Open Educational Resources in Serbia

Ivan Obradović, Ranka Stanković, Marija Blagojević, Danijela Milošević

Дигитални репозиторијум Рударско-геолошког факултета Универзитета у Београду

[ДР РГФ]

Chapter # - will be assigend by editors

OPEN EDUCATIONAL RESOURCES IN SERBIA

AUTHOR(s) - Ivan Obradović, Ranka Stanković, Marija Blagojević, Danijela Milošević

Abstract: This chapter provides a review of open educational resources in Serbia. It covers different aspects of open educational resources: policy, resources, licenses, curriculum and teaching methodology, outcome, stakeholders and impact. All mentioned aspects give an overview of the current state of open educational resources development and implementation in Serbia. Analysis of the results show an affirmative direction of open educational resources implementation in Serbia and future possibilities.

Key words: Open educational resources, BAEKTEL, metadata portal

1.   CASE OVERVIEW

The educational system in Serbia, in accordance with the Law on the Basis of the Education System (Official Gazette of RS, No. 68/2015), comprises the following levels:
1.Pre-school education and upbringing;
2.Primary education and upbringing;
3.Secondary education;
4.Tertiary education.

These levels of education are carried out in:
Preschool institutions (up to 7 years of age);
Primary schools:
   a)   Regular primary schools,
   b)   Primary schools for the adult education,
   c)   Primary music or ballet schools and

    d) Primary schools for students with developmental disorders;

Secondary schools:

    a) Gymnasiums (general and specialized),

    b) Secondary vocational schools (SVS),

    c) Mixed or combined schools (gymnasiums and vocational or art schools),

    d) Art schools,

    e) Secondary schools for the adult education and

    f) Secondary schools for students with developmental disorders or disabilities;

Tertiary education institutions:

    a) Universities,

    b) Faculties and art academies within universities,

    c) Academies of Professional Studies,

    d) Colleges and

    e) The Colleges of Professional Studies.

Educational institutions were until recently predominantly public, that is, state-owned, but the number of private educational institutions at all levels is rapidly growing, especially at the pre-school and tertiary level. Primary education in Serbia is mandatory and available for free of charge in public elementary schools. Secondary and tertiary education is free in public schools and universities (although for a limited number of students), but it is not mandatory. All citizens have access to higher education under equal conditions (Papic et al, 2016)

According to the Statistical Office of the Republic of Serbia /http://www.stat.gov.rs/en-US), in 2019, there were 445 (162 public and 283 private) pre-school institutions with 218,567 children enrolled. According to the same source, at the beginning of the school year 2018/19, there were 3319 regular elementary schools with a total of 527,834 students, 506 secondary schools (454 public and 52 private), attended by 252,108 students, and 41 public schools/departments for students with disabilities, attended by 1993 students. As for the tertiary education, 27,801 students were enrolled in the first year of study at 7 accredited public universities, 6,728 at accredited private universities, 10,239 at public high schools and 1,582 at private high schools.

2. CURRENT SITUATION OF OER

The infrastructure related to OERs in Serbia is comprised of several portals, offering possibilities for publishing OERs and featuring various types of OERs. This section offers a review of these portals.

2.1 Infrastructure

The BAEKTEL portal

The BAEKTEL portal for indexing of OER and other supporting TEL content including audio, video and written text materials, published by partners involved in the Tempus BAEKTEL (Blending Academic and Entrepreneurial Knowledge in Technology Enhanced Learning), provides searching capabilities for any type of published content. It includes:
- BAEKTEL Metadata Portal (BMP) with metadata for all published OER within BAEKTEL network.
- Terminological web application for management, browse and search of terminological resources.
- Web services for linguistic support (query expansion, information retrieval, OER indexing, etc)
- Annotation of selected resources
- OER repository on local edX platform.

The BAEKTEL OER framework supports publishing of resources of partners in BAEKTEL project (baektel.eu) institutions, but can also integrate OERs that are not created by partner institutions, regardless of the place where they are stored. Those resources only have to be registered and described in the central metadata repository.

The aim of the BAEKTEL Metadata Portal is to provide structured access to information on open education resources within the BAEKTEL network.
To OER creators, the Portal provides OER metadata management, and to learners, metadata search and direct access to learning resources, such as courses, training materials, guidelines, case studies, best practices etc. available in any media, which can support education.

The BAEKTEL metadata platform development is based on the open source Digital Asset Management (DAM) system ResourceSpace, relying on PHP backend, MySQL database and the GD Graphics Library (http://www.resourcespace.org/)

The Platform provides intelligent search ordering by scoring resources against keywords on the basis of user search activity, preselected groups of resources, resource access level permissions by user group, multilinguality, allowing the user to change the language, with most major languages supported, automatic thumbnail creation for resources, multiple file upload, possibility for geolocation search, adaptation of metadata.

