Models and approaches to modernize training in universities

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1. The ACADEMICA educational environment – concept, models and solutions

The widespread digital technology is popularizing the fast transforming business models, the policy landscape and social norms. The exponential growth in digitization and internet connectivity is the backbone of the Fourth Industrial Revolution [13]. As ever more daily tasks are carried out online, everyone needs enhanced digital skills to participate fully in society. The application of digital technologies could affect 50% of the world economy. More than 1 billion jobs are automatable by today's technology, which could open the door to new ways of harnessing human energy as well as to displacing routine jobs [9]. The process of moving to a digital business is related to the use of digital technologies to change a business model and provide new revenue and value-producing opportunities. This transition imposes new requirements and challenges for the higher education, which are related to the need for ensuring social cohesion as well as sustainable growth [3, 8].

In order to support the modernisation, accessibility and internationalisation of the HE the European Commission launched (as a part of the Erasmus+ Programme) the Capacity Building in the Field of Higher Education (CBHE) initiative. The paper presents some results and outcomes achieved so far in the framework of the project ACADEMICA [2] involving partners coming from Europe (Bulgaria, Italy, Austria and Spain) and Central Asia countries (Kazakhstan, Uzbekistan and Turkmenistan). One of the main aims of the project is to equip lecturers from Central Asia Universities with transversal and key competences and skills necessary for their active inclusion in the HE reform in their institutions and countries as well as in the global digital teaching and learning space. For the achievement of this goal ACADEMICA VLE has been developed. The environment has hierarchical structure consisting two main levels – central VLE part and institutional VLEs. The central part (on the top of hierarchy) provides the training area for e-training of the University Lecturers from the countries involved. It plays a role of a central hub providing the opportunity for collaboration and communication among the all users - project team members and all other participants in the training. The other level of the ACADEMICA environment comprises the institutional VLEs of the Universities involved (those which are already established as well as those which some of the partners have been developing during the project). These institutional VLEs are established in accordance with the national/institutional policies and strategies and with national language support. The lecturers, trained in the project framework during the first experimentation project phase, will modernise their own courses in line with the proposed ACADEMICA methodology. The modernized courses will be piloted in the local VLEs with the active involvement of control groups of students during the second phase of the experimentation which will end in May 2018.

Another important role of the ACADEMICA VLE central part is to provide an inter-University collaboration platform and the English is considered as a common language. The students from the different Universities will be able to roam from their own VLE to the central hub to participate in shared activities and via the central part to have access to their courses established in the corresponding institutional environments in line with the rules and didactic policy of their Universities.

The lecturers can manage their own courses on their institutional VLE, share information and collaborate with other lecturers and experts from other Universities in the network on the central part of the ACADEMICA VLE.

The administration of the central part includes the provision of access to all VLEs, support of the local administration of the institutional VLEs, management of the central hub and the common training area for lecturers, i.e. setup of the courses

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addressed to the lecturers, management of the trainees, maintenance of the calendar, provision of reports etc. The institutional VLEs administration includes activities related to the courses and curricula setup, management of the students, reporting on the institutional level, administering the local environment. The teachers (trainers /lecturers) are able to run the course events, grade learning activities, support learners. They have access to the central part and trough it they can roam on other institutional VLEs if granted. The learners are able to take courses and to be engaged in learning activities, they have access to the central part and to their institutional VLE. The learners can participate in the courses available in the central training area, in courses of their institutional VLE and also in the courses of the other institutional environments only if they have granted access. The next Figure represents the overall concept of the ACADEMICA VLE.

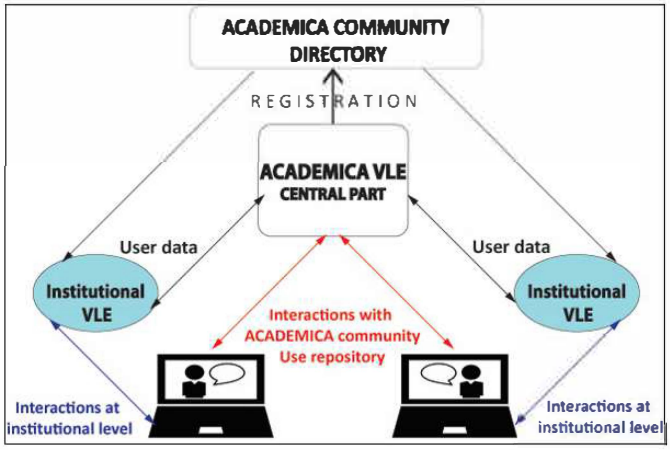

Figure 1. ACADEMICA virtual learning environment - overall concept

Learning management systems /LMS/ are very common and useful tool for supporting or fully conducting training and learning process. A wide variety of platforms (open source and commercial software solutions) are used nowadays. The selection process of the appropriate LMS among the vast majority of available contemporary e-learning platforms was preceded by careful examination of the training specific factors and traits on one hand, as well as the system specifications and functionalities on the other hand.

Taking into account the results obtained through extensive research at international level regarding the needs, gaps and requirements in the countries from Central Asia for digitalization of education and in line with the initially put priority on the usage of open source software tools, solutions and resources the most popular free LMS such as Moodle [7], .LRN [1], Sakai [10], and Google Classroom [4] were examined in order the most appropriate one to be selected.

