USING LEARNING ACTIVITIES DATA FROM MOOCS TO REVISE COURSE CONTENT

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Abstract
In the fall of 2015, after the first launch of the online courses by Al-Farabi Kazakh National University, we began to look for a methodology for evaluating the quality of the developed courses. Usually after the completion of the course, an online survey of students is conducted with the help of which you can get an initial picture of the external evaluation. In addition, review and feedback from active listeners about the course are also important when assessing components of the online course: video, activities, assessments, forum, and i.e. But analyzing learning activities data from MOOCs and comparison with the external evaluation allows to obtain more adequate results for the course evaluation.

While MOOCs offer educational data on a new scale, many educators find great potential of the big data including detailed activity records of every learner. This data can be used for educational research, learners’ behavior prediction, detection and prevention of various cheating in MOOCs, and for revising course content.

In this work, we describe how we were able to use students’ learning data in the evaluation of the online courses and revising course content.

Keywords: MOOCs, Course Quality, Instructional Design, Data Analysis.

1 INTRODUCTION
Since 2012, known as “The Year of the MOOC” [1], massive open online courses (MOOCs) have expanded worldwide, shaking up the higher education landscape and potentially disrupting the model of brick-and-mortar universities. Whilst higher education institutions have long been engaged in the delivery of online content (via, for example open educational resources and virtual learning environments), the rapid advent of MOOCs is regarded by some experts as an education revolution. According to Class Central [2], the total number of MOOCs reached 6,850 in 2016 with 58 million attracted students and over 700 involved universities worldwide. If such interest to MOOCs by learners can be explained with their ability to offer free or low-cost quality education to anyone, anytime, anywhere, and on a massive scale [3-6], then from the other side institutions and authors have the opportunity to get a huge audience to evaluate their courses and to approve new technology-enhanced pedagogy [7-9].

Despite the increase in enrollments in MOOCs, many people remain skeptical of online learning due to low completion rates [6], [10-13] and comparison of learning outcomes between face-to-face and online learning [14], [15]. Moreover, Koller and Ng, the founders of Coursera MOOCs platform, indicated that up to half of the registered Coursera students never actually start their courses [16]. However many researchers have come to the conclusion that comparison studies between face-to-face and online courses are a waste of time because researchers cannot control for additional factors that may impact student achievement [14], [15].

MOOCs in essence have unique characteristics that make them valuable for society:

- provide a full course experience for free, increasing access to education for all kinds of (non-formal and formal) learners;
- can serve as a channel to enrich teaching and learning experiences both online and on campus;
- as a catalyst for quality higher education and lifelong learning;
- data collected from MOOCs can support the development of learning analytics, improve assessment and provide targeted feedback to faculty to enhance active learning experiences for students;
unprecedented opportunity enabled by availability of big learning data for enabling artificial intelligence in e-learning and so on.

Globally MOOCs can be treated as a tool for achieving Sustainable Development Goal 4 of the UN 2030 Agenda for Sustainable Development: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. MOOCs can potentially contribute to many aspects of the other Sustainable Development Goals [17].

In 2014 Al-Farabi Kazakh National University became the first from Kazakhstani universities which have joined the MOOCs movement and began work on producing own online courses. Initially as the target audience was selected prospective students: graduates from secondary schools, students of vocational schools and colleges. Since the project was initiative funds for the development and delivery of courses was not provided. Despite the high teaching load and other professional duties of teaching staff we found and revealed among them enthusiasts and volunteers, which agreed to create courses in the new format.

In the fall of 2015, after the first launch of the massive open online courses by Al-Farabi KazNU, we began to look for a methodology for evaluating the quality of the developed courses. Evaluation is a stage of the cyclic ADDIE instructional design model, which can be applied to the online courses development process (fig. 1). This model is suitable with MOOCs development life cycle presented in fig. 2 that useful to describe how much time involving this task [18].

![Image](http://cognitiveperformancegroup.com/tag/addie-model/)

**Figure 1. The ADDIE Instructional Design Model**.

**Figure 2. MOOCs development life cycle.**

Overall, the experience with the launch of the first MOOCs in 2015, showed us a general lack of awareness and low motivation both the students during learning via LMS and among instructors on delivering their online courses. However, since the half of 2016 there is a rise of interest in MOOCs in Kazakhstan: many universities have expressed their desire to develop online courses, private companies have sponsored production of MOOCs in Kazakh, and number of enrollments have
increased. The positive dynamics characterizes the inclusion of the Kazakhstan audience in the global market of e-learning.

2 METHODS

As for every form of education, considering the quality of MOOCs is essential to guarantee a worthwhile learning experience for the learner and at the same time reach the goals the institution has for offering a MOOC. However, the quality of MOOCs has been criticized from the start and many recent works focused on the evaluation of the quality of MOOCs (for example [19-21]).