The main purpose of the metadata portal is to describe courses created on edX (edx.baektel.eu) portal. Except courses, different downloadable resources, in different formats, can be uploaded and described. On the other side, this portal helps users to find resources of interest, and it provides easy access to courses. There are three different user roles on site:

> 1. Administrator – creates accounts, controls resource upload, manages the portal
> 2. Teacher – describes course created on edx portal
> 3. Learner – search described courses and download uploaded resources

The upload of resources and description of either uploaded resources or other courses on the Portal is enabled only for authorised users with teacher role, so those users must have an account. Only users with accounts can use the Portal as teachers.

A metadata schema was designed that consists of data elements drawn from existing standards for metadata creation, which enables description and sharing of learning in a common way and, therefore, allowing increasing accessibility of the resources from other OER portals.

The metadata model was defined based on DC (Dublin Core) and with the addition of some elements from LOM (Learning Object Metadata). The selected metadata set is designed to describe the resources sufficiently well for the user to be able to locate and access them easily and to facilitate exchange with other OER systems (see Figure 1).
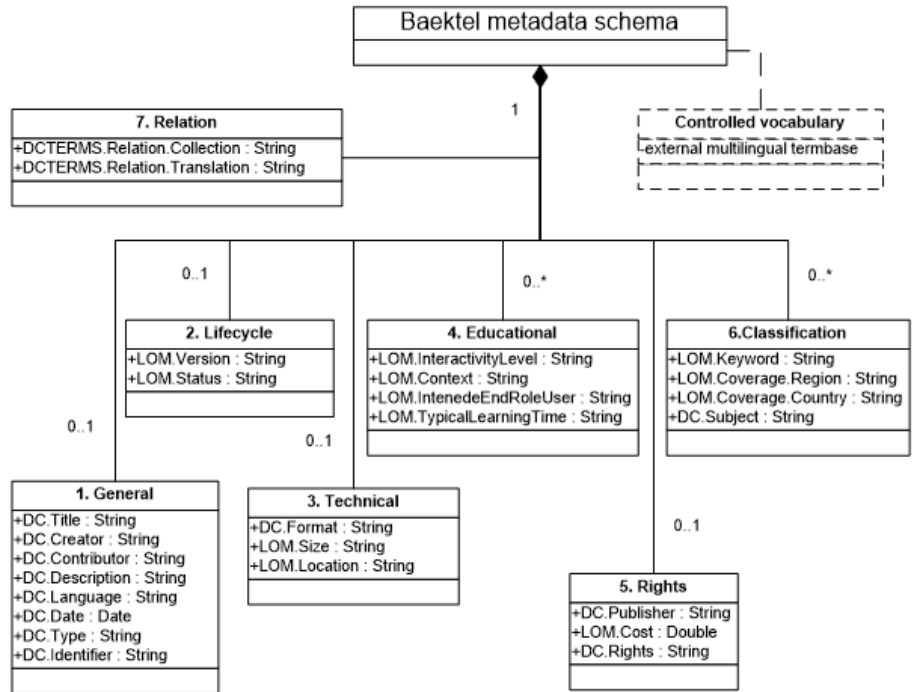
Figure 1. BAEKTEL metadata scheme

Petlja

The Petlja Foundation [1] was founded with the aim of improving algorithmic literacy in Serbia through OERs. It includes the portal with learning materials for programming and Takprog, an official website with materials from competitions of secondary school students in Serbia in programming .

The BubbleBee Portal was developed by a group of professionals from the Microsoft Development Center in Serbia, Mathematical and Computer Gymnasium, other schools, the Society of Mathematicians of Serbia and the Petnica Research Station. Materials on the BubbleBee portal are freely available, designed for the widest population and approach programming in a simple and interactive way.

[1] https://petlja.org/

Takprog was developed by members of the High School Commission for Programming Competitions of the Society of Mathematicians of Serbia and represents infrastructural support for the maintenance of programming competitions in secondary schools. Now the common infrastructure[2] basis is used for primary and secondary school competitions, as well as for BubbleCup.

OER Serbia

OER Serbia is the portal of the Open Education Initiative, founded by a group of university teachers, and intended for all those who work in education and share the view that knowledge is a common good and that it should be available for everyone (http://oer.rs/)

The portal is developed as a WordPress platform with metadata about resources, links and containing different regulations and various types of information about open education resources.

The aim of the portal of the Open Education Initiative is to contribute to the inclusion of Serbia's educational space in European and global trends in open education. Several university teachers have already made their learning materials freely available on this portal.

Bearing in mind the proximity of the languages used in the Western Balkans region, most of the educational materials that become available through this portal will be able to be used not only within the educational system of Serbia, but also within the educational systems of the region.

---

[2] https://takprog.petlja.org/

Khan Academy Serbia

Khan Academy Serbia[3] has started the translation of Khan Academy instructional videos in 2013, providing interactive exercises, instruction manuals and a personalized learning dashboard that empowers students to learn at their own pace, but also outside the classroom. They are tackling mathematics and computer programming, primarily, while for other languages also history, art history, economics and others are available. Their mission in mathematics encourages children from kindergarten to tackle mathematical analysis with the most up-to-date adaptive technology that recognizes their advantages and shortcomings in knowledge.

