

Experience in Preparing an Online-Course for the National Platform for Open Education

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Abstract—In the article presented an interactive training system, which was developed for the online course "Fundamentals of Metrology, Standardization and Conformity Assessment" on the National Platform for Open Education. The principal scheme of interaction in the interactive training system and variants of project tasks are described. A comparative analysis of the student's attestation results who have been trained on an online course and traditionally is carried out.

Keywords—online course, interactive training system, video lectures, individuals project tasks, comparative analysis.

I. INTRODUCTION

Open online education is an advanced technology which expands access to the education, encourages its quality improvement, makes new possibilities in professional education area [1-10] available. New technologies of the education through online-courses provide the possibility of getting information from the best specialists in their areas of activities and of ensuring more independence in proper time and results scheduling to students and all interested listeners. Nowadays Harvard University, Stanford University, Massachusetts Institute of Technology are widely known mass open online courses organizers. They provide online courses through Massive Open Online Courses platform. Besides, there are distance education projects on Coursera, Udacity, edX, NovoED and other platforms, which are developing fast. [11]

II. APPLICABILITY AND SCIENTIFIC NOVELTY

Some Russian universities have been already participating in the preparation of courses for Udacity, Coursera, edX educational platforms for a long time. But Russian Open Education National Platform was established only in April of 2015. Eight leading universities of our country (including Ural Federal University named after the first President of Russia B.N. Yeltsin) became founders of the Open Education National Platform Association, which ensures the publication and assistance to online courses, developed by Association's members, by means of investments. In January of the year 2018 about 250 courses

were published on the platform. In September 2015 among first courses there was developed a course on Fundamentals of Metrology, Standardization and Compliance Assessment by URFU professors. This online course can be attended by all those who wish to do it with no restrictions, including by the students of Institutions for Higher Education as part of education according to general educational programs (principally the students of technical fields of study).

III. TERMS OF REFERENCE

Our course workload amounts to 108 hours, classes continue in course of 16 weeks. The course main target is to ensure acquiring necessary competencies in the area of products and processes quality and safety.

Obligatory requirements, submitted by the Association founders, were taken into consideration during the course preparation: firstly, the course content shall be in accordance with the requirements of Federal State Educational Standards, secondly, the listener, who passed the online course, shall know and be able to do the same things as a student, who studied it in the Higher Education Institution classes.

IV. THEORETICAL PART

Course materials contain various resources, designated for forming competencies in the area of products and processes quality and safety. These resources include video lectures and text materials for each topic; automatic evaluation tests for each topic of the course; virtual laboratory researches; practical trainings with the use of interactive educational system; different types of project assignments with automatic step-by-step control of the student's activities correctness and final assignment.

Virtual laboratory researches and interactive educational system are of special interest.

There are four virtual laboratory researches foreseen in the course: three of them concern the section of Fundamentals of

Metrology and one of them concerns the section of Compliance Assessment.

In course of executing laboratory researches concerning metrology (Measurement of geometric dimensions of products with the help of a trammel and a micrometer and Trammel calibration) a trainee has a possibility to accomplish direct multiple measurements of different samples (cylindrical cores, square and round bars of various dimensions in a tube section) with the help of a trammel and micrometer, accomplish calibration of these measuring instruments. In the laboratory research called "Measurement of a cladding layer thickness" a typical system of images analysis on the basis of a light (optical) microscope is used. Besides optical microscope it includes a digital video camera, personal computer with specialized software, which lets to operate microscope and camera, capture and save images, perform their preparation for analysis, accomplish measurements on images, process results of measurements, prepare reports.

Virtual laboratory research in the section Compliance Assessment is dedicated to the products informative contents theme and gives a possibility to learn more than 150 various informative signs, used for products marking.

Interactive Educational System (IES) was developed specially for acquiring practical skills in the area of compliance standardization and confirmation. IES ensures acquiring necessary competencies for working with real normative documents databases of the Russian Federation, which are used for the documents preparation in course of going through procedures of products compliance confirmation. IES integrates all information of the online course and demonstrates its interrelations at the solution of a specific practical target, which appears after the product compliance confirmation. Interrelations and IES provided information are shown in the Fig. 1.

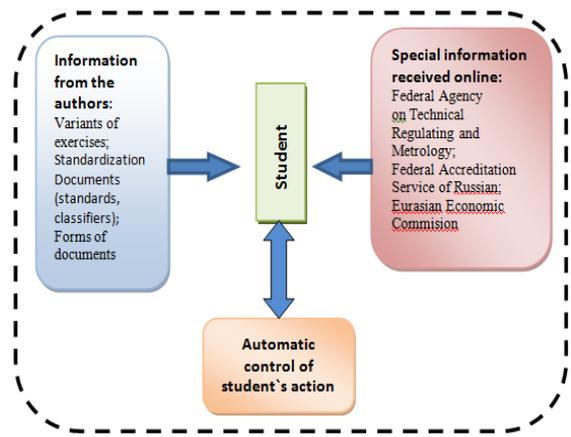


Fig. 1. Interrelations and IES provided information.

