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Strengthening Teaching Competences
in Higher Education
in Natural and Mathematical Sciences

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Presentation of activities and results in WP4

The formation of online learning environment

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Activities in WP4:

- 4.1 The integration of online technologies into traditional courses
- 4.2 Developing systems for electronic testing
- 4.3 Forming online labs
- 4.4 Preliminary analysis of performance indicators

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Deliverables in WP4:

- 4.1 Pilot courses delivered
- 4.2 Systems for electronic testing developed
- 4.3 Online labs formed
- 4.4 Preliminary analysis of performance indicators realized

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How indicators will be measured WP4:

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- Pilot projects launched
- Technology-enhanced courses based on suitable online platforms developed
- Database of questions created
- Inventory books ?
- Report based on the results of preliminary analysis

Assumptions and risks WP4:

- Motivation of teaching staff for the integration of online technologies into their courses;
- Motivation of technical staff for additional work;
- Motivation of students for electronic self-testing;
- Motivation of teaching staff for updating and sharing information;
- Motivation of teaching staff to conduct a preliminary analysis of performance indicators;
- Motivation of teaching staff for the formation of online labs;
- Lack of interest of teaching staff to prepare the basis for electronic testing;
- Inertia of teaching staff for the presentation of learning and teaching materials;
- Inertia of students for filling out the questionnaires;

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The integration of online technologies into traditional courses

Description

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- The aim of this work package is to promote wider integration of ICT in teaching and learning at the PC HEIs through the launch of pilot projects which should demonstrate the benefits of using online technologies in teaching and learning and encourage a wider circle of teachers and teaching assistants to use these technologies themselves.
- Pilot projects that will be implemented within activity 4.1 will integrate online technologies into a certain number of traditional courses at the PC HEIs in all areas of natural and mathematical sciences.

The integration of online technologies into traditional courses
Description/ 1

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- For that purpose, ***several online learning platforms*** will be developed by adopting some of the existing free platforms to the specific needs of courses to be designed, which will open up a wide range of opportunities for supporting and enhancing educational delivery and management and enable the transition from teacher-oriented towards student-oriented learning.

The integration of online technologies into traditional courses
Description/ 2

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- Within the activity 4.2 systems for electronic testing will be developed which should help to overcome or mitigate the problems of objective assessment and equal treatment of all students, and difficulties that arise in examining large groups of students. This will include student evaluation with questions randomly chosen from the database, as well as a system for self-testing.

The integration of online technologies into traditional courses
Description/ 3

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- The integration of online technologies in laboratory exercises and scientific experiments will be conducted in the framework of activity 4.3. Its main goal is to enable students to participate in experiments from remote locations, which could alleviate the problem of insufficient quality laboratory equipment at some PC HEIs.

The integration of online technologies into traditional courses Description/4

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- The aims of the last activity in WP4 is to define the methodology to be used in the analysis of *performance indicators* of innovative teaching and learning methods introduced within activities 4.1-4.3, and to conduct a preliminary analysis of performance indicators.
- The preliminary analysis will be the first step in the further analysis of performance indicators of the innovations introduced in the process of teaching and learning at the PC HEIs, which will be continued after the completion of the project cycle and whose results will be used for further improvement of the quality of teaching and learning at the PC HEIs.

4.1.Pilot courses delivered

- Pilot projects for the integration of online technologies into a certain number of traditional courses at the PC HEIs in all areas of natural and mathematical sciences.
- The role of these pilot projects is to demonstrate the benefits of using online technologies in teaching and learning, and to encourage a wider circle of teachers and teaching assistants to use these technologies themselves.
- In order to emphasize the large variety of models of using modern technologies in teaching and learning, several different scenarios for the integration of online technologies into courses will be offered.

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4.1 Pilot courses delivered

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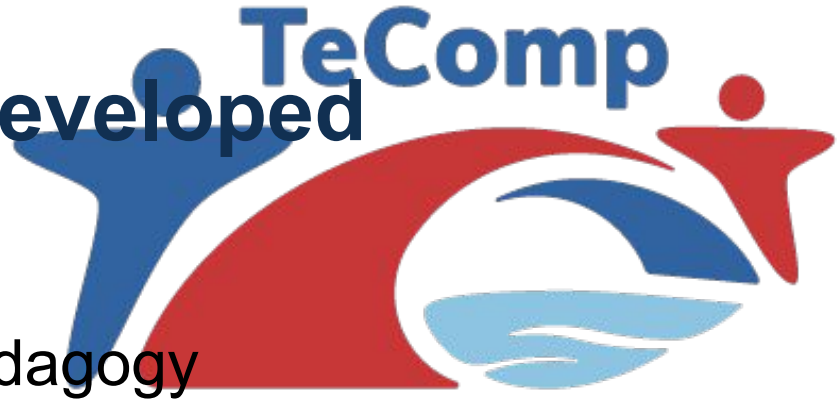
- A team composed of experts in information technology and pedagogy from the partner institutions will examine the specific needs of courses and teachers, and will suggest suitable online learning platforms that will be used as the basis for designing new technology-enhanced courses.
- These platforms will be developed by adapting some of the existing free online learning platforms to specific needs of courses to be designed, and will provide a wide range of opportunities for supporting and enhancing educational delivery and management.
- The courses will mainly be designed using the blended learning approach – combining web-based online learning with traditional classroom methods, and both synchronous and asynchronous models of learning will be used.

4.2 Systems for electronic testing developed



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- A team of experts in information technology and pedagogy from the partner institutions (not necessarily the same as in Activity 4.1), in cooperation with teachers of particular subjects, will propose methodological and software solutions for the development of systems for electronic testing and monitor the creation of these systems.
- Questions on the tests will be randomly chosen from the database of questions that will be created, for each student individually.
- Special attention will be paid to self-testing – a mode of testing where students can check their knowledge, and immediately or after completing the test they are informed about the test results and mistakes, that they have eventually made.

