Comparative quality inspection of Moodle and Mooc courses: an action research

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***Abstract* — This paper shows comparative analysis of Moodle and Mooc courses. In the domain of Mooc courses, the edX platform was used for course creation and analyses. A survey was applied and participants were students from the Faculty of Technical Sciences in Cacak. Results point to possible differences betwen two chosen platforms. Future work relates to continuous improvement of courses and quality assurance of created courses.**

I. INTRODUCTION

The term Open Educational Resources (OER) was first mentioned in 2000 during the UNESCO conference. According to OECD [1], resources are not related only on content but on three different categories:

- Learning content - Relates to the content of learning, learning objects, collections and journals;
- Tools - Software that enables the development and distribution of content as well as searching and organization of the content;
- Implementation resources - Relates to the intellectual property licenses

The term "Open" in OER refers to a number of aspects, according to [2]:

- Openness in open source
- Openness in the social domain
- Openness in the technical domain

Massive open online courses (MOOC) have an unbreakable bond with Open educational resources. The term MOOC (Massive Open Online Course) was first used in 2008 and it was related to an online course "Connectivism and Connected Knowledge", designed by George Siemens and Stephen Downes. According to [3], MOOC integrates the advantages of social networking, a collection of open educational resources and the support of experts in the relevant field. "Massive" refers to the number of the course's participants, as well as the capacities of the course in terms of allowing access to a large number of activities.

E-learning is being standardized by the International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) - ISO / IEC, [4]. Standardization of e-learning is preceded by development and research results from other institutions, such as, for example: AICC, IMS, DCMI, ADL-SCORM, ALIC, IEEE LTSC, ADRIADNE, CEN/ISSS WS-LT, CEN/ISSS CDFS, CEN/ISSS WS on Privacy, W3C etc ... [5]. JTC 1 / SC 36 subcommittee for e-learning functions within the First unified technical committee (JTC1 ISO / IEC).

Along with development of electronic courses, a question arises about their quality. According to [6] "quality issues often manifest as dissemination on teaching effectiveness, faculty to student rations, attrition rates, student satisfaction, and institutional resources invested in online delivery".

There are several approaches to evaluation of quality on electronic courses. Khan listed some possible approaches in [7] that are shown in Table I.

TABLE I.
KHAN'S QUALITY FACTOR

Quality factor	Concern
Pedagogical	Issues related to teaching and learning such as course contents, how to design it, how to offer it to target audience and how the learning outcomes will be achieved.
Technological	Issues related to hardware, software and infrastructure. e-learning environment, LMS, server capacity, bandwidth, security and backup are also covered in this dimension.
Interface design	The overall look and feel of an e/learning program. Interface design encompasses Web and content design, navigation, Web accessibility and usability testing.
Evaluation	The evaluation of e-learning at institutional level, evaluation learning assessment.
Management	The maintenance and modification of the learning environment, it also addresses issues related to quality control, staffing and scheduling.
Resource support	All technical and human resources support to create meaningful online environment which includes Web based digital libraries, journals, and online tutorials.
Ethical	Issues related to social and political influence, diversity and legal issues such as plagiarism and copy rights.
Institutional	Including three sub dimensions: issues of administrative affairs; issues of academic affairs; issues of student services.

However, according to [8] a consensus was not achieved when it comes to standards and methods of evaluation that would relate to electronic materials. Namely, it is necessary to determine different methods and criteria of evaluation for traditional and online learning materials.

By reviewing related research in the field of evaluation the quality of electronic course presented in [9-12] it was determined that most often a combination of various factors of quality was used in order to get relevant information.

II. METHODOLOGY

A. Purpose, tasks and goals

The purpose of the research is comparative analysis of quality of Moodle and Mooc courses. Research is of action type because the goals were to promote created courses and reach socially useful results in the domain of electronic learning.

The goal of the research relates to determining potential differences in the quality of courses on Moodle and Mooc platform that arise from different possibilities that these platforms offer. Regarding Mooc platform, in this research is analyzed edX platform (https://www.edx.org).

Research methodology:

- Creating the courses on Mooc and Moodle platform
- Enrolling beginners to appropriate Moodle and Mooc courses
- Creating a survey
- Applying the survey
- Analysis and evaluation of results

B. Research framework

Courses that were evaluated are created within the Moodle LMs at the Faculty of technical sciences in Cacak (itlab.ftn.kg.ac.rs/moodle) and edX courses, created within Tempus Baektel project (www.baektel.eu).

Within Moodle LMS over 100 courses was created from various fields within basic and master studies. There are around 2000 active users in the system.

