a matter of concern at Escuela de Graduados en Educación. On an average, close to 30% of the students withdrew from at least one of the courses in which they were enrolled in the Fall semester of 1998. We believed that knowing this percentage was important to interpret correctly the data of academic performance as well as student satisfaction. The changes might have an effect not only on satisfaction, but also on student withdrawal from the course, or even the master's program. This did not occur, however. As Graph 2 shows, in spite of decreased satisfaction during the first three semesters of the project, the percentage of withdrawal also decreased in a gradual manner. By the Spring semester of 2002, the percentage of withdrawals had reduced to practically one-half of what it had been in 1999, when the project began.

GRAPH 2

Percentages of Student Withdrawals from Online Courses (Spring 1999 to Spring 2002)

Percentage of Student Withdrawals



Courses

I do not believe that these results in academic performance and student satisfaction resulted exclusively from the action plans carried out in the project. On one hand, technological improvements in the equipment and communications systems in the period may have had an influence. Efforts made in other courses (by instructors not participating in the project and virtual university administrators) also had an impact on improvements in academic performance, increased student satisfaction with online courses, and decreased withdrawals. But since concern for these aspects was not limited to the members of the action research project, taking credit for these results would be unfair as well as inexact.

Based on the data, however, the statement can be made that student learning may have benefited from the project; at least, it was not affected in a negative direction. If academic performance, student satisfaction, or student withdrawals had indicated that our actions were making the situation worse for students, the project would have been terminated at that moment. Termination did in fact almost occur at the end of the Fall semester of 1999, when student satisfaction seemed to be a serious problem (see Graph 1). If the student withdrawal rate had not decreased (see Graph 2), and if student comments in interviews and discussions forums had not confirmed wide variation in the data on student satisfaction (resulting from the statistical analysis), the project would have been halted.

Results in Light of the Thematic Concern

Two important findings respond to the project's thematic concern. Our discoveries suggest emphatically that the type of work done by a "virtual" professor is very different and not a simple extension of "real" teaching work. It is work for which "real" teachers are poorly prepared. Most of a "virtual" teacher's time is devoted to two activities, which we identify as "letter writing" and "holographic teaching", described below.

Letter Writing

An important change in educational practice refers to the way the professor communicates with his students. One-on-one communication represents 75% of the working time of the "virtual" professor, while a "real" professor will communicate one-on-one with students less than 20% of the time. Most of the instructors involved in the project also teach in the face-to-face classroom mode, either at the undergraduate or graduate level. Interaction was monitored in the two modes by comparing the work of the same professor. In most cases, one-on-one communication with students, even in seminar-type courses, rarely exceeded 25% of the teaching time. In lecture courses, such communication was seldom more than 10% of the time.

This finding implies an important change in the work of the "virtual" professor. It is the equivalent, as one of the group's professors wrote in her field journal, of "having multiple conversations with different students at the same time. Although the topic is the same, each conversation moves in a different direction." Face-to-face interaction in a group does not develop in this way. Another group member commented:

> [Sometimes], especially when a project had to be turned in, I was answering questions from twenty different students during the day. I would often send a student an answer to a question he had not asked, which would make things worse. An extra E-mail was needed to clear up things. When I give a "real" class, this never happens. Questions follow a "logical" line of reasoning. "Virtual" courses are like a cocktail party that never ends, where everyone insists on talking to the same person about different things at the same time. And you cannot simply nod your head and go away! If you don't answer, you end up with a new E-mail in the box.

The logs indicate that the professors were receiving an average of twenty-five requests per day from students. In almost 50% of the cases, a response from the instructor generated at least one more E-mail from the student. The problem, however, is about variability:

> On some days, there is almost no E-mail or questions in the forums. On other days, there are more than 90 questions. The day I had most questions, there were 230. I spent at least six hours communicating with students that day. The questions are not always different, but they all require an "individual" response. Keeping a file of possible answers decreases the time invested in answering students. However, it takes between one and fifteen minutes to read what a student sends, to decide how to answer, write the response, and send it.