The following major criteria were specified as most important for LMS overall selection:

- Platform architecture, development and maintenance – this technical specification determines the most important system features like, hardware and operational system requirements, stability, database speed and maintenance, possibility of system expansion by installation of new available modules, etc.;
- License – this feature influences the system exploitation by presence or not of ability of free use, edit, develop or disseminate the platform and the developed materials;
- Costs of exploitation –the necessary costs of hosting, exploitation, upgrade and maintenance of the platform;
- Interoperability with other systems – easy establishment of data transfer from and to LMS and other systems, used by the organization – students database, used as an external data source of students records or destination of students results, payment system, systems for videoconferencing, collaboration software, etc.
- Localization – the option of internationalization is very important while working in multinational environment with participants with different mother languages;
- Accessibility – the ability for system proper visualization on various kinds of devices with various size and software;
- Presence and size of platform community – this option is useful in the case of problems or obstacles the system administrator or the trainers may encounter or the necessity of common place for sharing ideas.

On the basis of the detailed analysis, conducted taking into account the criteria mentioned above, was decided the training phase of the project to be accomplished by using a Moodle based VLE as an e-learning platform for the target group training. The e-learning platform contains two major sections: a section with the target group training courses and a section providing a catalogue of pilot courses, developed by project participants

as results of their training – modernized courses included in the curricula of the involved CA Universities. The catalogue is structured by countries and provides information about finished and available/ongoing courses as well as about the upcoming courses scheduled for the summer semester of the academic year. Each pilot course registered in the ACADEMICA catalogue is supplemented by information about the course provider as well as additional information such as a brief abstract, descriptions of the target audience and the learning objectives, the downloadable course syllabus, contact details for the instructor/s and a link to the local virtual environment where the course is piloted. The ACADEMICA VLE participants from the other partner organisations or from the same organization but from different specialties can roam the registered courses if these users have been granted access. The user can enter directly in a given available course by clicking on the course title from the Welcome screen (shown on the Figure 2) after entering correct username and password in the appearing login page.

The courses and materials available in the e-training area of the ACADEMICA VLE central part are addressed to the target group, consisting of university lecturers, with purpose to improve their skills in e-learning tools usage in the process of design and creation of blended or pure online courses.

The platform implementation applies the following types of user roles: Manager (administrator); Teacher; Non-editing teacher; Student; Observer – a role assigned to the project evaluators, who have privileges to access all learning content, assessment tools and gradebooks, without permission to make changes. The access to the VLE is assured via the Project website [2] in both the English and Russian site version via special tabs. Tab "Training area" - for English version and the tab "Тренировачная зона" – for Russian version.

Figure 2. ACADEMICA VLE Welcome screen

2. Learning design and learning content concepts

The e-learning material for the courses, delivered through a VLE, is developed in the form of learning objects - smaller independent pieces that can be used independently or in combination with other material to form higher level objects covering the learning needs of the users on demand at any place and at the right time. According the LEGO metaphor, where a learning object should be Reusable, Accessible, Interoperable/portable, and Durable. An important aspect for reusability and personalization is the granularity of learning objects. The main idea behind the learning objects concept is that instructional designers can build small instructional components that can be reused a number of times in different learning contexts. However the structure and composite nature of a learning object is still open to interpretation [6]. The learning objects are structured in learning components on the basis of the planned educational activities aiming the achievement of the learning objectives initially set.

The course syllabus was developed by the international team of experts involved in the project. The course was structured in six modules where each module covers five topics. Going in detail, at the end of the course lectures will be able to:

- Understand Distance Learning evolution;
- Define custom lessons layouts;
- Exploit social network to increase learning process and optimize students interactions;
- Find license-free learning materials;
- Develop learning materials in responsive technology;
- Use the most recent pedagogical techniques both for traditional and distance learning.

The ACADEMICA training aims to introduce innovative teaching methods and contemporary pedagogical ICT-based tools which are in compliance with the European educational standards and best practices in higher education. At the end of the course is expected the lecturers to be able to develop and find online learning materials and open educational resources, to define an appropriate standard for lessons and contents, and to exploit tools offered by WEB 2.0.

In order the aims and objectives mentioned above to be achieved, the following types of educational activities were took into consideration:

- Assimilative activities – first part of the learning cycle where students receive and begin to make sense of new information.
- Finding and handling information – students are actively and critically engaged in generating and manipulating information – conducting research, extracting information from DB, analyzing information, synthesizing data.
- Communication – through dialogue, students begin to take a position in relation to problems and debates, and internalize complex and interrelated concepts. Collaboration activities where students and tutors work together to produce an artefact and through that process make new links and connections in their shared knowledge and understanding. Through using online social media tools learners are able to share experiences and to solve problems.
- Productive activities – students apply their knowledge and skills together or alone in order to create a piece of work (a list, a piece of narrative text which answers a question, a report, a presentation or a video etc.
- Experiential activities – students are required to apply their skills, knowledge and understanding in real world settings. This could include a case study taken from the student's real world setting.
- Interactive/adaptive activities – students apply their knowledge and skills in simulated setting, receive immediate feedback and are then given opportunity to adapt their approach – role-play, problem-based scenarios, simulated case studies, and simulated experiments.
- Assessment – should be scheduled to support consistent progression and pace of learning. Students should be given opportunities to engage in and develop their skills in peer review and self-assessment.

Learning objects are assembled from information objects and assets into higher-order collections such as courses and curricula as is illustrated by the Learnativity Content Model [12] for assembling content into higher-level objects (Figure 3).

