Work in Progress: Designing an Academical Online Course for Technical Students: Structure, Content, Assessment

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Abstract. Distant education and online courses have recently become a part of a new reality, especially in the last four months as many institutes and universities all over the world had to shift most of their educational content online because of the ongoing COVID-19 pandemic. It appeared that some higher educational institutions and a certain part of their students were almost ready to go online as these institutions had been developing their online platforms thus integrating traditional face-to-face classes with computer-assisted learning as well as integrating massive open or shared online courses into their curricular. At the same time, many other universities and institutes proved to be absolutely unprepared to shift online as they and their students had neither their own educational environment and online resources developed by their teaching staff nor any experience of working in an external online environment and choosing courses appropriate for their educational purposes. It turned out that most existing online courses could not be successfully used for implementing into most universities curricula and for teaching a majority of technical students as they simply reproduced the traditional classroom learning process and missed all advantages and opportunities afforded by online learning environments. The authors objective for this research in progress is to identify the key features and describe structure, content and assessment specifics of an academical online course for technical students. This paper provides tips on how to organize the course content into a proper structure stressing what types of teaching materials could be uploaded to the educational platform and goes into its assessment specifics. In a long-term perspective the authors aim to design, develop and introduce a modern and progressive constructivist learning environment for teaching business English in technical universities.

Keywords: Engineering education · Online course · Online course design · Teaching materials · Online tests and quizzes · Formative assessment · Summative assessment · Peer reviewing
1 Introduction

Recent events as well as official instructions and guidelines suggest that online education has come to stay and when most university classes come back to a traditional face-to-face format there will be a certain amount of educational university courses which stay online. For technical students it is mostly academical courses in humanities, such as Philosophy, History, Theoretical Economics, Fundamentals of State and Law, National Languages, Intercultural Communication, Foreign Languages & Business English, etc., covering a significant amount of content to be delivered online to a large number of learners to save money and work expenditure. At the same time, most existing online courses in social and humanitarian disciplines cannot be successfully used for implementing into most universities curricula and adjusted for teaching a majority of technical students as they simply reproduce the traditional classroom learning process and miss all advantages and opportunities afforded by online learning environments.

2 Project Description

2.1 Research Background

In spring 2020, when all universities in Russia had to switch to computer-assisted distance learning, it turned out that most of them were not ready to successfully go on with it. At first, they had to resort to e-mail correspondence and social services’ chat-groups which turned out to be unproductive. Though limited either in time or in the number of participants, web-based video conferencing sessions via Zoom, MS Teams, etc. proved themselves better. Still, it became clear that this unexpected online educational process required careful planning and managing.

Universities were actively encouraged to search for ready-made open or shared online courses which content was similar to the subjects they taught and involve these courses into their studies [12]. Some teachers even managed to hastily elaborate and refine or even develop their own online courses in either their universities official learning management systems (such as Moodle, WebTutor, Blackboard, iSpring Learn, etc.) or while using such free resources as Edmodo, Sakai, etc.

The authors of this paper studied 34 online courses in social disciplines (among them 18 massive open online courses (MOOCS) on both internationally recognized platforms such as Coursera, EdX & etc., as well as 16 local online courses developed by the teachers of Samara State University of Social Sciences and Education (SSUSSE) and Samara State Technical University (SSTU) in LMS Moodle. The research was qualitative, data collection continued for over ten weeks and is still in progress. Two mechanisms for collecting data were employed: observations of structure, content and assessments tools employed in these courses & short interviews with course participants (both teachers and students) from SSUSSE and SSTU. Both mechanisms considered the categories that are often used to evaluate online courses in terms of course organization: Course Overview and Introduction; Learning Objectives (Competences); Assessment and Measurement; and so on [11, 19].
2.2 Purpose

The objective for this research in progress is to identify the key features and briefly describe structure, content and assessment specifics required of an academical online course for technical students as many courses (mostly presented on Russian educational resources) simply reproduce the traditional classroom learning process, lack most advantages and opportunities afforded by online learning environments and expect your students to consume knowledge rather than create it. In a long-term perspective the authors aim to consider the principles behind good online design, go deeper into the features of a successful course, outline the features of an unsuccessful course design and content, and then develop and introduce a constructivist learning environment starting with a course on teaching business English in technical universities.

2.3 Approach

When dealing with online education, it is necessary to rethink the methodologies, criteria, and approaches normally adopted for conventional educational design [8]. The authors resort to constructivism as a philosophical and pedagogical approach and consider its fourth (lower) technological methodology level to give a description of methods and techniques which can be fruitful for developing constructivist learning environments to enhance online courses. The research is based on the assumption that analysis and design stages as well as the course content, materials and assessment tools are essential to ensure course effectiveness and learners’ motivation and participation; learning activities offered by the course should be both interesting, inspiring and well-matched to the level of the participants and their learning objectives.