We professors in the project carried out various actions to try to control the volume and diversity generated by one-on-one interaction with students. Such actions ranged from establishing a strict policy of not answering questions until the following day, of establishing discussion forums on web pages for distinct types of interaction (discussions of a topic, forums to answer questions about a particular chapter or reading, questions about technological problems, and so on). Even assigning specific professors to questions about a certain topic or of a certain type. These actions were able to reduce the flow of communication to manageable conditions, but at regular intervals there was always an additional flow of student questions. "It's like a Seven-Eleven store. You're open seven days a week, 24 hours a day, and you have a problem if someone goes to the store and finds it closed! The complaint is immediate," commented an instructor at a face-to-face work meeting.

> I never realized how useful it is to have a three-hour class session to answer student questions and make sure that everyone understands the same thing. And if there are questions, the students have to wait until the next week to get the answer. Or make an appointment with you. Or solve the problem on their own. Problems in face-to-face communication are not common. Teaching online is the opposite. Having problems is the rule, not the exception.

An additional factor identified by the group is that communication with students is in writing, in a style between formal academic writing and the more colloquial writing of a chat room or E-mail. An analysis of a wide variety of incidents that occurred in the courses shows that more than 90% is due more to the lack of writing skills in communicating and less to problems in information. Relatively simple problems become unsolvable conflicts, exaggerated by the delay in asynchronous communication.

> At the beginning, we would send the student to the corresponding section of the course, but that did not help much. Some students do not read the course materials, but most do. So sending them back to that information does not help. It only annoys them. Once Cynthia [a student enrolled in a TDO course] answered my E-mail by saying that she had already read the page four times, and still did not understand what she was supposed to do. She asked me in the E-mail if I thought she was slow. And no, I didn't think that. I tried to calm her down, telling her that I didn't think that about her, but from one message to another, which took one day to write, and another day for her to read and respond, a week passed and Cynthia still did not have the answer to her question. During the same time period, she complained to her program director, and asked other students what they were doing. She got contradictory responses, and was convinced that I couldn't or didn't want to help her. I had to get her telephone number, locate her, leave her various messages, and finally talk to her in an attempt to solve the problem. I'm not very sure I did so. The worst thing was that it was such a simple problem. Cynthia had read a different article by the same author. Obviously, what we were asking her to do made no sense. Asking for a bit more information before returning her to the course's web page would have prevented a lot of problems.

Interviewing students about these problems allowed the research group to understand the type of written communication that was most useful for them. The response given by Leticia, a student, was very important in reformulating our perspective on written communication.

> […] I print and save a file with all the answers they give me when I ask a question, either by E-mail or in one of the course's forums. I also print and save the questions I send. Last week I was reading the file of another course we took, the Planning course last semester [PEIE course, Fall, 1999]. I felt like I was reading a book of letters, like the letters written by the writers and scientists and philosophers during the 18th and 19th centuries, before radio and telephone and television simplified the exchange of ideas. When people had time to write in this way, and would wait to read the next letter. But in order for a new letter to come, you had to write back. They would refer to what the other person had written, and then they would suggest a response or a new idea. People did that for years! We do it for a semester. Or two semesters, because although this is a different course, some of the things we commented on last semester are also important for this course. And some of the questions from last semester can be answered more easily once we know more about educational organizations.

"Letter writing" was the term used by the research group to describe this writing format. It is sequential, but requires both parties involved in the communication process to provide information on previous exchanges, to include other information related to shared meanings, and then to ask explicitly for new information or new perspectives. This type of written communication normally leads students to respond in a similar format, generating a series of "letters" on the same topic. The analysis of incidents that concluded positively showed a common pattern of "letter writing communication" between the professor and student, and even between students, or between professors. Although writing in this manner required more time from the instructors, it also reduced the number of conflicts and misunderstandings, eventually resulting in less time used by the instructors to communicate with their students in writing.