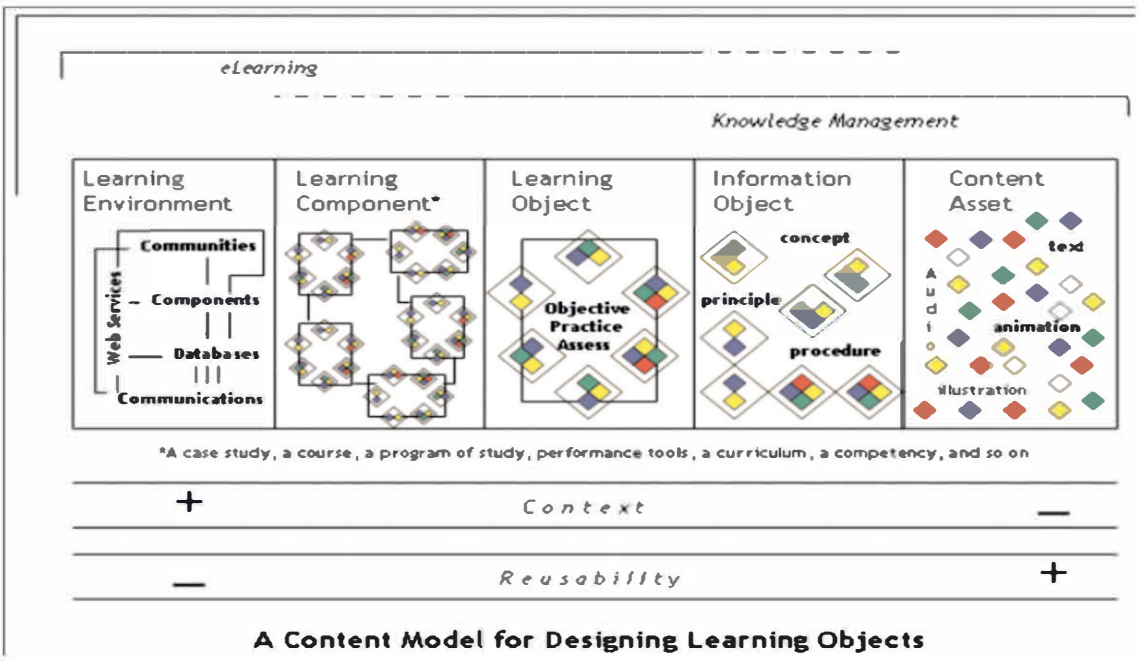

Figure 3. The Learnativity Content Model [12]

The ACADEMICA e-course for training the University lecturers consists of the following components: Course description, Training chart, Help desk, Calendar, Syllabus, Educational resources, Online library, Quizzes, Assignments, Virtual classes, Communication tools (forum, messages), and Announcements section.

The ACADEMICA e-training course addressed to the University lecturers developed has modular structure. The course content is organized in modules. The structure includes an introductory module, six learning content modules and six library modules (one per each content module) as well as an overall course Library.

1.1. Introductory module

The introductory module provides general information about the course structure, training schedule where the duration of each course stage is pointed out, help desk providing information about the people who can help in case of faced obstacles and technical difficulties, and last but not least, a user's guide providing information about the platform, its functionalities and the tools integrated.

Each University has ACADEMICA Experimentation team. This team is responsible for the management, monitoring moderation and support of the ACADEMICA e- training. The teams involve:

- Moderator – provides data necessary for registering and tracking of the participants progress; collects piloting reports; provides data about the project when is necessary; manages pilot training on University level;
- Tutors – provide pedagogical support and expertise during all piloting period in their University;
- University Facilitators - in charge to provide technical support.

Apart from these teams engaged to provide support on local level in the experimentation team are involved representatives of the Ministries of education in Kazakhstan and Uzbekistan as well as experts from the EU partner organizations.

2.2. Learning content module

Each learning content module consists of several topics related to the main theme of the module. Each topic's content could be represented via learning objects which could be one of the following formats: Multimedia lesson; Slides; Lecture Notes; Tests.

Multimedia lessons

The multimedia lesson is interactive learning content built up by an audio explanation in English synchronized with a slide presentation and provided with a hypertext index allowing the learner to navigate the lesson's content.

The standard SCORM (Sharable Content Object

Reference Model) [11] is developed by the ADL (Advanced Distributed Learning) project. The main aim of the standard is to allow the implementation of reusable content material as learning objects, within a technical framework conceived for computer aided learning and through the Web. SCORM is widely adopted by Learning Management Systems (LMSs), Learning Content Management Systems (LCMSs), authoring environments, assessment engines and course management systems and by this reason by this reason it is characterized as the most important development currently occurring in the area of eLearning standards and specifications.

SCORM is a set of specifications for developing, packaging and delivering high quality education and training materials whenever and wherever they are needed. The use of SCORM enables reusability, accessibility and durability of the learning material in technology changes, and interoperability between different e-learning platforms.

A Content Package contains two major components:

• A particular XML file named imsmanifest.xml, compulsory for each SCORM package and to be found in the directory root. It describes in details and in an exhaustive way the LMS path, the modules and their organization.

• The content (i.e., physical files) making up the content package.

– Documents, pictures and other resources that represent the learning material in itself. Sometimes they are organized in subfolders

– The XML schemas required for the imsmanifest.xml analysis.

– Some XML files of metadata that describe the resources. They are optional and could be integrated on the manifest or as separated files.

– Possibly some Javascript files to improve the communication between the content resources and the LMS

SCORM content has the format of a .zip file. On Figure 4 are shown the items of one unzipped SCORM file.

Every learning path module should indicate the LMS the student's learning progress. A particular API (Application Programming Interface), implemented in Javascript, is devoted to this task.

The tracking engine returns information about the progress of the learner via special field cmi.core.lesson_status. This field shows the lesson progress status and can have the following values:

• "not attempted": the student has never started the current module. It is the default value set to all the modules when a student begins a learning path.

• “incomplete”: the student has already begun the lesson but has to finish it.

• “completed”: the student has finished the lesson.

• "passed": only for exercises. this value states that a student has passed the current exercise.

• "failed": only for exercises. this value states that a student has failed the current exercise.