Usually after the completion of the course, an online survey of students is conducted with the help of which you can get an initial picture of the external evaluation. In addition, review and feedback from active listeners about the course are also important when assessing components of the online course: video, activities, assessments, forum, and i.e. But analyzing learning activities data from MOOCs and comparison with the external evaluation allows to obtain more adequate results for the course evaluation. While MOOCs offer educational data on a new scale, many educators find great potential of the big data including detailed activity records of every learner. This data can be used for educational research, learners’ behavior prediction, detection and prevention of various cheating in MOOCs, and for revising course content.

In many cases, we should think about how we can review the course and improve content using this information and data, rather than just writing a report, providing the statistics for course. For this reason we use students activity data and analyse it with having tools in the MOOC platform, and sometimes using other data analysis tools in R or Python like Rattle GUI, iPython, Pandas or Stata [24].

3 RESULTS AND DISCUSSION

We used learning activities data from two most enrolled courses in our University MOOC platform (http://open.kaznu.kz):

- “Al-Farabi and the modern time” by professors G.M. Mutanov, G.Zh. Nurysheva and A.S. Syrgakbayeva;
- “Solving physical problems with V. Kashkarov” by associated professor V.V. Kashkarov;

with 1267 and 1491 enrollments respectively. A current MOOC platform, taking Open edX as an example [22], provides overall statistics for courses, such as the number of enrolled students, demographic distribution, for example fig. 3. Open edX also provide useful features like course data analytics, mobile application for Android and iPhone, enhanced teaching and learning tools, extensions and APIs for developers, etc.

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**Figure 3. Education metrics of “Al-Farabi and the modern time” course students.**
In addition, Open edX support community constantly are creating many suitable tools, such as a sample learning analytics tool developed by the Hong Kong University of Science and Technology (HKUST) called VisMOOC [23], a visualization tool for MOOCs (fig. 4), which may be available as open source technology in 2017.

![Figure 4. MOOC video clickstream patterns analysis.](image)

Source: HKUST, accessed 17 November 2016. Sample from VisMOOC – Student’s video watching and clicks analysis in “Introduction to Computing with Java” by Mr. T.C. Pong, Senior Advisor to the Executive Vice-President & Provost Director of Center for Engineering Education Innovation Professor of Computer Science & Engineering Hong Kong University of Science & Technology (HKUST)

Video watching is the most important way of learning in MOOCs. Therefore, we can focus on video playback activity of learners. As the saying “no pain, no gain,” the score of one learner is relative to his/her learning engagement. For comparison, in the table 1 you can see the number of learners with the average video watching activity and total views in the course “Solving physical problems with V. Kashkarov”.

<table>
<thead>
<tr>
<th>Student groups</th>
<th>Number of students</th>
<th>Total views</th>
<th>Average views</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midterm score &gt;= 90</td>
<td>15</td>
<td>769</td>
<td>1.35</td>
</tr>
<tr>
<td>Midterm score &gt;= 80</td>
<td>32</td>
<td>1508</td>
<td>1.24</td>
</tr>
<tr>
<td>Midterm score &gt;= 50</td>
<td>27</td>
<td>1149</td>
<td>1.12</td>
</tr>
<tr>
<td>Midterm score &lt; 50</td>
<td>39</td>
<td>1304</td>
<td>0.88</td>
</tr>
</tbody>
</table>

MOOCs platform also saves detailed activity records of massive learners during the learning process. In given dataset, every learner’s activity is collected as an event. When a learner logs in to a course or watches a video, or makes attempt to pass the test, this will generate a new event and tracking logs. For measuring activity results, we compared data of KazNU students who involved in our investigation. The students were selected so that the average academic performance of the two groups were the same. The students were aware all learning achievements will be taken into account, so it is considered that they were reasonably motivated. Half of them learned from online courses and another part did their activities in-class. Based on the improvement values we were able to find out
that some of the results of the online activities are significantly different from in-class analogues. This means that we should reconsider the formulation or conditions of the activities to adapt for online completion. Here in fig. 5 we can see that certain activities have better results than in-class ones after improvement.

![Figure 5. Comparison of online and classroom activities results.](image)

4 CONCLUSIONS

There are several viewpoints on what pedagogy provides in terms of an effective learning experience. Learning materials should be designed with an adequate level of interactivity so that students can engage and test their knowledge, understanding and skills at regular intervals. It is important to invest in building the ICT skills of teachers as well as learners to increase participation in MOOCs and improve achievement of learning outcomes. It is useful to build quality models for each component of a MOOC, such as identity management, pedagogy, assessment and credentialisation.

Based on activities data in MOOCs, some problems are improved because the parameters of the activities can be tuned in a finer scale to fit more learners. However some parts in the analytical component of the method need further improvement. Moreover, through this iterative user-centered design process, we have outlined a set of domain-specific goals and design rationales that could further inform the future design of similar approaches. On the other hand, learners may join a course with the motivation to persist for some or the entire course, but various factors, such as attrition or lack of satisfaction, can lead them to disengage. How to deal with the motivation transition is also a problem to be solved in future.

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