



LEARNER-CONTROLLED SITUATION WITH DISTANCE EDUCATION

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Keywords: Distance education; Tele-learning; Just-in-time help.

Introduction

During the years I was studying to become a good professor, I was taught many learning and teaching concepts, principles and rules. I learned that individualized feedback facilitates learning. When a student makes an error, the object of the individualized feedback is to eliminate the wrong answer and to substitute correct information in its place. This correction function is probably the most important aspect of feedback [14].

During the years I was studying to become a good professor, I was said that under appropriate instructional conditions virtually all students can learn well most of what they are taught [1].

During the years I was studying to become a good professor, I mastered several instructional-design theories and models [2, 7, 9, 10, 11, 13, 15, 17, 20]. I was convinced that instructional design is a professional activity done by professors. It is the process of deciding what methods of instruction are best for bringing about desired changes in student knowledge and skills for a specific course content and a specific course population [16].

But, when I joined the Computer science department of Université Laval, the worse happened. The traditional system of education prevailing in my university places control of the learning environment in the hands of administrators, professionals (for example, those that allocate the classrooms), and professors, thus requiring close conformity of the learner. I had to teach to crowded classrooms the fundamental elements of computer science. The courses I was responsible for were taught to more than 100 students. Within those crowded classrooms, there was no time for personalized, individualized, and I will add, humanized instruction. There was no time to be concerned about the individual learning. There was no time to believe that under appropriate instructional conditions virtually all students can learn well most of what they are taught. Moreover, there were no research funds available to undertake projects with those human concerns; I was told (or I should say written) by my (male) peers to focus on technical and mathematical aspects of computing.

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I did not accept the situation. Consequently, I tried to discuss with the men managing my Department, my Faculty, and my University. I also had discussions with the male colleagues of my department. All those people showed no actual interest for what they called a «female concern». Day after day, I was told I was wrong. Week after week, there was always someone to describe me what should be my «feeling». My colleagues don't mind to have to teach to a crowd; in fact, they like it, which is well. They can live their professional life as they want. It does not bother me at all. What is worrying me is that they denied my concerns, so I cannot live my professional life as I wanted.

Because I need to believe that my «female concern» was not really understood, I must say that I do not blame all those people. In this paper, I am reporting the situation to help anyone that lives the same nightmare.

During the years I was studying, I struggled pretty hard to become a good professor but, I was beginning to regret those efforts. No place and no funds for the little details of instruction that make a big difference. Until I decided to look for a kind of technological support, I was alone. Although it was against my beliefs, I was forced to teach to a crowd. Remember, I believe in the power of personalized, individualized, and humanized instruction and to adaptive system of instruction. I was beginning to be annoyed by this career that should be so wonderful. I must say the information technology "rescued" my students ... and me.

Rescuing the students ... and me

I was aware that research has demonstrated that learner control is a variable having a significant effect on learning [8]. With the help of the technology and without disturbing any male colleagues, professionals and administrators, I was able to replace our traditional system of education by a learner-controlled instruction. It is a mode of instruction in which one or more key instructional decisions are delegated to the learner. Some of these decisions include pacing, sequencing, resource accessing, and even evaluation [22]. Because the information technology allows the use of network as Internet, it was possible to think about distance education. I developed two distance courses: *Information technology* and *Systems analysis and design*. I also designed and developed an environment of just-in-time help. The components of the two courses are summarized in the following.

First, there is a study guide that indicates what to do unit by unit. For each learning unit, the students can find the

instructional objectives related to the content of the book, the content of the television program, and the content of the exercises. The instructional objectives are based on the professional tasks the students will have to perform when they will be on the workplace. The following example reproduces a part of the *Systems analysis and design* third unit.

«At the end of this unit, you will be able to analyze the data pertaining to a system. To do so, you have to master the following objectives:

- To distinguish the various levels of data models.
- To write a description of each data model pertaining to a system.
- To justify the utility of each category and type of data models.
- To find appropriate occurrences for each element appearing in a data model.
- To validate a data model.
- To verify a data model.
- To criticize a data model.» [5].

The second component is a book [3, 4] especially designed to fulfill the need of each distance course. In those books, the fundamental elements pertaining to each instructional objective are detailed. At the beginning of each chapter, the list of objectives appearing in the study guide is reproduced. When writing the content of each section of the chapters, I frequently recalled the instructional objective related.

The third component is 13 television programs (30 minutes each). They are broadcasted on Cable television; they are also available at the audiovisual resource center of the Université Laval. A copy can also be mailed for students living outside of Quebec city. Each television program is a documentary showing how the knowledge detailed in the book is used in the real workplace. For the *Systems analysis and design*, I interviewed near of thirty-five persons. The content of the third television program relevant to the third unit instructional objectives listed above is summarized in the following.