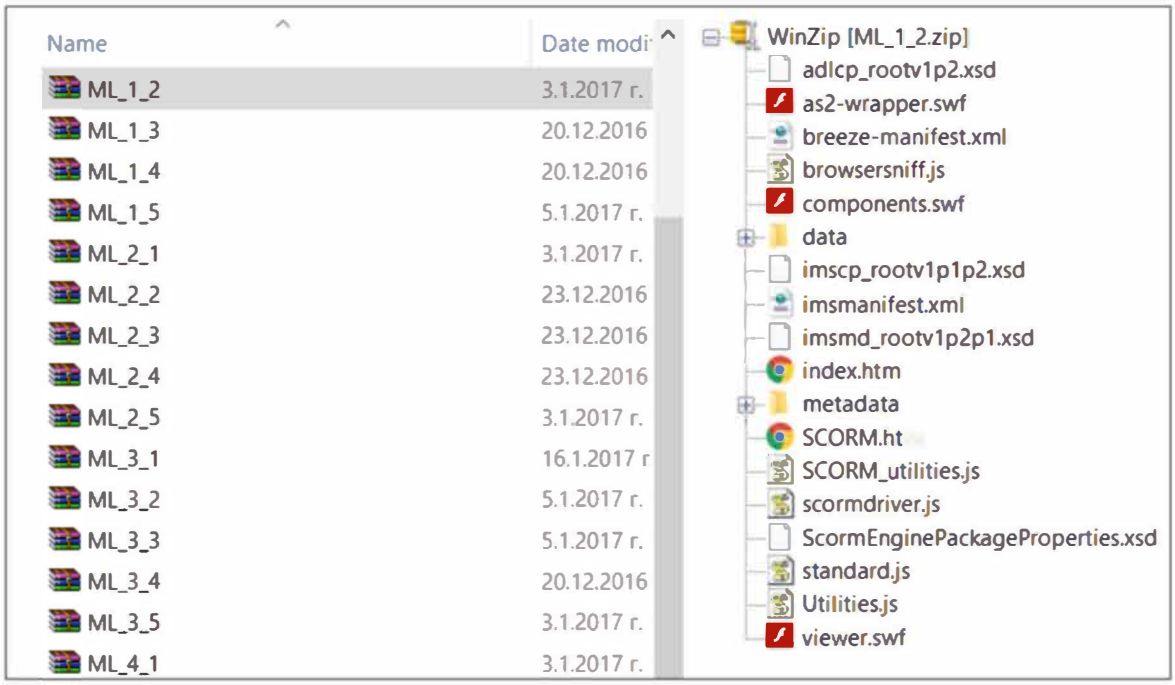

Figure 4. Structure of the unzipped SCORM object

Some other fields give some information concerning the exercises:

• cmi.core.score.raw: the mark carried out by a student on the current exercise.

• cmi.core.score.max: the highest mark to be carried out on the current exercise by answering to all the questions correctly.

A multimedia lesson is a multimedia and dynamic lesson with text, images and animations synchronized together with the teacher audio contribution. The student has the total control of the audio lesson flow by clicking on the stop / go button, the forward button, the backward button.

Some panels (Outline, Thumb, Notes, Search) are available to allow an easier navigation:

• "Outline" panel to jump from one slide to the other.

• "Thumb" panel to display the slides preview where it is possible to jump from one slide to another by clicking on the preview.

• "Search" panel to search the slides that match the text of your search

A multimedia lesson is a multimedia and dynamic lesson with text, images and animations synchronized together with the teacher audio contribution. The student has the total control of the audio lesson flow by clicking on the stop / go button, the forward button, the backward button. (Please see Figure 5.)

Lecturers will be able to develop by themselves this kind of learning objects thanks to the software Adobe Presenter. This software is a plug in of Microsoft PowerPoint that makes a normal presentation dynamic and multimedia. A teacher, with an average computer skills and adequately trained, will be able to make high professional and multimedia learning objects.

