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MULTICAMPUS DISTANCE EDUCATION BASED ON VIDEO-CONFERENCING SYSTEM

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Abstract – This paper aims at evaluating the potentials of videoconferencing education as well as to understand students’ perceptions and satisfaction with this kind of distance education compared to the traditional classroom environment, but also to understand the main challenges in this kind of setting. An experimental research conducted showed that this form of distance education could be equally good as traditional methods of teaching. It also led to several important conclusions that may help in creation of efficient teaching methodology.

I. INTRODUCTION

Up to several years, go two state universities were providing the higher education services overall territory of Republic of Macedonia. These universities, Ss. Cyril and Methodius and St. Kliment Ohridski, were located respectively in the cities of Skopje and Bitola. Considering their location as well as strong economy demands at one hand, and the economic circumstances preventing people from moving freely from rural areas to cities for studying, have risen important questions regarding the ease of access to academic institutions for people living in not developed regions, notably the east of the country.

Therefore, in order to offer equal possibilities for high education studies, state University “Goce Delcev” – Stip was established in 2007. Organized as an integrated university, according to contemporary standards, it perfectly fits the global worldwide trends in higher education. Namely, the University is located in Stip and has four campuses, integrating 13 faculties - covering almost all scientific disciplines, 10 university centers and three institutes. The studies at this university are performed in 12 units, dispersed in 12 different cities (mainly in the eastern part of the country).

“Goce Delcev” University is permanently growing both in number of students and staff members. This is constraining the university to enlarge its infrastructure as well. These growing trends are challenging the university itself to organize and support the education process with attention for communication and collaboration between the various campuses.

Although, this process is still mainly conducted through physical mobility of academic staff between different locations, the university is progressively supporting initiatives that replace or enhance physical with virtual mobility.

Considering the new challenges in higher education and understanding the importance of innovation in education through implementation of contemporary ICT technologies, the institution is doing permanent efforts to integrate various forms of distance learning with the traditional education.

Distance education has been defined as “a separation in time and/or space between the learner and the instructor. More than a geographic separation of learners and teachers, it is a distance of understanding and perceptions that must be overcome by teachers and learners” [1]. There are many types of distance-education models including online courses, interactive videoconferencing, videotaped lectures, and audiotaped lectures.

According to our preliminary evaluation, among other distance learning methodologies, videoconferencing is considered the most relevant and proven to stimulate collaboration between the various sites, to support and enhance student and/or staff communication, to enable flexible quality learning and accessibility, as well as to rationalize various costs.

Various research studies have been conducted in order to investigate the challenges of establishing a establishing a video – conferencing based distance education. Moreover, many studies have been conducted in order to understand the real benefits of video – conferencing as a form of synchronous form of education not only in higher
education but also, also in other segments of the society.

For e.g. a pilot project aimed to deliver video-conferencing diabetes lessons to healthcare and allied healthcare professionals who provide basic level care for, and management of, people with diabetes in the Scottish Highlands region [2]. Feedback from participants indicated that the educational content was relevant and that the use of videoconferencing could provide accessibility to training where distance, cost and other issues may make access difficult. Student performance on the assessment instruments did not differ between those who received the training through videoconferencing and those who received the training through face-to-face delivery.

Another, qualitative research study has been conducted in order to determine how students who are taking synchronous distance education classes via video conferencing perceive distance learning courses [3]. The results of the study have shown that the most important problems in synchronous distance education were the disconnection and sound problems, mainly due to hardware issues. Other very important issue evidenced in this study was that students became bored after some time because of limited camera angles and cameras. Besides these technical problems, the researchers observed, and the students expressed that the factors of teacher, environment, distance, course type and duration also caused the students' perceptions to change.

In [4] researchers focus on the issues how two separate classrooms that are connected to one instructional process can be handled simultaneously by one teacher.

The purpose of this study is to evaluate the potentials of videoconferencing distance education compared to the traditional classroom environment as well as students' perceptions and satisfaction in both settings.

II. RESEARCH METHODOLOGY

In order to compare the traditional face-to-face classroom course delivery to synchronous videoconferencing way of distance teaching an experimental research has been conducted. This research also aimed at evaluating the students’ perception and satisfaction with this method of teaching using contemporary ICT technologies.

This research was conducted for an elective 6-credit hour Object – Oriented Software Engineering (OOSE) course delivered during the winter semester of 2012. This course was delivered to two separate groups of students, all of them regular students at the Faculty of Computer Science, University “Goce Delcev”. To the first group counting 60 students, the lectures were taught face to face in a traditional classroom setting. These students were physically located in the city of Stip.

Second group, counting 42 students was attending the same course in asynchronous sessions via interactive videoconferencing. Students from the second group were enrolled at one of the dispersed campuses of the Faculty of Computer Science, University “Goce Delcev” located in the city of Strumica situated in the far southeast part of the country, and approximately 70 kilometers away in the city of Stip. In the latter course, the instructor was physically located in the city of Stip (Figure 1).

![Figure 1. Campuses locations](image)

Both courses covered the same topics and were given by the same instructor except for two lecture hours to the students in Stip, and two lecture hours presented in the classroom to students in Strumica campus given by external experts.

The distance-education lectures were delivered from a classroom equipped with Polycom HDX 8000 end-point (Figure 2), 36 computers, document camera, interactive whiteboard, two LCD projectors and monitor.
The lecturer had the ability to combine and to switch among three views delivered to the distant classroom: video image (e.g., the lecturer); computer screen (e.g., PowerPoint presentations); and the document camera (e.g., used to show hardcopies of figures and demonstrate working out calculations by hand). One LCD projector projected the image being transmitted to the distant classroom, and at the monitor, the image of the students in the distant classroom was presented. The distant classroom was equipped with Polycom HDX 7000 end-point, document camera, two LCD projectors and whiteboard. They were projecting picture big enough to be perceived clearly by all students. During transmission, the distant site also had a faculty facilitator present at least for the beginning of each class, and two technicians monitored the entire transmission.