Apart from Moodle course, courses developed within edX system were also evaluated. The edX platform, together with developed courses were established within Tempus Baektel project (www.baektel.eu). The main project objective is to "establish an OER framework for fostering technology enhanced learning (TEL) within HE institutions and life-long learning within enterprises in WB countries, develop and implement guidelines and procedures for quality assurance of OER according to EU practices at national level in WB beneficiary countries" [www.baektel.eu].

In the initial phase of the project, two courses on edX platform were created: introduction to programming and practical course on static electricity at gas stations. The comparative review on both systems edX and Moodle enviroment are described in detail in [13].

C. Participants and survey

Students from Faculty of Technical sciences in Cacak took part in the research. Selected students attended at least two courses at Moodle LMS and both courses on edX system. Table II shows data about the participants.

The easiest and fastest way to assess quality is self-evaluation that can be done by passing through a simple and concise evaluation. Survey is given in table III [14]. Survey contains the following categories:

- Course overview and Introduction
- Learning objectives (Competencies)
- Assessment and measurement
- Instructional materials
- Learner interaction and engagement
- Course technology
- Learner support
- Accessibility

TABLE II.
INFORMATION ABOUT PARTICIPANTS

Gender	Frequency	Percentage	Valid percentage
Male	15	68,18	68,18
Female	7	31,82	31,82
Total	22	100,00	100,00

TABLE III.
INFORMATION ABOUT PARTICIPANTS

		Moodle courses grade	edX courses grade
1	**Course overview and Introduction**		
1.1	Instructions make it clear how to get started and where to find various course components.		
1.2	Students are introduced to the purpose and structure of the course.		
1.3	Etiquette expectations (sometimes called "netiquette") for online discussions, email, and other forms of communication are stated clearly.		
1.4	Course and/or institutional policies with which the student is expected to comply are clearly stated, or a link to current policies is provided.		
1.5	Prerequisite knowledge in the discipline and/or any required competencies are clearly stated.		
1.6	Minimum technical skills expected of the student are clearly stated.		
1.7	The self-introduction by the instructor is appropriate and available online.		
1.8	Students are asked to introduce themselves to the class.		
2	**Learning objectives (Competencies)**		
2.1	The course learning objectives describe outcomes that are measurable.		
2.2	The module/unit learning objectives describe outcomes that are measurable and consistent with the course -level objectives.		
2.3	All learning objectives are stated clearly and written from the students' perspective.		
2.4	Instructions to students on how to meet the learning objectives are adequate and stated clearly.		
2.5	The learning objectives are appropriately designed for the level of the course.		
3	**Assessment and measurement**		
3.1	The types of assessments selected measure the stated learning objectives and are consistent with course activities and resources.		
3.2	The course grading policy is stated clearly.		
3.3	Specific and descriptive criteria are provided for the evaluation of students' work and participation and are tied to the course grading policy.		
3.4	Students have multiple opportunities to measure their own learning progress.		
4	**Instructional materials**		
4.1	The instructional materials contribute to the achievement of the stated course and module/unit learning objectives.		
4.2	The purpose of instructional materials and how the materials are to be used for learning activities are clearly explained.		
4.3	All resources and materials used in the course are appropriately cited.		
4.4	The instructional materials present a variety of perspectives on the course content.		
4.5	The distinction between required and optional materials is clearly explained.		
5	**Learner interaction and engagement**		
5.1	The learning activities promote the achievement of the stated learning objectives.		
5.2	Learning activities provide opportunities for interaction that support active learning.		
5.3	The instructor's plan for classroom response time and feedback on assignments is clearly stated.		
5.4	The requirements for student interaction are clearly articulated		
6	**Course technology**		
6.1	The tools and media support the course learning objectives.		

6.2	Course tools and media support student engagement and guide the student to become an active learner.		
6.3	Navigation throughout the online components of the course is logical, consistent, and efficient.		
6.4	Students can readily access the technologies required in the course.		
6.5	The course technologies are current.		
7	**Learner support**		
7.1	The course instructions articulate or link to a clear description of the technical support offered and how to access it.		
7.2	Course instructions articulate or link to the institution's accessibility policies and services.		
7.3	Course instructions articulate or link to an explanation of how the institution's academic support services and resources can help students succeed in the course and how students can access the services.		
7.4	Course instructions articulate or link to an explanation of how the institution's academic support services can help students succeed and how students can access the services.		
8	**Accessibility**		
8.1	The course employs accessible technologies and provides guidance on how to obtain accommodation.		
8.2	The course contains equivalent alternatives to auditory and visual content.		
8.3	The course design facilitates readability and minimizes distractions.		
8.4	The course design accommodates the use of assistive technologies.		

III. RESULTS AND DISCUSSION

During result analysis, a T-test of paired samples was used (or repeated measurements).

Research question was posted as following: Are the results of user satisfaction with courses created within Moodle LMS and edX considerably different?