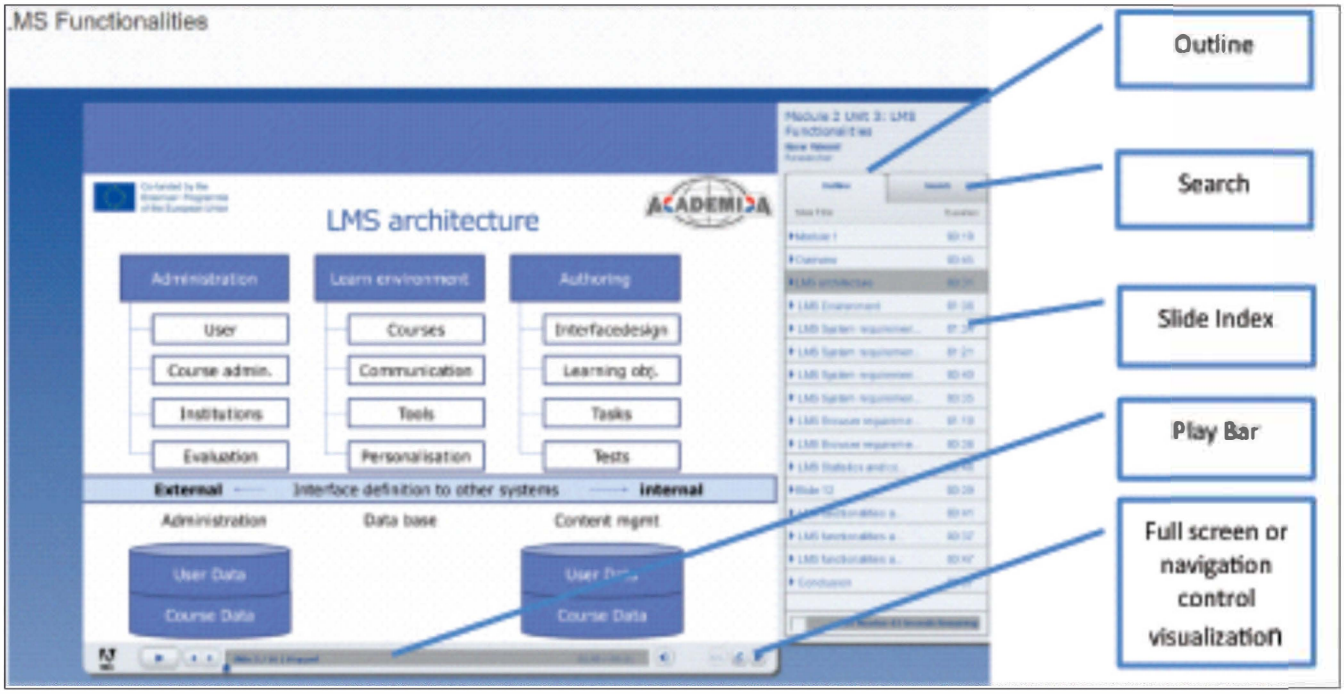

Figure 5. Multimedia lesson: navigation control visualization

Slides

The Slide objects are standard presentations about the module topics realized by the subject domain experts and converted in PDF format. This content is downloadable in order to be used in off-line modality. The tracking system marks the activity as successfully finished if the learner open the slide object at least once.

Lecture Notes

These are textual documents presenting in detail the lesson's topics and /or different perspective of the contents already explained as well as list of referent materials. They could be text materials necessary for the training, hang-outs and so on. These contents are also converted in PDF and are downloadable in order to be used in off-line modality. The tracking system marks the activity as successfully finished if the learner open the lecture notes file at least once

Assignments

The assignment activity enables a course instructor to communicate tasks, collect work and provide grades and feedback. Course instructor is able to provide instructions for the activity fulfilment, resource files, and descriptions of tasks which trainees have to do. Students can submit any digital content (files), such as word-processed documents, spreadsheets, images, or audio and video clips. The assignments are graded by the instructor responsible for the module after review of the provided work and in line with the evaluation methods communicated to the trainees in advance.

Tests

In the end of each module trainees have to pass a test. Each test contains 10 multiple choice questions with only one correct answer. Each question has 3 answer options.

The trainees are allowed on two attempts for a limited time. The final grade is the average of the grades for the two attempts. In each attempt the questions are reordered automatically by the system. The answer options per each question are reordered either.

After the test attempt submission trainees receive feedback with comments of their answers, comment of their final grade, statistics about the time spent and the grade result achieved. The test is considered as successfully passed if the trainee has answered correctly at least to the 60% of the questions.

Virtual Class

The activity redirects trainees to Google Hangouts [5] - one-stop messaging service for mobile and the traditional desktop web. It allows video calls with groups of people, and moreover – broadcasting the calls live with Hangouts on Air. The links to the webinars are provided to all participants via the description of the activity published in the e-platform together with other important details such as:

- Date and time;
- Starting time and duration;
- Agenda (in PDF format)
- Additional materials if any.

The aims of this activity are:

- to provide trainees with a summary of the module (progress, results achieved, and other key elements of the learning) prepared by the instructor/s;
- in interactive mode to provide trainees with comments and feedback on previous and current experience;
- holding an open discussion about the test results as well as about the additional module related topics, sharing experience, real life examples, information and know-hows among the participants.

The virtual classes were recorded and published in the YouTube ACADEMICA channel so participants who have not been able to take part in the activity to be able to have access to the activity record.

1.1. Section "Library – Module"

Each course module contains a section "Library - Module". In this section the users can find additional materials and list of links to the open educational resources recommended by the contents' authors (according the contents topics covered) and addressed for those learners who are with deeper interests in the area. Some of the recommended materials are available in printed versions. The Library section is not mandatory for the trainees. They are free to review the provided additional materials by choice.