This sort of writing, however, required developing a new set of skills, and especially a new perspective on communication with students. It also obligated the instructors to organize their work differently. These changes took time—at least two semesters were needed to develop a functional skill level. Recognizing the other person is necessary. Writing in this manner is a skill that must be reviewed constantly, since communication is always one-on-one. And the audience of a single person is always different.

Holographic Teaching

A second distinctive characteristic of the work of a "virtual" professor is that teaching is no longer an individual task. Yet it is not a joint effort in which professors work together as a teaching team. We coined the term, "holographic teaching" to attempt to describe with greater precision this characteristic of the "virtual" professor's work. In a hologram, each part has the information necessary for reproducing and projecting the complete image at any moment. In an online course, each student has access through technology to any of the professors participating in the course, and can even approach all of them simultaneously (by sending the same E-mail to all at the same time), in the hope that their responses will not be conflictive, and that the instructions and explanations given by any one professor will be accepted by the others. Each message from an instructor remains as a written reference, and is even distributed among students as information for clearing up doubts and doing projects, with the expectation that the information will be considered valid for any professor participating in the course.

Even if specific "functions" are assigned to the different professors and specialists involved, and students are assigned to a particular professor with whom they "must" work, whatever one team member does (although simply a technician), affects the entire course. While a "real" professor must communicate orally with groups of students and work individually in his course, the "virtual" teacher communicates one-on-one with many students, and works in parallel with his colleagues, who are doing the same. There is normally wide variation among a course's professors and specialists in terms of their knowledge of the content, teaching experience (face-to-face or online), and technical knowledge about Internet technology.

For a course with 120 students, for example, at least six people are working. The "head professor" is an academic with a doctoral degree who is responsible for the course content and "administrates" it. Three instructors serve as tutors or advisors; they may have a master's degree in a related field, or be a doctoral student at EGE; they work as teaching assistants with groups from 20 to 40 students and are responsible for students' academic performance (by grading projects and giving feedback). Lastly, two technical specialists are involved, one for the graphic design of the pages and the other for web programming.

The initial decision was made to divide the work to take maximum advantage of each team member's knowledge and experience, and channel students to those who could help them the most. If a student had a question about course content, he could ask the head professor or the tutor or assistant most familiar with that topic in particular. Students' technical problems with using the computer or accessing the course's web site, would be the responsibility of the appropriate technical expert. The tutors would respond to questions on grading, and would offer "their" students follow-up whenever they had administrative problems.

This decision rapidly proved to be erroneous. Although the plan made sense for the professors and technicians, it did not for the students. Forcing the student to differentiate between one problem and another and then wait for the "appropriate" person to contact him, made a complicated situation even more complex. Comments from students interviewed in the fall semester of 1999 illustrate the point:

> As students, we are used to dealing with a person in class: our professor. If there is a problem with homework, or a problem in finding the articles on reserve, or if we do not appear on the class list, the professor normally fixes it. But not in these online courses! They were complicated to start with, because we had to learn to use the technology besides doing the coursework. And when something did not function as it was supposed to, I would send an E-mail to my tutor. I thought it would work as in any class, that the tutor would solve the problem. But most of the time he would tell me to contact another person. After a while I thought that I knew who to contact when I needed something. Sometimes I guessed right! But most of the time I did not. So I decided to send an E-mail to everyone on the teaching team, and wait to see who answered. That didn't work either. No one answered! And then I got an E-mail from my tutor, asking me please not to do that because it made them all lose time.