The following was applied:

- One category independent variable (in this case that was the type of the system: 1-Moodle, 2-edX)
- One uninterrupted, dependable variable (platform rating)

T-test of paired samples shows us whether there is a statistically meaningful difference in mean values received for two selected systems. Received results are shown in Table IV.

In the above mentioned table, starting from the second to the last column named Sig., it can be noted that there isn’t any couple with Sig values less than 0.05, which points to the conclusion that there is no meaningful difference between two tested systems regarding the categories.

TABLE IV
PAIRED SAMPLE TEST

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	1 - 1	,600	1,647	,521	-,578	1,778	1,152	9	,279
Pair 2	2 - 2	,900	1,595	,504	-,241	2,041	1,784	9	,108
Pair 3	3 - 3	,300	1,059	,335	-,458	1,058	,896	9	,394
Pair 4	4 - 4	1,100	1,853	,586	-,226	2,426	1,877	9	,093
Pair 5	5 - 5	,800	1,814	,573	-,497	2,097	1,395	9	,196
Pair 6	6 - 6	1,000	2,160	,683	-,545	2,545	1,464	9	,177
Pair 7	7 - 7	,900	1,853	,586	-,426	2,226	1,536	9	,159
Pair 8	8 - 8	,900	1,101	,348	,113	1,687	2,586	9	,029
Pair 9	9 - 9	1,000	1,633	,516	-,168	2,168	1,936	9	,085
Pair 10	10 - 10	,600	1,430	,452	-,423	1,623	1,327	9	,217
Pair 11	11 - 11	,200	1,317	,416	-,742	1,142	,480	9	,642
Pair 12	12 - 12	-,200	,919	,291	-,857	,457	-,688	9	,509
Pair 13	13 - 13	1,100	1,595	,504	-,041	2,241	2,181	9	,057
Pair 14	14 - 14	,800	1,619	,512	-,358	1,958	1,562	9	,153
Pair 15	15 - 15	,100	1,595	,504	-1,041	1,241	,198	9	,847
Pair 16	16 - 16	,400	1,713	,542	-,825	1,625	,739	9	,479
Pair 17	17 - 17	,300	2,003	,633	-1,133	1,733	,474	9	,647
Pair 18	18 - 18	,600	1,647	,521	-,578	1,778	1,152	9	,279
Pair 19	19 - 19	-,400	1,578	,499	-1,529	,729	-,802	9	,443
Pair 20	20 - 20	,000	1,700	,537	-1,216	1,216	,000	9	1,000
Pair 21	21 - 21	,500	1,716	,543	-,728	1,728	,921	9	,381
Pair 22	22 - 22	,500	1,958	,619	-,901	1,901	,808	9	,440
Pair 23	23 - 23	-,200	1,398	,442	-1,200	,800	-,452	9	,662
Pair 24	24 - 24	,200	1,619	,512	-,958	1,358	,391	9	,705
Pair 25	25 - 25	-,300	1,889	,597	-1,651	1,051	-,502	9	,627
Pair 26	26 - 26	,200	1,317	,416	-,742	1,142	,480	9	,642
Pair 27	27 - 27	,400	1,350	,427	-,566	1,366	,937	9	,373
Pair 28	28 - 28	,300	2,003	,633	-1,133	1,733	,474	9	,647
Pair 29	29 - 29	,700	2,312	,731	-,954	2,354	,958	9	,363
Pair 30	30 - 30	,500	1,780	,563	-,773	1,773	,889	9	,397
Pair 31	31 - 31	,600	1,897	,600	-,757	1,957	1,000	9	,343
Pair 32	32 - 32	,300	1,947	,616	-1,092	1,692	,487	9	,638
Pair 33	33 - 33	-,100	1,524	,482	-1,190	,990	-,208	9	,840
Pair 34	34 - 34	,300	1,494	,473	-,769	1,369	,635	9	,541
Pair 35	35 - 35	,100	2,132	,674	-1,425	1,625	,148	9	,885
Pair 36	36 - 36	,700	1,494	,473	-,369	1,769	1,481	9	,173
Pair 37	37 - 37	-,400	1,506	,476	-1,477	,677	-,840	9	,423
Pair 38	38 - 38	-,700	1,767	,559	-1,964	,564	-1,253	9	,242
Pair 39	39 - 39	-,900	,994	,314	-1,611	-,189	-2,862	9	,019

IV. CONCLUSION

According to the obtained results two conclusions can be made:

- The current state in regards to differences between two analyzed systems: based on the conducted T-test, it was determined that there are no meaningful differences.
- Further research directions: having in mind that the research is active and the work in both systems is still conducted, by improving and developing new courses and functionalities within those courses goals will be achieved.

Limitation of the research is apparent in inadequate number of test subjects (22).

Future work relates to the development of courses and continued surveying of both systems, analysis of comparative results and further improvements.

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