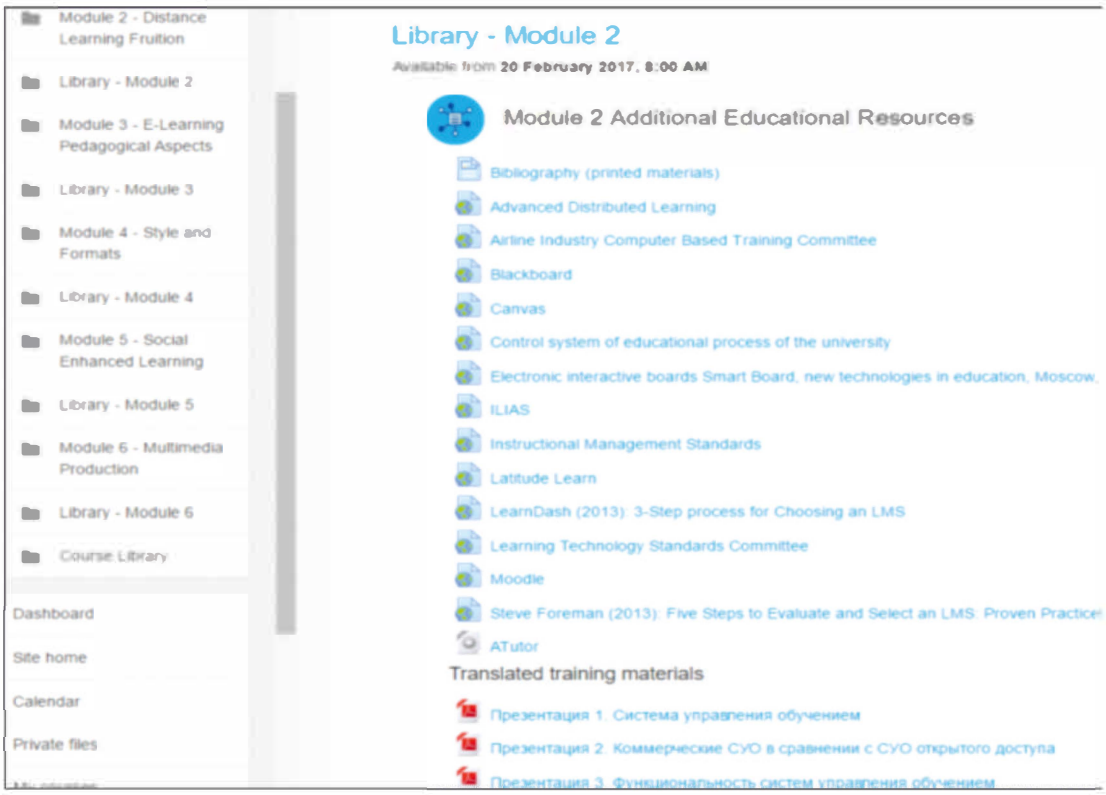

Figure 6 Example - Section "Library – Module 2"

The users have access to the Bibliography - realized as a web page where a list of recommended printed materials is provided. The digital materials could be accessed vie the published links or are available in PDF format. The section content could be enriched on the regular basis by the teachers and managers of the courses. Apart from that the library section of each module includes a special sub-section with translated educational materials. In this sub-section are provided translated in Russian language materials from the section Slides and Lecture Notes. These materials are converted in PDF format. The users can download them and to use them in off-line modality.

2.4. Course Library

The library module is a separate module integrated in the whole the course. In comparison with the library sections related specifically to the topics covered by the corresponding module the course library provides links to the materials related to the question "How to bring innovation to the world of education?" and focused primarily on the potential of digital technologies and OERs to improve teaching and learning.

The users have access to the other libraries with OER, open online courses portals, educational portals, e- magazines and e- journals. The module content could be enriched on the regular basis by the teachers and managers of the courses. The review of the course library is also optional activity.

3. Evaluation and results from the methodology experimentation

The provided methodology and developed solutions were evaluated by lecturers who took part in the ACADEMICA training. Below are presented results of the analysis of online survey which was conducted in February 2017. A total of 97 respondents provided their complete answers. The results of the questionnaire provide a good basis for a possible adaptation of the proposed models and approaches for future use.

The next figure shows the evaluation of the login procedure of the platform.

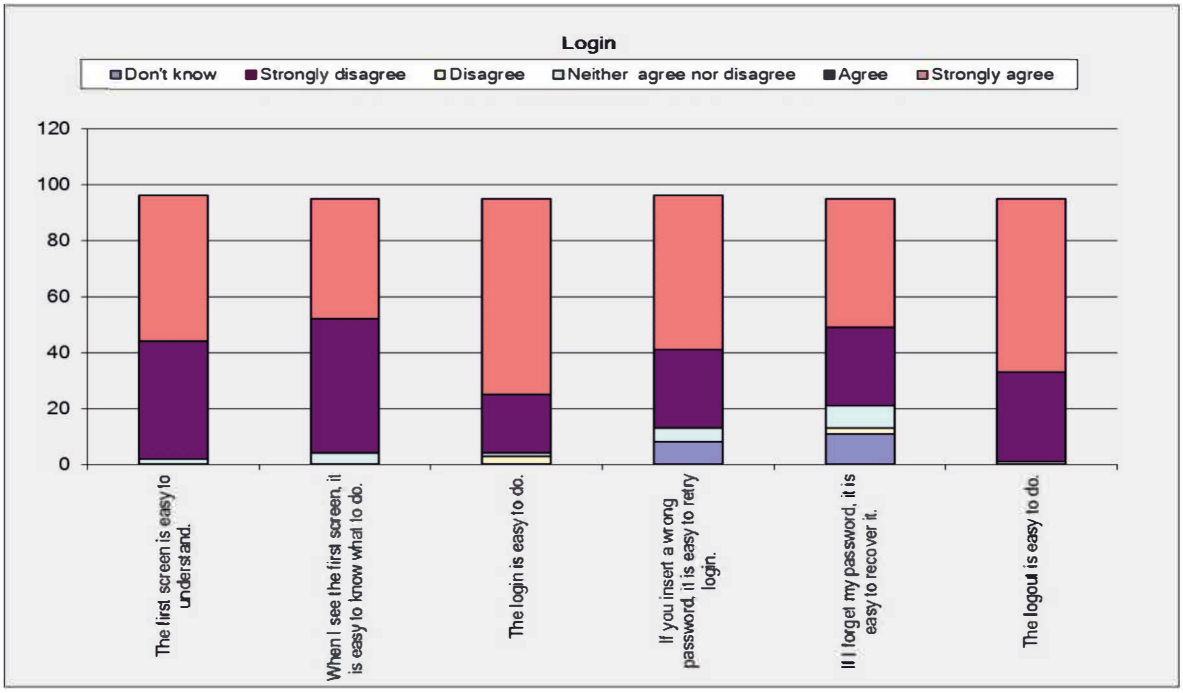

Figure 7. Evaluation of the login procedure

The results show that the respondents have not faced difficulties with the interpretation of the screen elements and fulfilment of the login procedure. Only 2 persons declare that they have had obstacles with the recovering of their forgotten passwords.

The following figure represents the evaluation results regarding the course description and it characteristics.