> The answer takes so long to arrive that it's frustrating. I write an E-mail to my tutor, who tells me to write the technological advisor. I do so. Three days later, the advisor writes me to say that I have no access to the course because of some problem with my enrollment. I tell him that I have been accessing the course for eight weeks without problems. He writes me the next day and tells me to write my program director, since someone updated the courses and information was lost, and that he cannot help me until he receives school approval. I send an E-mail to my program director and a copy to the tutor. At this stage of the game it is already Friday, and I have not been able to access the course all week. And there is homework to turn in on Wednesday of the next week. I also write the head professor of the course. He answers me Tuesday, telling me that he cannot solve my access problem, but he sends me a file with the instructions for the homework. I ask him for an extension, and I receive an E-mail Thursday, saying an extension is no problem. My program director does not answer me until Friday, but he has "good news". The access problem should be solved by Monday. And it was. I send in my work Thursday, a week late. But the head professor said it was fine, no problem, right? But it is a problem. My tutor writes me to say that he will not accept my work because I turned it in a week late. I look for a copy of the head professor's E-mail and I forward it to the tutor. He answers me Monday, saying that he is going to check with the head professor. After a couple of E-mails more, the problem is "cleared up". But I've had the problem almost one month. Now I save every E-mail I receive, in case it's needed. And I hope not to have another problem or question.

Dividing the work was the most tedious part for all of the involved parties. The group decided to keep a log of all student questions and requests. They were separated into two groups: those that could be answered by the person who had received them, the person "responsible", and those that had to be referred to other people. More than 60% of the petitions had to be sent to another person, and dividing the work was not a useful alternative.

Although the division seemed reasonable, analyzing the team's flow of work in the semester provided an interesting perspective on why dividing the work affected the course's operation. Tasks were not distributed in a uniform manner throughout the semester. Questions and comments on academic content, for example, increased noticeably around the time work was to be turned in, demanding much more time from the tutors. Such increases caused delays in responses to other questions. If the problem was technical, the students literally bombarded the team's technicians in their search for a solution. While one person had 86 E-mails to answer one afternoon, the other professors had no E-mails. Problems of this type simply do not occur in face-to-face teaching, in which class time I used to provide all students with the same information. But this option does not exist in online courses. And if the attempt was made to emulate the face-to-face classroom situation by making a "general announcement" on the course platform or by E-mail, the cure was usually worse than the illness.

> A group of students was reporting problems with accessing an online exam scheduled for the third week in October. We were not sure what was happening since the system was apparently functioning well. The students were concerned, so I decided to put in an announcement asking the group to contact me if there were problems with the exam. I'm the only one who would think of something like that! I was deluged by E-mails from students, messages saying that they had not had problems, or students wondering if their responses had arrived although there had seemed to be no problem, even questions about how their final grade was going to be affected if they did the exam the following week. The rest of the team also received E-mails, and some answered by saying that there were no problems with the platform and that the exam had to be done as scheduled. Such a mess was created that we had to give them all an extra week to take the exam. And there were twenty students who could never access the exam, due to configuration problems with their computers. If I had not had the extra work of responding to 140 students because of the announcement I made, I probably would have realized in a couple of hours that the problem with the first twenty was because of the configuration and not the network.

Dividing the work also led to repeated tasks, adding more to the load of all the course's professors. This was especially noticeable when professors were answering questions about the material, or students were turning in projects. The tutors' comments exemplify this point.

> We thought that the easiest way was to divide the students into three groups, each group with its own tutor. Each one of us would work with "our" students. In retrospect, we were simply emulating face-to-face teaching, by dividing a very large group into three "sections" of the same course. And we all ended up writing detailed responses to similar questions, when we could have shared the written responses one had done for "his" students and used them for "our" students. The idea of "one teacher, one group" that makes all the sense in the world when you're teaching face-to-face makes no sense in a "virtual" course. Senge [1998] was right: "Dividing an elephant does not make two little elephants". It makes a dead, cut up elephant. When we centered on "our" students we

