Synchronous Courses Attendance in Distance Higher Education: Case Study of a Computer Science Department

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Abstract—The use of videoconferencing platforms adapted to teaching offers students the opportunity to take distance education courses in much the same way as traditional in-class training. The sessions can be recorded and they allow students the option of following the courses synchronously or asynchronously. Three typical profiles can then be distinguished: students who choose to follow the courses synchronously, students who could attend the course in synchronous mode but choose to follow the session off-line, and students who follow the course asynchronously as they cannot attend the course when it is offered because of professional or personal constraints. Our study consists of observing attendance at all distance education courses offered in the synchronous mode by the Computer Science and Software Engineering Department at Laval University during 10 consecutive semesters. The aim is to identify factors that influence students in their choice of attending the distance courses in synchronous mode. It was found that participation tends to be relatively stable over the years for any one semester (fall, winter summer) and is similar from one course to another, although students may be increasingly familiar with the synchronous distance education courses. Average participation is around 28%. There may be deviations, but they concern only a few courses during certain semesters, suggesting that these deviations would only have occurred because of the composition of particular promotions during specific semesters. Furthermore, course schedules have a great influence on the attendance rate. The highest rates are all for courses which are scheduled outside office hours.

Keywords—Attendance, distance undergraduate education in computer science, student behavior, synchronous e-learning.

I. INTRODUCTION

DISTANCE learning has assumed considerable importance this past decade; it has even become inevitable. Indeed, when compared to current traditional education, it primarily allows greater accessibility. It does not require a physical presence facing the trainer. This not only avoids local travel where the difficulties of traveling form part of the everyday reality of any town where universities are situated, but it allows students to receive university training that they would not normally be able to access locally. Furthermore, access to training is not limited solely to "from anywhere" but "at any time", from the moment that the training sessions are recorded and available off-line. The flexibility of the formula then allows any student who desires it, to keep a full-time job while being able to follow courses meeting for one to two-hour periods during the day, when their schedule permits, or in the evening once at home. Thus, numerous studies suggest that distance education can also be as effective as a traditional classroom training model [1].

Previously, the formula of distance education courses was limited to the use of the website and exchanges by e-mail. So, the increasing capacity of networking and the new means of communication now available offer new technological perspectives. The arrival of videoconferencing platforms adapted to teaching, in particular platforms allowing synchronous sessions [2], brought about a change of paradigm that highlights the importance of the interactivity between the teacher and the student, and between the trainer and the learner. Numerous studies [3]-[7], have proposed new approaches as to the design of distance education courses. In the current context however, we shall speak rather of virtual education. It is indeed necessary to distinguish two main orientations: blended courses, where parts are planned for face-to-face meetings with educational material that is available online, and courses exclusively online where the presentations of the teacher are available from a videoconference platform adapted to the educational context [8]. Also, the use of such platform thus allows, on the one hand, attending in synchronous mode, and on the other hand, enables recording the training sessions to make them available asynchronously.

The training session recordings offer two advantages: they allow following the course deferred when one cannot follow the course at the time when it is provided and they make it possible to listen again to the course followed earlier, for example to complete an exercise. However, as shown by Cao et al. [9] and also by Martin [10], interaction is crucial to student satisfaction in online courses. Adding synchronous components (virtual class technologies) to online courses facilitates this interaction [10], whether between learner and instructor or between learner and learner. So the virtual classroom approach is the form of distance education which comes closest to classroom teaching and which allows greater interactivity. Furthermore, if some practice perspectives [11], [12] or instructional strategies [13]-[15] are required for successful distance learning, the choice of tools is also very important [16]. However, to better assess the impacts of such tools, as well as practices and instructional strategies according to the course content and student cohort, it is important to know the student behavior when they can choose to follow the course in synchronous mode or in asynchronous

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mode.

II. THE EXPERIENCE OF A DEPARTMENT OF COMPUTER SCIENCE AND SOFTWARE ENGINEERING

After more than 10 years' experience in offering distance education courses using synchronous and asynchronous mode, the Department of Computer Science and Software Engineering at Laval University has accumulated significant expertise. The aim has been to work on and analyze student behavior during recent years. Also, in this study we are interested in identifying factors that influence students in their choice of attending the distance courses in synchronous knowing that the records are always available. Our study covers several years, and concerns specifically distance undergraduate education in computer science.

III. ORGANIZATIONAL CONTEXT OF DISTANCE EDUCATION COURSES

The courses are initially offered in hybrid [17]. The use of a virtual learning environment is not specific to distance courses, since it is the essential link of the digital learning environment of all enrolled students at Laval University. Although there are many types of virtual classroom [18], [19], the context of the study is when interactivity is privileged. So all distance courses are taught using a video conferencing platform specialized for teaching. Many platforms are available [20]. The one which was used for the entire duration of the study was Elluminate (now Blackboard). The use of this platform was well mastered by the teachers who had the opportunity to provide more than one course by using the same. However, although each teacher has his own way of using it, the difference in the choice of available tools is often related to the subject they are teaching. Indeed, virtual white board, for example, tends to be most often used in courses dominated by mathematics. In more "hands-on" courses, application sharing is more often used to produce demonstrations. Commonly used tools are documents sharing (like slides) and the chat, which is integrated into the platform fostering interactivity.