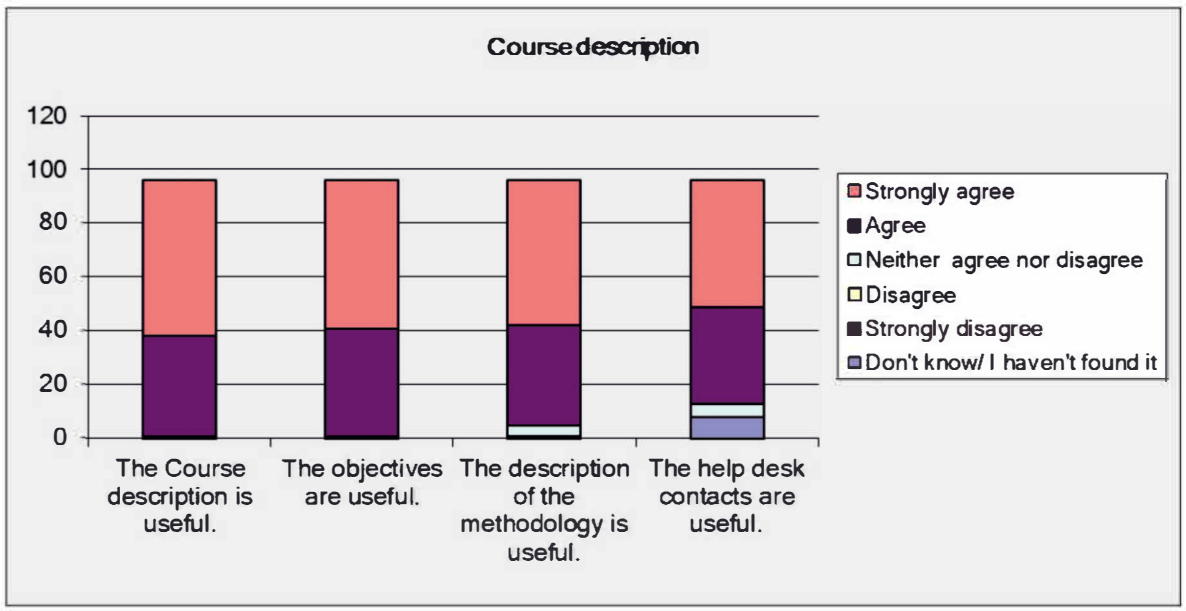

Figure 8. Evaluation results for the Course description section

The shape of the graph demonstrates that the course description has been very good in terms of usefulness of the specific items such as objectives, description of the methodology, help desk and contacts.

Concerning the quality of the navigation within the platform the following items were taken into account:

- The menu for the course navigation is useful;
- Returning to a previous screen is easy;
- The navigation is friendly.

The analysis results are presented on the next figure.

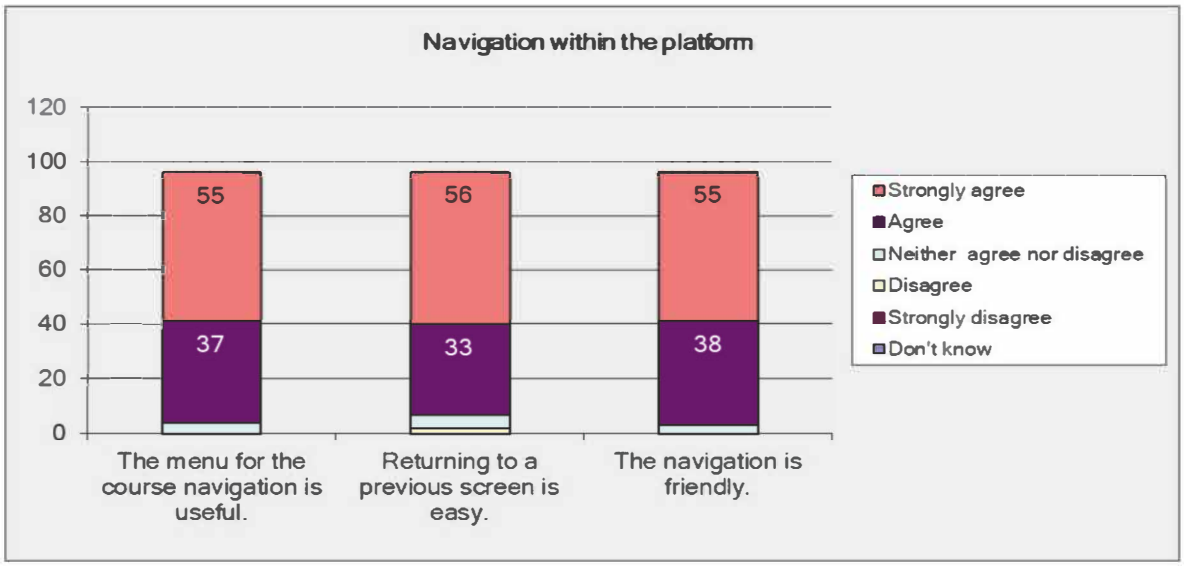

Figure 9. Evaluation results about the navigation within the platform

The majority of the respondents selected "strongly agree" in each question. "Returning to a previous screen is easy" has the only "disagree"- answers (2) in this section. This item has also the most neutral answers, but both numbers are relatively low. Therefore it can be said that navigation within the platform works well.

The next figure is showing the results for the multimedia lessons for the online questionnaire.