3 Literature Review

From the first offering of a fully online course in 1981 [7] it was clear that this new model of education had much potential to impact the design and delivery of education at all levels [9]. Soon after online learning emerged as a learning approach, certain advantages became apparent – such as flexibility, alleviation of overcrowded classrooms, increased enrollment, reduced cost, and increased profit [4, 5]. In almost forty years that passed after this memorable event, online education has changed greatly. As long ago as in 2001, Taylor identified five generations of distance education development and assumed that the latter, fifth, generation, ‘the intelligent flexible learning model’, that had just begun to take shape would include Internet-based access to resources, easily accessible online interactive multimedia, and computer-mediated communication using automated response systems …” [17]. In a few years other researchers expressed hopes that online learning would soon transform education from instructor-centered to student-centered, where students had more responsibility for their learning [14]. Now we still hope that it would really happen one of these days as most online courses still aim at pouring content into student minds rather than supporting students in making that knowledge their own through practice and experience [16].
The reasons for that are as follows. Institutional learning environment is still mainly used as a repository for lecture materials and reproduces the traditional paradigms of teaching [2]. Thus, academics remain largely teacher-centered in their use of technology and are very reluctant to adopt more learner-centered ideas [15]. One of the great potentials of online learning that students can take more responsibility for their learning is obviously not harnessed in most cases [16].

At the same time, successful online course developers share a ‘social constructivist’ view of learning which means that the teacher should primarily act as a facilitator and guide rather than a deliverer of information, and that peers will influence an individual’s approach to learning [18]. Constructive approach – an outcomes-based teaching and learning framework, proposed by Biggs and Tang [1], in which teaching activities and assessment tasks are systematically aligned to the intended learning outcomes – is based on the idea that teaching by telling doesn’t really work, and that the most effective learning is achieved by students doing something active. Active learning, defined as any teaching method that engages students in the learning process, requires students to complete meaningful learning activities and to think about what they are doing [14]. Online education, in its turn, is a different medium for teaching and learning, and therefore requires a different approach and even a different pedagogy [8].

4 Main Body

In this part of the research the factors that contribute to constructing a high quality and meaningful course for learners are considered. It is also important to stress that while studying online courses during the preliminary stage of the research, the authors initially concentrated on the drawbacks and pitfalls evident in the courses’ structure, content, adopted approaches, etc. These observations also helped to establish a framework for the researchers’ schematic overview of an academical online course for technical students, its structure, content and assessment tools.

The importance of providing students with a structure for learning is one the most important steps towards quality teaching and learning. In this case, it is evident, that being aimed for technical students of Russian universities, an online course in social or humanitarian disciplines should be fitted within an autumn or spring term starting and ending at the same time with face-to-face courses [13]. As technical students are in the habit of going to class at the same time every week, these students need to form the same habits to maintain consistent performance across the term while having an online course. Making sure that assignments are always due on the same day of the week and modules always begin on the same day of the week also helps. Thus, the course should be organized over a specific time scale, with modules and lessons for each week of the program, and the number of modules aligned with the number of academical weeks.

Creating course content is one of the most challenging steps of creating an online course [10]. While investigating existing academical courses created on the Russian platforms the authors couldn’t help but notice that these courses instructors are often tempted to pack too much content into each module pouring on students all materials they have. It might be long texts to and even whole books to summarize or 90-minute-long recorded video lectures as the other extreme. Most instructors ignore the
assumption that an online course should include a variety of materials, both audio, visuals, video, texts, etc.

Briefly characterizing the types of teaching materials that could be uploaded to the educational platform, it is vital to stress that video lectures are a widely-used kind of resource for online learning. But simply recording a lecture in front of a live classroom and using that video in an online course has many drawbacks and is not as effective when put online. Live classroom lectures are much longer than the short videos designed for online learning experiences; and, when delivering a live classroom lecture, the primary audience are the learners in the live classroom, which can make online learners feel like mere bystanders. Effective video lectures need to engage directly with the online learner. Besides, online lecture videos need to be short (their length varying from 6 to 12 min), engaging, and tailored specifically to the online audience [6].

The next type of educational content is a variety of text materials, often referred to as ‘text-only documents’ [3]. It can be additional reading materials, video subtitles, notes, manuals, etc. This is the type of content that is easiest to edit and update.

The third type of content is a variety of interactive elements: slide shows, simulators and simulation facilities, education games of different types. For example, on the Coursera platform, you can integrate your own external plugins both inside the lesson and inside the test connecting your model with Quizlet or Kahoot and the like.

Assessment tools and test formats in online courses and special aspects of their use stand aside. In online courses, assessment is used for two purposes: formative and summative assessment. Formative assessment allows students to test understanding of the material before passing to summative assessment, but summative assessment allows authors of a course to verify understanding of the material by the listener.

We especially stress such principles for effective online assessment as designing learner-centred assessments that include self-reflection; rubrics for the assessment of contributions to discussions, as well as collaborative assessments through public posting of papers; encouraging students to develop skills in providing feedback by modelling what is expected; designing assessments that are clear, easy to understand, and likely to work in the online environment.

