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From traditional to complete online study - A case study of the Faculty of Computer Science and Engineering in Skopje

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Introduction

- The COVID-19 pandemic has affected every aspect of human life.
- Educational institutions worldwide were temporary closed.
- From traditional face-to-face with few elements of online learning we had to switch to complete online learning.
- Our faculty made the transformation to only online learning within a week.

Let's describe the journey.....

Pre COVID state - equipment

- FCSE is the biggest technical faculty in the Republic of North Macedonia with more than 3000 actively enrolled students.
- FCSE has a good technological infrastructure and equipment
 - all classrooms have projectors and/or smart tables;
 - fast wireless internet within the campus is provided for faculty staff and students;
 - six computer-equipped laboratories with around 180 seats and
 - a decent amount of computer equipment supports the learning process.

Pre COVID state - software

- Moodle and a customized information system support the educational process and administrative work.
 - Two installations of Moodle – one as a standard LMS system and another as an assessment platform.
 - The Moodle tools in asynchronous and synchronous contexts are used for formative and summative assessment.
- Licenses for the required software provided by the faculty.
 - All students - Microsoft tools (Windows, Office Tools Suite and Visual Studio) and JetBrains tools.
 - Some courses (ex. Visualization) provide licenses of software (Tableau) only for course-enrolled students.
 - The rest of the courses use open software tools.

Pre COVID state - experience

- Many teachers used technology in courses and introduced a blended learning approach.
- Many professors conduct research in the field of technology-supported education.
- Staff participated or was the main principal in many international and national educational projects.
- Several doctoral theses were defended under the mentorship of the faculty teaching staff.
- The faculty has accredited (and offers) undergraduate and graduate study programs for computer science teachers in primary and secondary schools.

Pandemic related challenges - students

- The most important problem was related to their socio-economic situation and availability of equipment.
- Students dormitories were closed, and students returned home.
- Some students were not able to afford a broadband connection.
- The students were supposed to own devices such as computers/laptops or tablets.
- All students have licenses for the required software tools.

Pandemic related challenges – teaching staff

- The teaching staff had to rapidly change their practices, including daily tasks and responsibilities.
- New tasks
 - creating accessible materials;
 - recording lectures and captioning videos;
 - adopting a flexible approach to student participation; and
 - adjusting the assessment process.

Pandemic related challenges - faculty

- **(Infrastructure)** establishing a stable/fast Internet connection and the possibility of video conferencing.
- **(Organization)** keeping on time with the academic schedule.
- **(All above mentioned)** the assessment process and exams:
 - the existence of sufficient technology infrastructure to support online examinations;
 - postponing examinations that can't be organized in predefined terms and
 - altering the assessment process for courses when the classical assessment was not possible or was inappropriate.

Video-conferencing tool

- Starting experiments **by the staff**
 - Google Meet (free – **used for the defence of all kinds of thesis**),
 - Microsoft Team (the faculty, staff and students have licenses for Microsoft tools) and
 - Zoom (with limited time for video conference for the free version).
- The final selection was a BBB plug-in for Moodle.
 - enables recording the conference and **storing recordings in LMS**,
 - managing the presence and visibility of participants, and
 - has a built-in whiteboard.
- The real classrooms and laboratories are exchanged with virtual space and the educational process continued without changes in the academic schedule.

Computer infrastructure

- Starting
 - two servers for Moodle installation for learning (Moodle-LMS),
 - four servers for Moodle installation for exams (Moodle-exams),
 - 16 servers for Big Blue Button (BBB) for both Moodle installations,
 - Load balancing servers - one server for Moodle servers, one server for BBB sessions and one server for video recordings.
- Upgraded
 - four servers for Moodle-LMS,
 - four servers for Moodle-exams,
 - one database server,
 - BBB is hosted on separate servers for Moodle-LMS and Moodle-exams,
 - Moodle-LMS - eight servers, one server as the load balancer of servers and one server for recordings.
 - Moodle exams - 10 servers and one for the load balancer and exam recordings.
- A stable Internet connection to the faculty servers in agreement with the biggest internet providers in the country.