> stopped realizing that all of us were teaching the same course. And we ended up working three time more, instead of three times less.
>
> When various professors teach different sections in a "real" course, the students normally compare what is happening in one course and the other. Normally, this comparison does not have an effect on the other course. After all, the students are in "different" courses. And what one student says to another is essentially his opinion, and cannot be proven by the student in the other course. With us, this was not the case. Students can and do communicate, and technology makes it easier for them to do so. After all, the content is the same, the work is the same. And everything is in writing. Everything. We had problems because of this on more than one occasion, when the students compared what we had written. Sometimes, one of us might interpret what an author was saying in a slightly different manner, and the students thought that any one of the three interpretations was valid. Or that none was valid. We realized that it was best to share what we were doing and reach agreements before our opinions became "public" with the students. Dedicating time to talk (in person, on the telephone, or by E-mail) about our perspectives of the content and projects, which at first I thought was a waste of time, prevented problems in the future. I would never do it with my colleagues in classroom courses. But I would never fail to do it for an online course.

These problems explained why "virtual" professors report a sensation of additional work, and why online teaching requires so much time, even when equipped with a team of tutors and technical advisors to do the job (Smith *et al.,* 2002). Work could not be divided into individual functions, since teaching requires having all the information and control of the tasks. Dividing the work generates conditions in which people have to handle insufficient information, without control over many parts of the process. Thus additional effort must be made for the process to function adequately. Conflicts, delays and errors are generated, and they affect the motivation of both students and professors.

> There is a certain beauty in the design of "one teacher, one group, one class" that we use in face-to-face teaching, and this beauty explains the persistence of this teaching, in spite of everything. What happens outside of the classroom is not important. Once the professor and his students are in the classroom, the teacher has absolute control of the process. If something comes up, he has all the information to adjust the process. And since all the students are there, the adjustment seems natural. Even the famous team-teaching, which could be confused with what we are trying to do, functions in the same manner. The professors agree on what they are going to do, and that can take some time. But in "class", the one who is in charge can easily adjust the process. What we do is not at all similar to that. We do not have a "classroom". We do not have a "group". We have more than 100 students, and each one has access to all of us at the same time, but one-on-one. We teach individuals who form a collective, and what each one of us does has an effect on each one of the students. A hologram is the most adequate analogy for what we do in a virtual course. Each one of us, at one time or another, is the entire teaching team.

This different perspective led to various important changes in practice. A "virtual" professor does not have to work collaboratively with others most of the time, but he needs to communicate constantly about what he is doing, stay informed about what the others are doing, and adjust the criteria to make decisions that are aligned with what the group as a unit is doing. Working in this way is very different from what a "real" professor does, although he is teaching the same course with other professors. While teaching with others requires everyone

to have a common base of knowledge, and to be able to carry out different activities with the group, "holographic teaching" implies that all the professors and specialists in the course function as "one". To do this, all team members contribute information about what they do and what they are learning, in order to build a specific base of knowledge. At times, the work requires collective decisions, yet the professors and specialists must communicate constantly in order for individual decisions to be consistent. Like the parts of a hologram, each one must represent the whole with the greatest accuracy possible, at all times.

Internet technology facilitates this process by sharing information derived from one-on-one interaction with students and the other team members, through open or blind copies of E-mails, or through discussion groups. Nonetheless, working as a "virtual" professor requires constant adjustments in course proceedings to accommodate changing situations and to communicate these adjustments to the others—not a common task among "real" professors.

The professors and technicians therefore need to reduce their specialization and develop multi-functional skills, and help the other team members. Such actions eventually reduce the instructors' work load, but add new tasks, especially in terms of communicating about the adjustments or the decisions that have been taken.