Each course is organized in the same frame. One and a half-hour lectures are provided twice weekly and are recorded in order to be able to be available deferred. These records are accessible during the entire semester from the digital-learning environment.

On-line participation from the students appears mainly through questions asked with the chat tool built into the platform. This is a privileged way to allow the students who attend the on-line course to able to rise, ask questions and respond to requests from the teacher. Thus, it is a good means for the teacher to have direct feedback from his audience.

IV. THE VARIOUS DISTANCE STUDENTS PROFILES

At Laval University, all students who wish to follow distance courses have only to register. The only existing constraint is to sit examinations under official surveillance in the center supervised by university staff. However, access to education remotely is not the only motivation expressed by the students. Indeed, three typical profiles can be distinguished:

1. Students who seek the opportunity to interact directly with the teacher during the sessions. As soon as a detail or an explanation seems confusing to them, they do not hesitate to intervene, which they are allowed to do by the use of the software platform. The teacher can then explain again, elaborate further or spontaneously give an example application before continuing his presentation.
2. Students who cannot attend the course when it is provided because of professional or personal constraints. They can then attend the course off-line by reviewing the records. But, if a detail or an explanation seems confusing to them, they will be able to spell it out by e-mail for example; however, this involves a response time.
3. Students who can attend the course in synchronous mode (not having time constraints at that time) but prefer to follow the session off-line to be able to follow it at their own pace.

Nevertheless, they must assume the response time inherent to the synchronous formula if details or explanations seem confusing to them or are not well understood.

Although the flexibility of the asynchronous design, both at the schedule and pace of learning levels, represents a major attraction for the student, we notice higher dropout rates in comparison with traditional classroom training. There are several reasons such as a lack of organization (the formula requests more autonomy and diligence), isolation (in the case of misunderstanding, this will require contacting the teacher to ask questions, but obtaining an answer may take some time), the overstatement of available time dedicated to study (a very tight study timetable planned several months in advance may be inappropriate faced with a change of work load).

V. COURSE ATTENDANCE IN SYNCHRONOUS MODE

As much as we may be interested in interactivity with synchronous mode, it must be considered that the majority of students will follow the course off-line. There is thus a dilemma to respect: foster exchanges during synchronous training course in thinking that the records will be reviewed. They have to change paradigm, and the teaching style must be different.

VI. METHODOLOGY

The aim of this research is to study a variety of factors that can affect the attendance of courses in synchronous mode. We need to identify trends or behaviors. Thus, all the information was collected relating to the connections to the videoconference platform, at the times when the courses were provided. The collection of information covered a period which included when the same platform was used.

The study then addresses all distance training courses offered as part of the Bachelor of Science in Computer Science and Software Engineering program during 10 consecutive semesters, which is 24 different courses. Note that not all courses are offered at distance every semester.

During the period under review, the frequency for each course is from six to two, with an average frequency of 3.54.

It is a matter of elaborating the data collected on synchronous attendance to identify participation trends in a global perspective, by the type of semester, by the course position depending on the Bachelor's programs to move forward, by time in which teaching is conducted and if the teacher changes at each semester for the same course.

VII. RESULTS AND ANALYSIS

A. Attendance in All Courses

Participation tends to be relatively stable over time and is fairly similar from one course to the next (Fig. 1). Indeed, it seems that the average participation rates, unless there are rare exceptions, are basically the same. They stand at around an average value of 28%, with a standard deviation of 6%. Furthermore, as is shown in Fig. 1 (see the tendency curves), despite the time that has passed, and although the students may be increasingly familiar with the synchronous distance education courses, their participation remains stable. Furthermore, we have observed that teachers adapted quickly to the change in approach in teaching. Indeed, between the first and last periods, the trend is constant. However, there is strong uncountable that the average and the standard deviation were higher in the summer of 2012. This is due to much higher participation rates in two specific courses (Fig. 2). Moreover, it is noticeable that the average participation rates are the same for two courses. In fact, it appears that it is the same students who were enrolled in the two courses at the same time. When looking at participation rates related to previous and next semester, see Fig. 3, we find that participation during the summer 2012 is unusual. Indeed, these courses were delivered by the same teachers. One can assume that they did not change the way they do things between these three years. Nor can this variation be attributed to a possible benefit of experience, since the other participation rates were in the core. This provides formal confirmation that the participation rate in synchronous can vary from one session to the next around a median of 28%, mainly depending on the composition of the class.
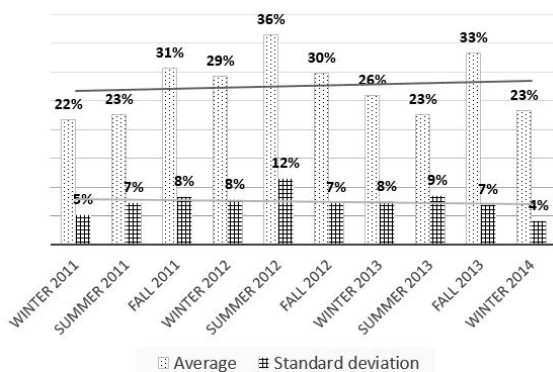