Lecture recording

- Options
 - pre-recording the lectures and using the lecture time for consultation,
 - recording the lecture itself
 - avoid recording altogether.
- Advantages and disadvantages
 - Recorded lectures
 - Advantage - provide additional material, the same recording can be used in future and so on.
 - Disadvantage - many students would be absent from the lectures.
 - Non-recorded lectures
 - Advantage - force students to attend the lectures and to be proactive.
- Final decision – left to the teaching staff!
 - Each "teacher" decided according to the type of the course, the difficulty of the material, and the number of groups in which the students are divided (for some courses we have up to 16 groups).
- I personally selected the approach to record all lectures even for the courses with multiple groups.
 - To avoid too many copies on the servers I selected one of the recordings and erased the rest.

Assessment – examination dates

- our institution should follow the higher education law rules
- we are obliged to perform some activities at an exact time.
- The solution was not straightforward.
- Some courses have changed classical exams to non-proctored assignments, quizzes, projects, and seminar works.
- The transition includes a definition of new rules and a selection of mechanisms to detect plagiarism and discourage cheating.
- Example,
 - For the course, Computer Graphics assessment was transformed into a process with quizzes, assignments, and a project.
 - After two consecutive years, this year we held a proctored exam for the part of the course.
 - The returned proctored exam is a result of the acquired experience in proctoring programming-based exams which require using programming libraries (OpenGL in this case).

Assessment – examination dates

- For courses with proctored exams problem was how to organize them in the online environment.
- Big organizational issues because of the number of students.
 - For example, on Structured Programming and Object-Oriented Programming more than 1000 students are enrolled each year.
- Another issue was how to proctor the exams.
- In the beginning, we postponed the first semi-final examination period and conduct only a few exams in several different contexts.

Assessment – Moodle quizzes and tools

- New types of questions were added very fast, together with the tool CodeRunner for the programming courses.
- Safe Browser installed on student computer is used to avoid opening additional material during quizzes in non-proctored context.
- **(rules)** Some courses use elimination quizzes, so only students that score a certain number of points are allowed to take the final exam.
- **(rules)** To prevent cheating and to increase quiz security, we added time limitations to quizzes, created a question pools and presented quiz questions randomly.
- **(rules)** The Moodle quizzes were used for fast assessments and mainly were held without proctoring.

Assessment – proctored exams

- Students are divided into virtual rooms with no more than 20 students and one responsible faculty staff.
- Proctoring is performed by monitoring - the profile view of the students shared by mobile phone and computer screen.
- This is enabled by DroidCam tool in combination with ManyCam tool.
- Students install software that shows the keyboard interaction (echoes the tasters pressed by the user).
 - for Windows-based computers - Carnac; for MacOS X – Keycastr and for Linux – Screenkey.
- All exams are recorded - recordings are available only on request under special circumstances and can be viewed only by the computer centre staff.
- Rules that deal with the lost connection and the submission process are also defined.
- Complete exam security is not yet possible even all measures are provided.
 - To increase exam security, the approach of taking exams with open books is implemented.
 - This isn't a new approach, and we extensively use this approach previously.

Assessment – socio-economic

- The problems related to the non-stable Internet connection and/or not having adequate equipment for the exams were solved by allowing students to physically come to the faculty to take exams.
- The rules for using computer laboratories were defined and adjusted each time according to the pandemic rules defined for the educational institution in the country.

Conclusion

- The COVID-19 pandemic has made online learning a new normal.
- Online learning brought about many challenges for educators and students
 - limited technological infrastructure and capacity,
 - socio-economic factors,
 - lack of experience to conduct assessment and supervision in an online mode and
 - the extra workload for teachers and education staff.
- Even though this was a difficult process we successfully transformed the educational context.
- Some of the solutions maybe are not the best ones but they are all results of the specific context of the faculty and its accreditation documents.
- At present, although many faculties in North Macedonia have returned to the old traditional way of learning, we are still online because of mostly organizational issues and a large number of students.



THANK YOU!