These actions also imply "losing" individual control over the teaching process—something that is very difficult when one is a "real" professor. In the face-to-face mode, ceding control to others causes problems, since the conditions that derive from the design of "one teacher, one group, one class" are based on the professor's adjustment and control of processes. In an online course, however, ceding control and adjusting to the decisions made by others has the *opposite* effect: fewer problems are generated. It implies distributing control over the course among all the professors in a nonsystematic form, which occurs over time as a function of the decisions made and communicated by others. Recognizing this fact, which is counterintuitive for an experienced classroom professor, is probably the most difficult aspect to overcome in a "virtual" course. A tutor who had worked on the project since the Fall of 1999 until the Spring of 2001, and then was absent for one semester, wrote the following in the Spring of 2002:

> I had forgotten that you have to let some things go, and not try to control everything that happens in a virtual course. I did not teach online last semester although I continued with my "real" classes as always. And what did I do when I came back? I forgot to tell the others about what I was doing with my students (after all, they are "my" students) and I forgot to read what the others are doing. Sooner than later, I was being slow about answering questions and sending feedback, while trying to help a couple of students (who claimed they couldn't access the course) by asking a couple of people I know, who are skilled in computers, if what the students were telling me was possible or not. Because "my" other students were saying there was no problem. And feeling overwhelmed, I wrote an E-mail to all of "my" students telling them that I could not send them feedback on their work because I was going out of town for a week; I was feeling extremely frustrated because I had worked until the wee hours to have all the comments read and sent. Before I sent the message, I checked my mail and saw two new messages, from two people on the teaching team. One was a blind copy of a message to a student, telling him that there were access problems with a specific Internet provider, but that he could change to another option on the navigator preferences to fix the problem. And other message from [...], dated the day before, thanking […] for sending a copy of a response he had given the students in a forum—a response that had been just what was needed to answer a question from four students who were asking about the contingency theory of organizations. Then it hit me. This is a virtual course. I am not teaching alone. There are six of us

giving the course. I erased the message that I had written about the delay in sending feedback, which had taken me about fifteen minutes to write, and I sent a much shorter message for the teaching team, with the feedback for thirty students in a file, asking someone please to publish them. And I turned off the computer about three minutes later, when I received the confirmation from the server that my E-mail had been delivered. From now on, I won't forget to tell the team members what I am doing, and I'll read what they are doing before making decisions about the students. I don't have to do this alone.

[Another entry, four days later]

It is hard to change habits. I had the opportunity to look at the course page in [another city] and I checked if the feedback I had sent was on the page. It was. […] had uploaded it the day it was supposed to appear, with an additional note advising that I would be out of town until Friday, and that if anyone needed anything, to write him by E-mail. "I would have written it differently," I thought, and was about to add a message to the forum but I stopped. Why do it? So that the students would know that "their" professor was there, in charge and in control? At 11 PM, after a long day and before an even longer one, I was connected to ensure that everything was going as it should. As I would in my face-to-face class, where I am the one responsible for the group and in charge. There is definitely something about the work of a "real" professor that works against you when you work as a "virtual" professor, and that makes online work much more demanding. So a better choice was for me to send [...] an E-mail thanking him for uploading the feedback on the papers (one minute) with a copy to all the teaching team (five seconds). Then I turned off the computer and went to sleep. The students are being taught. By all of us.

Conclusions

As a result of our action research project, we know that the work of a "virtual" professor is very different from that of a "real" professor, in at least two ways:

1) Communication with students and others is essentially in writing, one-on-one, and in a format that, for lack of a better term, can be identified as "letter writing", to differentiate it from other forms of writing associated with academic work. An important part of the time required to be a "virtual" professor is dedicated to this activity, which is not part of a "real" teacher's job.
2) Teaching is a collective task: a group of instructors works one-on-one with each student. While a "real" professor works with a group of students, the "virtual" professor needs a team of professors who all perform in a similar manner. The description of this type of work is "holographic teaching": each instructor is an individual replication of the teaching team as a whole, and informed individual decisions must be based on common knowledge that is reconfigured constantly. Such reconfiguration occurs through information that is communicated by each member of the teaching team to the other members of the same team.

These two characteristics profoundly transform the nature of the educational work. Working in this manner requires a set of skills and attitudes that are very different from those of a "real" professor. Such skills and attitudes must be developed by instructors who want (or must) work

online, at least in courses like those described in this article. Face-to-face teaching does not require or develop these skills; in fact, in many ways it acts as a barrier to their development.

