CREATING AN ENVIRONMENT FOR FREE EDUCATION AND TECHNOLOGY ENHANCED LEARNING

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Abstract: *The purpose of this paper is to present a project aimed at making knowledge publically available through open educational resources (OER). The focus is on open online courses which will be created by educational institutions and best practice examples offered by leading companies, with the purpose to support life-long education and enhancement of academic education with practical knowledge. The goal is to create diverse high quality educational materials in electronic format, which will be publically available. The educational material will follow basic pedagogical-didactic principles, in order to best meet the needs of the potential learners. In accordance with that a review of didactic principles that can contribute to producing OER content of excellence is given. The choice of a convenient platform, as well as the application of appropriate information technologies enable content representation in a suitable, innovative and meaningful way.*

Keywords: *Open educational resources, lifelong-learning, open online courses*

1. INTRODUCTION

Rapid technological advancement, expansion of information technologies, and growth of the internet have resulted in their penetration into all segments of the society. Consequently, substantial changes are underway in the educational domain as well. There is a growing support of the academic public to open educational resources (OER), and a respectable number of OER content is already available. There are many definitions of OER content, one of the most comprehensive being the one suggested by Downes [1], for whom OER can be understood as educational materials that can be freely accessed, changed, reused and shared. They include courses, textbooks, videos, tests, software and tools that can be used in educational purposes. OER materials can thus be found in different forms, from short video clips to complete complex courses.

Besides the strong support to OER in Europe, several recent reports testify to the spreading of OER around the globe, such as the initiative reported by Harsasi [2] about a project in Indonesia, which includes over 275 OER courses. Other examples include OER content implementation in the educational system in Japan, where courses were created in different areas, as well as OER initiatives in China, Korea and Taiwan, where large collections of open educational resources have also been developed [3].

There is an ongoing debate among researches on the mechanisms for fostering the creation of OER materials, who is to be included in this process, and what the advantages and challenges that OER brings are [4][5]. The historical rationale for OER can be found in the Universal Declaration of Human Rights (Article 26), which refers to education as follows: "Everyone has the right to education. Education shall be free, at least in the elementary and fundamental stages." However, reporting on OER implementation in Spain and its impact, Gil-Jaurena emphasizes the importance of institutional support to OER content creation [6], whereas a UNSECO report by Schwille et al. [7] sets OER in the global perspective of improving educational policy and practice.

An important argument in favour of OER development is that, by means of OER, universities do not keep their knowledge locked, but rather make it visible to their fellow educators and researchers from other institutions. Consequently, duplication of research can be avoided, a new working environment can be created among colleagues and integrated into their current work. Beside this, freely available material can be edited and enhanced by colleagues, and thus better educational results can be reached, as opposed to each educator or researcher starting from the very beginning. Moreover, materials of this kind can contribute to the promotion of the educational institution and in this way attract more students. It has been noted that even some kind of rivalry appears between universities, when it comes to number and quality of OER content [8]. Companies, on the other hand, by offering their best practices freely, promote their brand and identity in the competitive entrepreneurial environment.

However, application and development of OER materials faces certain difficulties. Some of the issues are how to secure the quality of OER content, and how to sustain long-term interest for development of OER materials. Thus Koppi and Lavitt [9] state that one of the reasons for the lack of motivation among the teaching staff regarding OER development can be found in absence of institutional valuation. Hence they suggest that appropriate credits should be awarded for contribution to OER development.

Having in mind all the advantages of OER materials, as well as the need to make free educational content available, a number of Western Balkans and EU universities gathered around the idea of creating BAEKTEL project (Blending Academic and Entrepreneurial Knowledge in Technology Enhanced Learning). Universities from Serbia, Montenegro, Bosnia and Herzegovina, Italy, Slovenia and Romania are taking part in this project (www.baektel.eu - Figure 1). The aim of the project is to create OER materials in different areas which will create a connection between university knowledge (theoretical knowledge) and practical (applied) knowledge needed for working in the industry. To that end, educational materials in electronic form will be created, which will be publically available at no cost to the end user. In this task all advantages of information technologies will be used in order to present materials in a meaningful way, by satisfying basic pedagogical-didactic criteria.

Figure 1: BAEKTEL website

In the next section we give an overview of didactic criteria, applied in our approach. Section 3 outlines the main features of the software solution, followed by conclusions.

2. DIDACTIC CRITERIA APPLIED TO OER

Didactic criteria can be understood as principles which determine the flow of teaching and learning, in accordance with aims of upbringing, education and laws of the teaching process.

Observing the aim of the project to create and make available educational content in various teaching areas, and also in different industries, the approach had to enable creating and facilitating materials in different forms. Since teaching subjects can differ a lot, various ways of presenting the content should be possible. The majority of the materials will be in form of online courses, which will be developed in accordance with basic pedagogical-didactic demands. It has also been planned to enable hosting of already existing materials like textbooks, scripts, power point presentations, videos… In order to improve and make materials more interesting to the end users, various types of multimedia as video clips, audio recordings, animations and images will also be used. The idea is to make users active subjects in the process of learning [10], and with that in mind special attention will be given to establishing interactivity through different types of questions and quizzes.