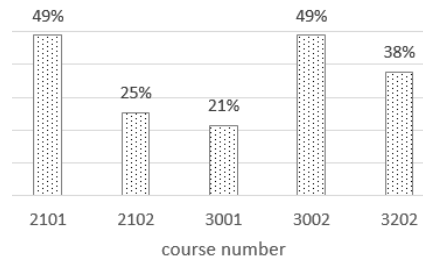Fig. 1 Average attendance in synchronous mode in all courses
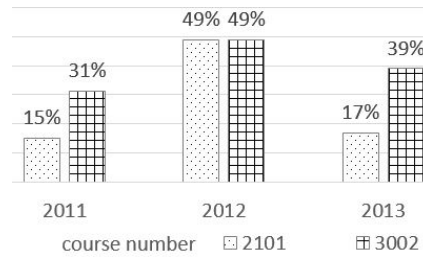

Fig. 2 Average attendance in summer 2012

Fig. 3 Average summer attendance for the 3 years for which data are available
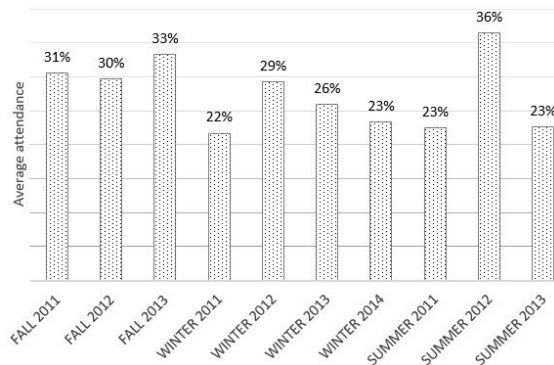

Fig. 4 Average attendance sorted by semester

If the results are sorted by semester, it appears, in general manner, that the participation in synchronous mode is slightly higher on average during fall than the winter semester and that it is more variable in summer (Fig. 4).

B. Course Schedules Influence on Attendance

As regards course schedules, we note that the courses timed exclusively in the evening present the highest participation rates (Fig. 5). This confirms that providing courses in the evening after office hours promotes synchronous attendance.
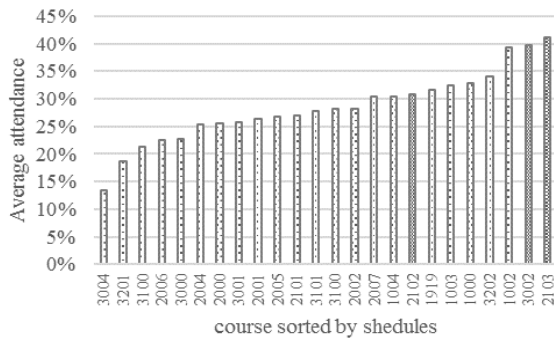
Fig. 5 Average attendance when the course is sorted by schedules (The dark-shaded bars indicate the three courses scheduled after business hours)

VIII. CONCLUSION

In this study, we were interested in factors which can influence participation in distance training courses in synchronous mode by students enrolled in undergraduate computer science programs. The context is when interactivity is privileged. So all distance courses are taught using a video conferencing platform specialized for teaching. The one which was used was Elluminate. Each course is organized in the same frame. One and a half-hour lectures are provided twice weekly and are recorded in order to be able to be available deferred. These records are accessible during the entire semester from the digital-learning environment. The results relied on the attendance at all distance education courses offered by the chosen computer science department over several years.

Overall, the average attendance is 28% (with a standard deviation of 6%) and remains relatively stable throughout the period considered. However, it is noted that there is variation in semester types. Indeed, attendance is higher in fall than in winter, and is more variable from one course to another in summer. The composition of the promotions is also important since, for the same course which is given by a same teacher, attendance can vary significantly, especially in summer, and may range from 15% to 49% from year to year. As might be expected, courses offered after office hours are among those which have highest attendance rates.

This study sheds light on certain behaviors that students can have when they follow distance education courses with possibilities of synchronous and asynchronous modes. Future work will include the kind of course (theoretical vs. practical) and its influence on synchronous participation.

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