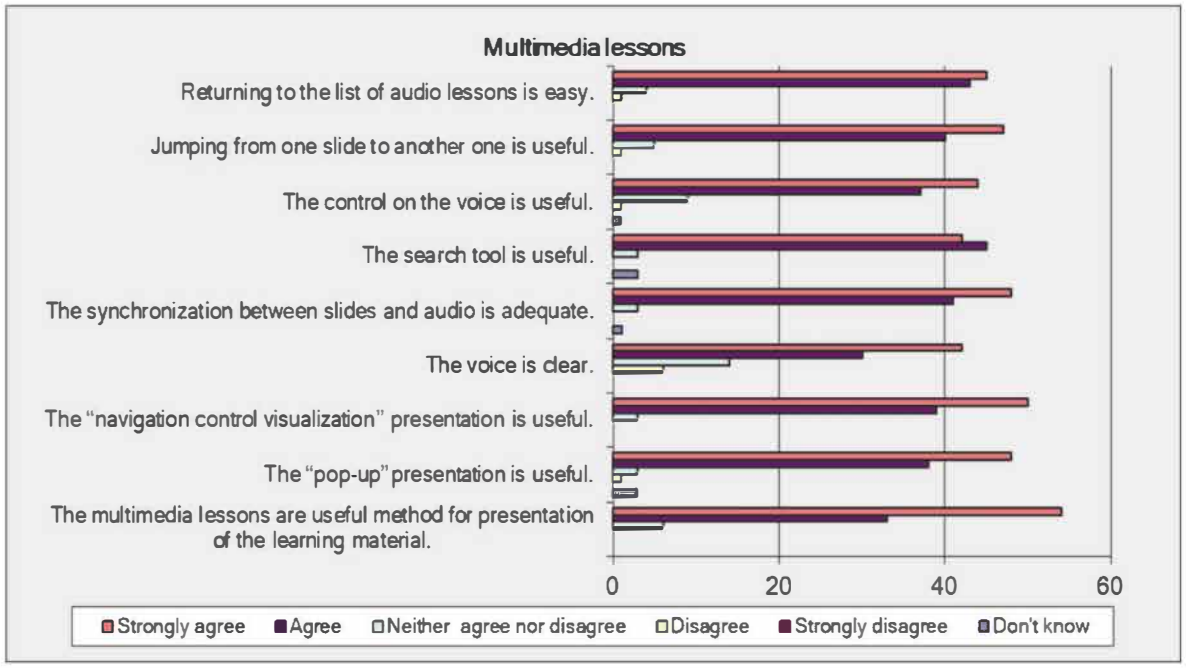

Figure 10. Evaluation results about the multimedia lessons

Although the results suggest that also the multimedia lessons are well received there is some room for improvement. Especially when it comes to items related to the sound of the lessons, which strongly depends of the technical parameters of the trainees' audio devices, the results are significantly less positive than for other categories. There are 14 neutral answers and 6 "disagree" answers for the item "The voice is clear". As the question "The multimedia lessons are useful method for presentation of the learning material." has received the most "strongly agree" answers, the multimedia lessons seem to be still a good type of knowledge transfer.

After the end of the training of the lecturers, May 2017, was conducted another survey aiming to collect data about their satisfaction from the course and provided tools and facilities. 110 respondents provided their complete answers. The summarized result from the survey analysis is presented on the Figure 11.

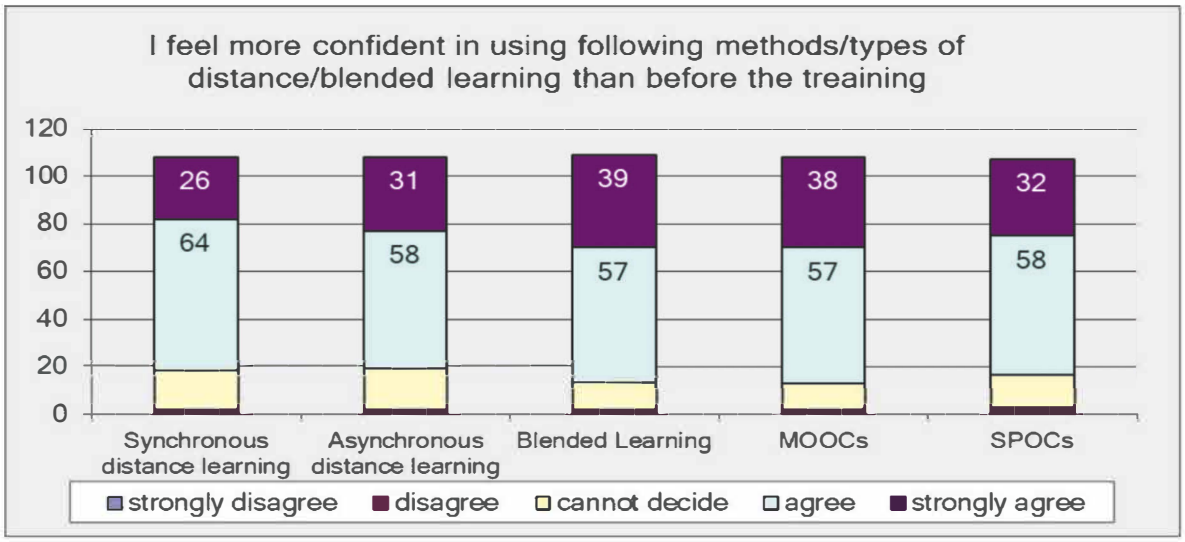

Figure 11. Results from the satisfaction questionnaire regarding the confidence level of the trainees

The figure above represents that after the training more than 80% of the lecturers perceive themselves more confident than before training in each of the learning methods: Synchronous distance learning; Asynchronous distance learning; Blended Learning; Flipped online classes; Virtual classrooms; MOOCs & SPOCs. Consequently, the models, approaches, and tools selected for the methodology implementation are appropriate and efficient.

Conclusions

In conclusion, the results from the surveys show that the models, tools and approaches were well chosen by the partnership. Moreover, the satisfaction survey results show that the participants really learnt a lot, as they perceived that they increased the knowledge and competences and that a vast majority now feel comfortable in using the learning methods taught and demonstrated in the course delivered through the ACADEMICA platform. These positive results prove that the methodology has a potential to contribute for the modernisation and development of the higher education in the countries involved in the project.

Acknowledgements

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