As for the types of assessment tools, an academic course for technical students should include:

1. Tests integrated inside video lectures or the so-called ‘In-Video Quizzes’. Tests integrated inside video lectures are usually simple non-timed ‘true/false’ questions, multiple choice and matching questions with no grades that the listener should undergo right while watching video fragments. In-Video Quizzes are usually checked automatically. This test format is only used for formative assessment, meaning that the results of such tasks do not contribute to summative assessment.

   Questions integrated inside video lectures should not include difficult tasks or complicated tasks. They can even be even humorous in cases where the joke fits the style of presentation of the material. In-Video Quizzes serve as a way to interact with the listener. They compensate for the absence of face-to-face contact in the process of online education. The recommended number of questions in these quizzes is 1–2 questions per 5–10 min of video, that is, it is about 1–2 questions per average online course video.
2. The second test type is standard tests. Tests in an online course consist, firstly, of multiple-choice questions where students choose one or several correct answers. Online course designers can also include such question types as calculated simple or calculated multi-choice questions, drag and drop into text/onto image tasks, short answer questions when the student types in a word or phrase in response to a question, flexible questions consisting of a passage of text that has various answers embedded within it, etc. Answers to these questions are also checked automatically. This test format can be used for both formative and summative assessment.

As a rule, a typical quiz for formative assessment includes 5–10 questions for 30 min of video. In turn, a typical quiz for summative assessment is about 10–20 questions per hour of video.

The number of attempts also differs. The number of attempts for formative assessment is not limited. At the same time, the number of attempts for summative assessment is usually limited to 3 staggered attempts.

3. The next form of checking-up is peer-reviewing. Peer-reviewing assumes that at the first stage students independently construct their responses according to a certain pattern, then upload their responses and finally check and grade each other’s works. Such tasks are obviously not automatic in terms of verification. Using peer reviews in online courses enhances student learning and allows students the opportunity to read a variety of student writing, learn from each experience, learn by providing feedback, and develop their writing skills in the process. Peer-reviewing is one of the key ways to test the achievement of complex learning outcomes, such as critical thinking or academic writing skills. Reviewees here benefit from the reviewers’ comments, which improves their understanding of the subject and vice versa. This task format is suitable in situations where listeners have to construct a complex response or complete a creative task, and their response could not be checked automatically.

This, of course, is only a brief outline of an academical online course for technical students design features.

5 Recommendations

One of the most significant requirements for further adoption of online learning is the development of well-designed courses with interactive and engaging content, structured collaboration between peers, flexible deadlines to allow students to pace their learning, continuous monitoring of student progress, and the provision of formative feedback when it is needed.

It is important to keep in mind that online learning can be as effective as face-to-face learning, but it is not the same and requires different planning, one should resort to constructive alignment to design and develop an online course. Decisions need to be made about the content, structure, timing, pedagogical strategies, sequence of learning activities, and type and frequency of assessment in the course, as well as the nature of technology used to support learning. Technology, when it is used appropriately, can play a very important role in this process, particularly where students locate material, undertake formative assessment and, critically, where effective collaborative working and critical discussion with peers is to occur.
Course content should be presented in organized, manageable segments for students to access and learn content in an organized and manageable format appropriate for the students’ prime goal which is the consumption of knowledge generated by the teacher. At the same time, the concept of active learning should not be overlooked as in an online environment students are supposed to create knowledge rather than consume it.

The consideration of appropriate assessment is central to course planning. Most importantly, developers need to remember the importance of constructive alignment, and ensuring that they plan their assessment to support the intended learning objectives or intended learning outcomes.

6 Conclusion

The analysis of existing courses suggested by such international platforms as Coursera and EdX and National Open Education Platform created specially for Russian-speaking learners has produced a set of recommendations. Some of these tips are as follows. Online courses should be divided into logical units, each of which is further divided into a series of modules. All materials must be carefully designed and must embed adequate instructional support to allow learners to function throughout the course. Types of teaching materials that could be uploaded to the educational platform include 6–12 min long video lectures; a variety of text materials (additional reading materials, video subtitles, notes, manuals, etc.); a variety of interactive elements: slide shows, simulators and simulation facilities, games of different types. Designers can integrate their own external plugins both inside the lesson and inside the test or attach a survey to their texts that was made using external services such as Survey Monkey, SurveyGizmo or Microsoft Forms.

As for assessment, in online courses, assessment is used for two purposes: formative and summative assessment. Formative assessment allows students to test understanding of the material before passing to summative assessment, but summative assessment allows authors of a course to verify understanding of the material by the listener. Formative assessment does not contribute to summative assessment, while summative assessment results is the student’s overall score for the course and so on…

As the authors are still working on giving a more detailed description of a highly efficient online course on humanitarian subjects for technical students, during the next term they plan to go deeper into their analysis of existing courses, point out their main drawbacks and thus make more steps forward to their ambitious objective.

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