When it comes to creating educational materials, one of the important didactic criteria is **adjusting content to its target group**. Since, the main subject of the project is OER related to higher educational institutions as well as partners from industry, the nature and the needs of the end users are hard to define. Hence, neither the level of education of the end users, nor their age or their motivation for using these means of education is easily predicable. That is why it is important to create courses in such a way that in each moment users are familiar with the aim, sum of knowledge and skills which can be obtained by a given course. To that end, it is necessary to provide a description of the course, as well as of the necessary prerequisites which the user must possess in order to follow the content of the course. With this in mind an indexing web portal with metadata of the OER content will be formed. The model of the metadata will be in compliance with the Dublin Core standard as well as IEEE 1484.12.1-2002 Learning Object Metadata Standard (LOM). In this way it is more likely that users who decide to use a specific content or take a specific course will meet the prerequisites and find the content useful, and thus be satisfied with the specific OER.

It is desirable to combine different ways of teaching content like plain and dynamic text, power point presentations, video clips and animations, etc. in order to adjust the educational content to various needs and learning styles of the end users. In addition to that, courses based on various types of materials can contribute a lot to keeping the educational materials dynamic, which can play an important role when it comes to keeping the end users motivated. Besides the important impact of these materials on increasing the motivation among users, various integrated audio-visual components should also help significantly in reaching a higher level of learning quality and better understanding of presented matter.

Beside the already explained didactic principles which referred to adapting the educational content to the end users, it is also important that educational materials satisfy the didactic **principle of systematization and gradualism in the teaching process**. This principle can partly be accomplished through structuring and organising

the course. It is desirable to create a clear structure of the course through which the user will gradually advance until the closure of the course. It is necessary that all segments which form the structure of the course be combined into a coherent whole. One of the ways to achieve that is to divide the course into sections, sections into units, units into lessons, where the lessons are formed by combining different textual and audio-visual components as depicted in Figure 2.
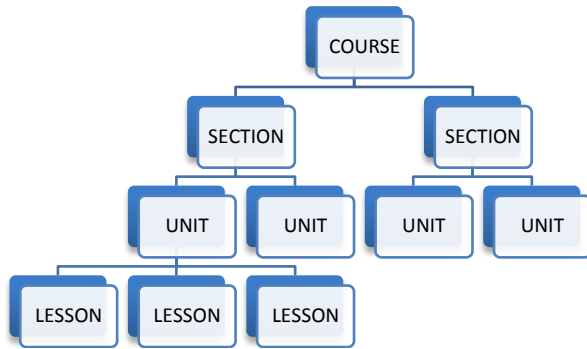

Figure 2: Course structuring

When it comes to the structure of a single lesson, it is recommendable to divide each lesson into three basic parts (Figure 3). In the introductory part of the lesson it is desirable to create motivational examples and tasks that will introduce the content of the lesson to the end user while awakening interest at the same time. The main part of the lesson follows, consisting of the largest part of the planned content, in accordance with the didactic principle of science, which will be elaborated below. Finally, the third part of the lesson should preferably contain a short resume as well as some kind of self-evaluation consisting of short questions and quizzes.

Figure 3: Structure of a lesson

As just mentioned above, the content of the OER materials should be based on the **didactic principle of science**. This principle refers to the orientation of the teaching content towards contemporary scientific development. Given the fact that it is not possible to consider and investigate every view, connection and relation, one of the important demands of the science principle in the teaching process is to make students familiar with the principal features and properties of a subject, as well as the connections and relations between subjects and phenomena. Hence, the idea is to create materials according to the principle of science, which of course implies reliability and verifiability of the given teaching materials.

Also, one of the important didactic principles is **connecting the theory and the practice**. The aim itself of BAEKTEL is in accordance with the mentioned

principle, since it is conceived as one of the means for cooperation and connecting the higher educational institutions with companies from the industry. The idea is for the higher education institutions to enrich, by means of these courses, theoretical knowledge with examples of practical application offered by companies. On the other hand, partner companies will use educational content offered by higher education institutions to enhance and renew the theoretical knowledge of their employees.

Finally, it is also necessary to attune OER materials to the didactic **principle of awareness within the teaching process**. The principle itself refers to effective participation of users in the process of learning, underlining their role as active subjects, as opposed to being passive bystanders in that process.[7] The idea is to enable the users to learn at their own pace, as well as to establish a specific interaction between users and the course creator, as well as interaction between users and the learning platform itself. This segment can be improved by combining many different types of questions according to the aims and the desired outcomes of the course, as well as meaningful animation and interactive applets which will demand direct user interaction.

Also, it is important to implement an evaluation system for OER content. The aim is to obtain user feedback on the quality of OER content, so that it can be constantly improved and further adapted to the end user. This can be achieved by using standard questionnaires as well as gathering and examining anonymous usage data generated by the learning platform.