IES combines three important elements:

- Author information, provided in the online course (assignments variants)
- Up-to-date document forms, used at passing compliance confirmation process);
- Special information, necessary for passing compliance confirmation process, which is available on web-sites of organizations of the Russian Federation, which perform coordination in the area of compliance confirmation (Federal Agency on Technical Regulation and Metrology, Federal Service for Accreditation, Eurasian Economical Commission) and it is provided for students in the online mode directly in the process of assessment accomplishment.

IES operation is possible in two modes: firstly, it is performing separate practical classes concerning the section of standardization and concerning the section of compliance assessment, secondly, it is accomplishment of a project assignment, which covers different course sections (see Fig. 2).

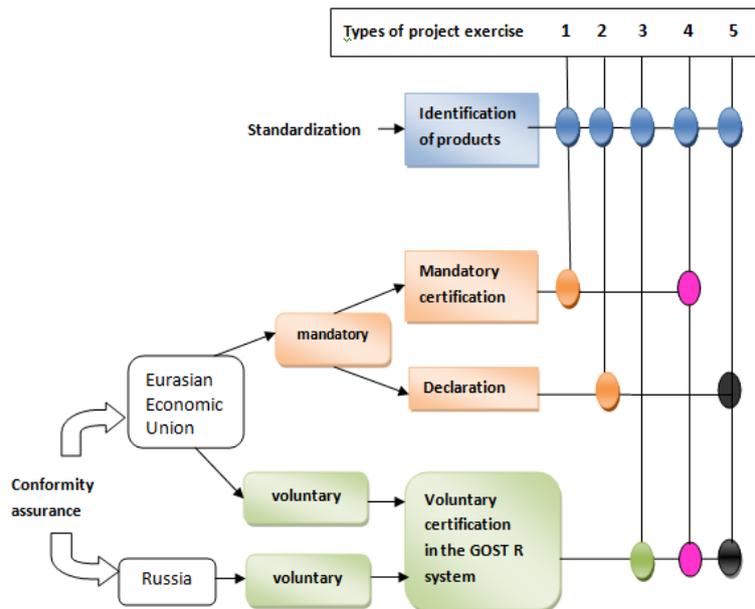


Fig. 2. Variants of individual project assignments.

There are five types of project assignments, foreseen in IES, which simulate various situations, which can occur in practice during compliance confirmation. For example, type 1: product identification and obligatory certification concerning compliance with the requirement of the technical regulations of the Eurasian Economic Union (EEU), or type 3: products identification and voluntary certification in the GOST R certification system.

Nowadays there are more than 50 variants of original data for project assignments prepared, they can be used according to five different scenarios.

V. PRACTICAL SIGNIFICANCE

The online course on Fundamentals of Metrology, Standardization and Compliance Assessment passed approbation at the Open Education National Platform of the Russian Federation in the years 2015-2016. In September of the year 2017 the course was included in the training schedule of students education (about 1000 people) of some specialist fields of the Ural Federal University in the discipline of Metrology, Standardization and Certification. The results of the course achievement are as follows.

58.40% of the second year students of the academic year 2017-2018 passed final test after passing online course, and 82.61% of the third year students did the same, the general percent of those who passed the final test among the second year students and the third year students amounts to 65.15 %. For comparison in the years 2016-2017 this discipline was taught traditionally for five groups of the second year students and for five groups of the third year students. Furthermore, there were obtained the results, comparable to those, obtained in the years 2017-2018: 52.,73 % of the second year students passed final test, and 80.25 % of the third year students did the same, the general percent of those who passed the final test among the second year students and the third year students of the year 2016 amounts to 64.40 %. All results were obtained during the final tests passing period (Table 1).

TABLE I. THE RESULTS OF PASSING FINAL TESTS BY THE STUDENTS, WHO STUDIED ONLINE COURSE IN THE ACADEMIC YEAR 2017-18, AND OF THOSE WHO STUDIED TRADITIONAL COURSE IN THE ACADEMIC YEAR 2016-17

The results of passing final tests	Traditional forms of teaching methods (2016-17 academic year)		After passing online course (2017-18 academic year)	
	second year students	third year students	second year students	third year students
Positive result, %	52,7	80,3	58,4	82,6
Negative result, %	47,3	19,7	41,6	17,4

VI. CONCLUSION

The course on Fundamentals of Metrology, Standardization and Compliance Assessment has been prepared for the Open Education National Platform. Course materials contain various resources, designated for forming competencies in the area of products and processes quality and safety. Laboratory researches and IES are of special interest among online course resources.

Virtual laboratory researches let to accomplish measurements of various samples, process results and prepare reports.

There are five types of project assignments foreseen by IES, which simulate different situations, which can occur in practice during passing compliance confirmation procedure, and which can be simulated according to 50 variants of different original data.

Since the September of 2017 the online course has been included in the academic schedule of students of some fields of study of students of the Ural Federal University. Furthermore, there were obtained results of education, which correspond to the traditional form of education and are specified by tendencies of acquired competencies quality improvement.

So, it can be stated that it is developed an up-to-date online course, which contains various resources, which correspond to the new digital reality, and which lets to form competencies in the area of products quality and safety in the process of distance education.

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