4.3 Online labs formed

- Within this activity pilot projects for the integration of online technologies into a certain number of laboratories at the PC HEIs will be launched.
- A team composed of experts in information technology from the partner institutions and teachers who plan to integrate online technologies into their laboratory exercises will examine specific needs and opportunities of these laboratories, propose methodological, hardware, and software solutions for such integration and monitor the realization of the pilot projects.
- In the realization of this activity equipment purchased from the project budget will be used.

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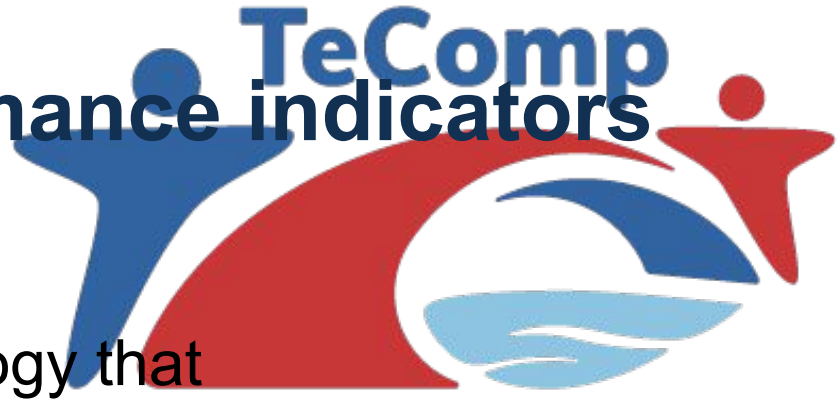
4.4. Preliminary analysis of performance indicators realised



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- The activity 4.4 will focus on defining the methodology that will be used in the analysis of performance indicators of new teaching and learning methods introduced within activities 4.1-4.3
- A preliminary analysis of performance indicators will be conducted and the results of the analysis will be published in the form of a report.
- The preliminary analysis will be the first step in the further analysis of performance indicators of the innovations introduced in the process of teaching and learning at the PC HEIs, which will be continued after the completion of the project cycle and whose results will be used to further improve the quality of teaching and learning at the PC HEIs.

RESULTS

- Coordinator of WP4 is the University of Novi Sad
- 5 faculties sent the reports about activities 4.1-4.3:
- University of Kragujevac
- University of Novi Sad
- University of Belgrade
- University of Gjirokastra
- University of Niš

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Results

- Due to the Covid-19 pandemic, we did much more than planned
- In most universities in some periods all classes in all study programs were organized online.
- We really used the know-how that we gained during seminars organized by our EU colleagues

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Results 4.1

- Periods where the teaching was organized online:

- 2nd semester 2019/2020
- 1st and 2nd semester 2020/2021
- 1st and 2nd semester 2021/2022

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Results 4.1

Platforms:

- Microsoft Teams platform
- Moodle platform
- LearningKey platform
- In a smaller amount:
- Google Classroom, Google meet
- Zoom, Skype, Whatsapp, Viber
- The Big Blue Button

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Results 4.1

- At the beginning of the pandemic usually, there was not some strict rule on which platform or which way of communication with students to practice, the choice was to professors and students.
- Later, in some universities it was decided to use some specific platform (mostly Microsoft Teams and/or Moodle platform).

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Results 4.2

- Study programs at participating universities in Serbia are not accredited for distance learning
- Such accreditation would require special conditions and technical requirements related to secure identification of students being tested remotely, and preventing non-academic behavior during the remote testing process.
- For that reason, final exams cannot be performed by electronic distance testing.
- However, electronic testing is allowed to be used in some activities that are parts of pre-examination obligations, such as homework and colloquia.
- Many courses and additional periodic online evaluations were organized for students in order to raise their engagement and ensure reaching learning outcomes.

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Results 4.2

- Sistems for electronic testing were developed in the Microsoft Teams and Moodle platform and also in the LearningKey platform.
- This was organized mostly for student self-evaluation, although some colloquia and exams were also held during the pandemic.

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Results 4.2

- In Albania, “Eqrem Cabej” University of Gjirokastra conducted all their activity online during the pandemic situation, which means all the subjects (study lectures, seminars, laboratory and practical work, **giving and submitting tasks and formative and summative evaluation**) were held via online platforms: MS Teams, Google Classroom, Google Meet, Zoom Whatsapp, Clean Score during the first year and MS Teams and Clean Score for the remaining period.

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Results 4.3

- During the pandemic, it was difficult to organize good experimental work for students, but with additional effort, with smaller student groups and more classes held in laboratories, that was overcome.
- Also, some of those classes were organized online or recorded for students.

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Results 4.3

- Remote access laboratories were used for:
- (a) demonstration and observation of the experiment;
- (b) conducting measurements (especially in real-time);
- (c) for manipulating instruments in experiments;
- (d) for remote cooperation and discussions.

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Results 4.3

Remote access laboratories were organized at

1. University in Kragujevac (Physics, Chemistry, Informatics), 5
2. University of Novi Sad (Physics and Chemistry), 6
3. University of Niš (Chemistry), 3
4. University of Belgrade (Biology, Physics), 2?

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Preliminary analysis of performance indicators

- Joint report (by University of Novi Sad)
- Defining the methodology that will be used in the analysis of performance indicators of new teaching and learning methods introduced within activities 4.1-4.3
- A preliminary analysis of performance indicators will be conducted and the results of the analysis will be published in the form of a report.

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