3. SOFTWARE SOLUTION

Besides having high quality OER content, the way in which it is offered is extremely important for it to reach its full potential. The platform that hosts the content, besides making it easily accessible, acts as a medium that enables the users to interact with it, as well as with each other. Combined, high quality OER content, its users and the platform form a rich user experience. Another important aspect of publishing OER content is making it easily searchable. This way users are able to quickly find the content relevant to their specific needs or get an answer to a specific question.

After examining all of the available open source solutions, and taking into account everything mentioned earlier, it was decided that BAEKTEL platform should consist of two segments: an **indexing web portal** and a **learning platform**.

In order to make the OER content more accessible as well as more discoverable, it is important to provide the users with advanced search features. That is why all the OER content should be properly described with earlier mentioned metadata. For the **indexing web portal** we found that the digital asset management platform ResourceSpace (http://www.resourcespace.org/) offers powerful features for managing metadata of OER content. It is also easily expandable to include advanced search capabilities, so the users are going to be able to search for

desired OER content not only by keywords, author, area, etc… but also by multilingual technical terms. For the search features to function properly, it is important that all required metadata about the OER content are provided.

As mentioned earlier, for a richer user experience, it was important to use the most interactive and the most user friendly learning platform. After examining the most popular learning platforms, we found that edX platform (http://code.edx.org/) created by MIT offers by far the richest and most interactive user experience, compared to the other two most popular open source learning platforms (OpenMOOC and Moodle). Hence a network of edX nodes spread throughout partner countries, together with the ResourceSpace platform form the core of the BAEKTEL framework, as depicted in Figure 4.

Figure 4: Distribution of BAEKTEL resources

After declaring it open source, edX started to gain rapidly in its popularity. Thanks to its modular design and fast growing community, through the use of third party plugins (software extensions that can be installed on top of the core framework to add new functionalities), new features (such as discussion board, equation editor, code execution simulators, etc.) are being added constantly. With its modern design and simple user interface (Figure 5), edX is easy to learn and simple to use both by content creators and content users. Its backend control panel for authors (edX Studio) makes it easy to combine different types of media and create a course structure that fulfils the previously mentioned didactic principle of systematization and gradualism. It is also possible to create interactive tests, implement self-evaluation and track the progress of users.
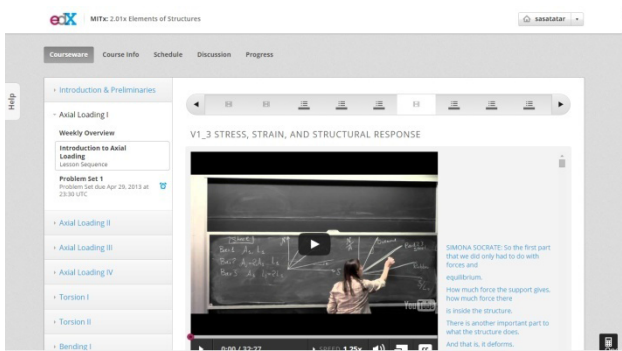

Figure 5: Illustration of an edX course

User feedback together with usage data generated through engaging in the content and interaction with other users offer an invaluable insight on how we learn best and how to further improve the content itself as well as the sheer process of teaching.

4. CONCLUSION

Thanks to rapid technology development the concept of lifelong learning and continuous self-improvement have become crucial in creating well educated and globally competitive work force. It is clear that OER and technology enhanced learning (TEL) will have a huge impact on the way we learn as well as the way we teach.

Our intent is that BAEKTEL plays a significant role in spreading the use of OER and open online courses in WB countries, especially considering that the native languages used there do not belong to the group of "big languages", which makes the impact of existing OER much smaller.

Given that the use of OER is formally not yet recognized in WB countries, our hope is that BAEKTEL will also help form a framework that will foster the development and active use of OER and open online courses at the higher educational institutions.

Other than promoting the use of OER, it is also important to ensure that the created content is of high quality, which is in part to be achieved by imposing the outlined didactic principles.

Finally, by implementing and promoting the use of modern learning platforms such as edX, BAEKTEL should help raise the quality of education, while at the same time, by analysing the usage data, improve the process of teaching in general.

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the academia and the enterprise. It thus contributes to the important task of preparing university students for their future jobs, but also enables them to improve their academic knowledge after graduating, by offering them a live-long learning opportunity.

Given the vast variety of content and the expected growth of the number of resources, as well as different profiles of potential users, indexing of resources that enables their efficient location within the network became a critical issue. To that end a metadata vocabulary and data structure syntax based on DC and LOMwere implemented withinResourceSpace,to offer a flexible and robust mechanism for indexing OER content and enabling the user to easily locate the resources of interest.

However, a lot of work still needs to be done before BAEKTEL enters full exploitation to the benefit of future and current university students, as well as university graduates working in enterprises. Namely, the populationof the network with resources is now crucial for bringing the BAEKTEL into full function, thus providing usability to the features outlined in this paper.

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