The possibility that educational practice using information and communications technology based on the Internet may be significantly different from what is normally understood as "teaching" has important implications in scientific and educational terms. From a scientific perspective, it gives us an additional focus on what we know about educational change, and specifically about why change initiatives fail in spite of the individual and organizational conditions that supposedly will ensure their success. The characteristics of the work to be changed must be taken into consideration. This research suggests that implemented and institutionalized changes that cause rupture in work, differ from modifications that have effects of continuity—an aspect that is not usually considered in processes of change, and which requires further empirical research.

From an educational perspective, understanding online work and its differences from face-to-face educational work is important in order to guarantee that initiatives to start online courses will truly be able to contribute to student learning without sacrificing the professor along the way. Online work should be done by professors who already work in educational institutions, with experience in face-to-face, classroom or technology-based teaching. The failure of change initiatives that use Internet technologies in higher education is normally attributed to the resistance to change or to a lack of training in technological skills and knowledge. These reasons may be valid in some cases. However, online teaching is really a *different* form of work that requires a series of completely new skills and attitudes for a "real" professor. Mere training in technology or instructional design is probably the best form of increasing the resistance to change, once the professor discovers that the work is excessive, exhausting and frustrating—precisely because of his attempts to use his experience as a face-to-face professor as the basis for his work.

Recognizing that being a "virtual" professor implies radically different work—which requires learning to communicate with individual students in writing, and working with other specialists in a different way—would be the first, indispensable step. Such awareness, on inviting a teacher to participate in projects of this type, will facilitate the process of constructing meaning, which has proven to be the necessary (although not sufficient) condition for any educational change (Fullan, 2001). No intelligent person will prefer work that leads to fewer results with greater efforts, regardless of its inclusion in the institution's strategic plans or the teacher's level of commitment to his students and university.

Although we discovered the "virtual" professor after three and one-half years, it was somewhat by accident. We still do not know if we have found him in his entirety, and we may at times be on a dead end. Our discovery has been delayed, considering that many "real" professors have been forced to teach online regardless of their preferences and skills or the additional effort required to attain student learning.

Further research on the topic is necessary: online teaching may be the most important change in education since the invention of the blackboard and classroom. We cannot continue by trial and error, or without sharing what we know with others. It would not be fair for professors who have just learned that next year they will have to be "online", and that the only support from their institution will be a series of workshops on using the computer, a group of technological experts who know how to program Internet pages, and a persistent discourse about the importance of "climbing" onto the information superhighway.

Change does not stop. But that does not mean that we cannot research this phenomenon as it is beginning. If this study and other similar studies contribute to understanding the change in professors' work, we shall be in better condition to know what we are facing, and to decide how we want to teach: face-to-face, online, or in both forms. In spite of all the technophiles who parade through the universities, much is lacking for all education to be "virtual". And yet—once again in spite of all the technophiles parading through the halls—we cannot grant ourselves the luxury of not trying to take advantage of this new medium to do what cannot be done face-to-face with our students.

Notes

[1] Two reports of progress on the research project have been made, first at the third International Congress on Distance Education held in Toluca, Mexico, in March of 2002 (Flores, 2002), and at the annual meeting of American Educational Research Association (AERA), in San Diego, California, in April, 2004 (Flores, 2004). This article is the first published version of the study's results.

[2] The current situation is different, since in 2003, the institution began to replace face-to-face teaching via a weekly satellite transmission with an online Internet format. Part of the reason for the change was the situation at Escuela de Graduados en Educación as described in this article, along with aspects of cost and coverage.

[3] A situation that is still occurring at this moment.

[4] This master's program, due to demands of the context, was opened one semester early, in January of 1999, with 40 new students and another 50 from the master's programs in education and in educational technology who decided to change programs.

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