The third television program presents interviews done with 3 analysts working for the LGS Consulting Group. They use a real case study to detail the various tasks leading to the design of each level of data models. During the introduction of the television program, I link what will be seen with the content of the book and, of course, with the instructional objectives. I also recall the prerequisite knowledge.

During the first part of the TV program, an analyst describes the characteristics (organizational context, results of the need analysis, etc.) pertaining to the case study. Then, I am back to link the previous and the next part of the TV program to the content of the book and to the exercise the students will have to perform.

During the second part, another analyst uses a case tool to illustrate the production of the conceptual data model

and its corresponding logical data model. Again, I am back to make the instructional links.

During the third part, a third analyst shows the use of what was created during the second part to produce the physical database and the SQL requests.

During the fourth part, the analyst that intervened during the first part summarizes the process.

To conclude the television program, I recall the instructional objectives and the part of the book related.

Each television program was designed to enhance the transfer of knowledge. I must add, it does. Students appreciate to see how the knowledge can be used in the real workplace. Because the interviewees are from different organizations, they use a quite different vocabulary to discuss about the same reality. Students learn to recognize a certain reality formulated with other words in the book.

The fourth component of the distance courses is the exercises. Students are asked to integrate the knowledge presented in the book and illustrated by the mean of the television programs during their exercises. The example presented here is related to the *Systems analysis and design* third unit discussed above: «Using the elements of a transaction that you recently made with an enterprise, elaborate the corresponding entity-relationship diagram».

There is a fifth major component. As example, we describe the just-in time help environment CODAMA (Conceptual Database Modeling Advisor). The advisor CODAMA provides help in elaborating entity-relationship diagram [6]. It is playing the role I cannot play: Providing individualized feedback and help to students. The advisor is interfaced to the CASE tool demonstrated during the television program described above.

There is within CODAMA mechanisms able to detect weaknesses in the mastery of the instructional objectives. CODAMA determines the knowledge level of each student with the use of the multiple facet model and tools issued from the domain of formative evaluation of learning [12, 18, 19]. CODAMA is able to situate students' errors and questions the student asks or is asked, within a structure of prerequisites. The weaknesses having been detected, CODAMA is able to propose an individualized remedial prescription. When the lack of knowledge is not too severe, CODAMA is able to generate a short remedial tutorial. When the lack is severe, students are invited to reach me.

The content of the CODAMA's knowledge base is related to the instructional design process results. So, I finally was able to use what I learned. For that, thanks to information technology. In the same way, the idea that the most important condition for ascertaining whether an individual will be able to perform a complex task is

whether or not the individual has mastered the prerequisite capabilities (cumulative learning hypothesis) becomes something real. I was able to consider that each person has a different set of previously acquired capabilities, and to be efficient, a computerized advisor (and even a human advisor) must be able to consider what a person knows and does not know. As many authors, I was able to consider that the most important is to teach the prerequisites that an individual has not yet mastered and to recall them. I was able to make profit of what I learned because the information technology is available. For that, thanks again to information technology.

If a student or group of students needs are not fulfilled by the study guide, tv programs, book, just-in-time help, they can reach me by phone (I have a paget) or anytime by email. They can have help to perform their exercises not only by using the online advisors but also by reaching me. When I was a «traditional» professor, students had to wait many hours at the door of my office to have an insignificant type of assistance. In my view, they were losing their learning time. It was quite hard for me to see that. So, again thanks to information technology.

Collaborative learning is also a reality. Students, by the means of information technology (computer network), are engaged in cooperative works that stress more social skills and group orientation. They exercise not only the technical ability, but also in conflict resolution, and problems and situations which foster their acceptance of diversity. As Taylor [21], I believe that because technology has increased the possibility of working together, so we have to focus on preparing students to work in such situations.

There are several other advantages. The courses I am responsible for were always given at night. As for all other universities in North America, the safety and security are deteriorating on our campus. Because many females would have to wait the bus at night more than 45 minutes, they were leaving 30 minutes before the end of my course. So, they were lacking many important explanations, and that had a negative impact on their results. For me, it was hard to accept because I knew the system that allocates grants is based on the academic results.

Conclusion

The information technology allows me to operationalize my beliefs and knowledge. For women working in non-traditional field, I think that is very important. The use of information technology in education can provoke changes in procedures and processes reflecting feminine perspectives [21]. The good is that we can make it our way, i.e., taking care of details, without exciting the emotion of the administrators and colleagues that provokes resistance to change. Students really appreciated it, so they are motivated to work hard. The quality of their exercises is enhanced compared to those produced when I was giving the lessons in traditional and

crowded classrooms. So, thanks to information technology: because of it, no more discussion in numerous comities, I can make it. I have the freedom to be the good professor I wanted to. Women in Science and Engineering can now use their wonderful differences to make the difference.

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