The videoconferencing system used, allows setting up the camera in a number of different positions (e.g., wide shot of an entire class, close up shot of students in on the lower right quadrant) and store them as 'camera presets'. The presets are usually assigned to a button on the remote control. This allows the lecturer to easily focus in on a group of participants during the interactive portion of a session or just get a good overview of the level of engagement of varying groups at the remote site.

The traditional classroom lectures were delivered in a classroom equipped with a computer, a document camera, two video projectors and one interactive whiteboard. The synchronous distance education environment is summarized in Figure 3.

In this setting, the instructor may incorporate an alternative video source (e.g., a document camera, a VCR) for sending to remote locations, or may receive video from an alternative video source at the remote site. New feature “people on content” for example uses chroma key technology to allow lecturer(s) in a video call to become one with their content. Therefore, the potential for combining video inputs and outputs can seem endless.

However, with the introduction of more technologically advanced resources during classes, there is the increased danger of losing focus on the most important aspect of teaching - learning. Planning curricular objectives and concentrating on students as the major stakeholders, leads to a continuum in the life cycle of a technology based course. Evaluation at a personal level throughout the course but also at a curricular level can lead to improvements to better suit the needs of the students.

Course and instructor evaluations were administered to each group at the conclusion of the courses. The questions rated students' perceptions of the course and instructor using a 5-point Likert scale anchored at 5 = strongly agree and 1 = strongly disagree. The variances of the results were first analyzed using Levene's test for equality of variances. The evaluations were then analyzed using independent sample t tests based on the assumption of the equal variances or unequal variances where appropriate in SPSS v19.0. The final course grades were analyzed by the same method.

### III. RESULTS

Students' demographic data are presented in Table1. The traditional classroom students had a higher computer science grade point average (GPA) (P = 0.012) at the onset of the 2 courses, and the distance-education students had a higher mean grade in the prerequisite Software Engineering Basics (SEB) and Software Analysis and Modeling (SAM) courses (P = 0.321 and P = 0.222 respectively) that preceded the OOSE course. No other significant differences were found.
TABLE I. STUDENT DEMOGRAPHICS

<table>
<thead>
<tr>
<th></th>
<th>Traditional classroom settings [Mean value]</th>
<th>Videoconferencing distance education settings [Mean value]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age(years)</td>
<td>16.40</td>
<td>17.56</td>
</tr>
<tr>
<td>Overall CS GPA (on the scale 5-10)</td>
<td>8.67</td>
<td>7.44</td>
</tr>
<tr>
<td>Grade in SEB</td>
<td>8.80</td>
<td>8.15</td>
</tr>
<tr>
<td>Grade in SAM</td>
<td>7.90</td>
<td>8.83</td>
</tr>
</tbody>
</table>

Students who completed the course in the traditional classroom setting had an average final course grade of 8.92 compared to an average final course grade of 8.45 among students in the interactive videoconferencing group (P = 0.031). The response rate for the course and instructor evaluation was 95.24% (40 out of 42 students) for the distance-education students and 95.00% (57 out of 60 students) for the traditional classroom students. The mean evaluation score (Table 2) for the distance-education students was higher than for the live students (4.7 ± 0.6 and 4.4 ± 0.7, respectively; P < 0.001).

TABLE II. DOMAIN ANALYSIS OF STUDENT RESPONSES

<table>
<thead>
<tr>
<th></th>
<th>Traditional classroom settings [Mean(SD)]</th>
<th>Videoconferencing distance education settings [Mean(SD)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>4.4 (0.7)</td>
<td>4.7 (0.6)</td>
</tr>
<tr>
<td>Lecture content</td>
<td>4.4 (0.5)</td>
<td>4.6 (0.8)</td>
</tr>
<tr>
<td>Presentation/style</td>
<td>4.6 (0.5)</td>
<td>4.8 (0.4)</td>
</tr>
<tr>
<td>Student contact</td>
<td>4.3 (0.8)</td>
<td>4.7 (0.6)</td>
</tr>
</tbody>
</table>

During the videoconferencing lecture, the number of interactions between students, as well as between students and teacher were counted. The number of interactions is presented in Figure 4. As it may be observed from the figure the number of interactions is growing, which means improved synchronous communication.

**IV. CONCLUSION**

In videoconferencing distance education, it is often common for the distance students to feel a sense of alienation. In our case, students completing the OOSE course in a traditional classroom setting or by videoconferencing performed well and had a high overall perception of the instructor and courses. The distance-education course was rated higher by students than the same course delivered in a standard classroom. Several techniques were used by the instructor to facilitate the instruction via videoconferencing that may have influenced the distant students’ perceptions of the course. Based on the results of the interview with the distance students the use of recitations was highly valued by the distant students. Therefore, the incorporation of regularly scheduled recitation-type sessions should be considered when developing a distance-education course. Moreover, encouraging interactivity with discussions between sites and group works were also highly appreciated. So, we can say, as a general finding from this research is the need for instructors to understand and acknowledge that using videoconferencing, as a delivery mode will have an impact on teaching styles and methods. Even though the term “interactive videoconferencing” is often used when discussing this type of technology-based, teaching, successful interaction does not take place unless lecturers plan and understand how the medium will alter their teaching approaches. Other findings also indicate that whether the course delivery mode is a traditional one or a technology-based mode, effective lecturers establish and maintain a highly interactive classroom community. Therefore, for efficient delivery of educational content through distance videoconferencing mainly depends on how much teachers are knowledgeable about their subject, about their learners, and about pedagogy.

**REFERENCES**