Napon

A significant number of scientific research institutions in Serbia recognized the need to make the results of their research more visible and accessible through different types of repositories and digital archives. The National Open Science Portal - NAPON[4] (Nacionalni Portal Otvorene Nauke) is being implemented within the Erasmus+ project BEOPEN as the future hub of open science in Serbia. As research papers can often serve as educational resources this resource is also considered as part of the OER infrastructure. The portal will consolidate catalogs of scientific production of Serbian universities and place them on researchers, competent authorities, industry and society as a whole. Most repositories are based on the free DSpace platform, but there are also examples of self-developed repositories for the specific needs of the institution. Portal map presents links to the currently active repositories in Serbia that meet the requirements related to the standards of machine readability. Adopted institutional policies of open science and institutions that have adopted institutional policies are listed. Guidelines, dictionaries and various types of methodologies related to open science and open data are briefly published.

Among repositories that are registered we the following should be highlighted: National Repository of Doctoral Dissertations (http://nardus.mpn.gov.rs/), SCIndeks - Serbian citation index, Repository of newspaper articles with DOI number, http://www.beopen.uns.ac.rs etc.

[3] https://sr.khanacademy.org/
[4] http://www.open.ac.rs/

Wikimedia Serbia

Wikimedia Serbia was founded in 2005 with the aim to allow free exchange of knowledge and participation in gathering educational content. Within thei educational program, they produce content in cooperation with schools and faculties, organize Edu Wiki Camp, Wiki Librarian, Digitization of techno culture.

Wikipedia is located on the Wikimedia Foundation's servers, which also manages a number of other projects, from which we distinguish: Wiktionary - Dictionary and thesaurus, Wikibooks - Free textbooks and manuals, Wikispecies - Directory of species, Wikiversity - Free learning materials and activities.

2.2 Policy

Educational policy documents in Serbia scarcely refer to openness in education. OERs are explicitly mentioned only in the Law on Foundations of Educational System, which regulates the preschool, primary and secondary education. Namely, in Article 46a of this Law, a Center for Educational Technology is envisaged within the Institute for Education Quality and Evaluation. With the competence of this Center, Item 4 stipulates that it "provides professional support, develops a methodology and instruments for the development of digital education content, open educational resources and software solutions". However, such a Center has so far not been established.

While this Law that regulates lower levels of education at least recognizes OERs, there is no mention of them in the Law on Higher Education, although there are some references to openness and harmonization with the European educational space. Namely, among the goals of higher education, Article 3, Item 7, states "improvement of the international openness of the higher education system". Article 4, which outlines the principles on which higher education is based, in Item 5 stipulates "openness towards general public and all citizens" and in Item 8 "harmonization with the European system of higher education and enhancement of academic mobility of teaching and non-teaching staff and students". Finally, Article 32 stipulates that the "competent Ministry takes care of the harmonization of the educational system in the Republic with the trends of educational development in Europe".

Other regulations related to education open the possibilities for the development of OERs but need further improvement at the national and institutional level in compliance with OER regulations in Europe.

The Education Development Strategy in Serbia up to 2020, adopted by the Government of Serbia in 2012, criticizes traditional tendencies of the

education system for independence from other systems and promotes its openness. It specifically targets openness and accessibility of higher education and provides opportunities for legal regulations for the realization of ideas related to OERs, although it does not mention them explicitly.

Yet another strategic document, the Information Society Development Strategy in Serbia up to 2020, adopted by the Government of Serbia in 2010, fosters application of information technology in education. It emphasizes the development of digital educational content as one of the main goals to be achieved and refers to the introduction of modern concepts of e-learning and open distance learning. However, OERs are not recognized by this document, either.

Given the close relation between Open Access and OERs, given that research results can often serve as educational resources, especially at the level of higher education, it is worth mentioning that the Ministry of Education, Science and Technological Development of the Republic of Serbia adopted an Open Science Platform (http://www.open.ac.rs/). The platform is intended for all participants in scientific and research activities in Serbia, and pertains to the results of research projects and programs financed in whole or in part from the budget of the Republic of Serbia.

2.3   Open license

Open licenses in Serbia are supported and promoted primarily by Creative Commons Serbia (CC-RS), the national Creative Commons (CC) project launched in 2006 with the aim of harmonizing CC licenses with the Serbian language and legislation, promoting open licenses, and providing information on these important instruments for the exchange of creative content (http://creativecommons.org.rs/). National CC standards allow authors and other right holders in Serbia to retain the rights to their work they publish, while at the same time allowing others to use this work under flexible and standardized conditions: "authorship", "non-commercial", "without processing" and "share under the same conditions". Serbian national CC licenses are internationally recognized, according to all rules of the international legal procedure, in 2007, when they officially became an integral part of the CC licensing system. Thus, the validity of national licenses throughout the world has been ensured, and authors and right holders from Serbia have been provided with free licensing of published work under appropriate pre-selected conditions.

Creative Commons Serbia is a project officially initiated by the Wikimedia Association of Serbia, an independent non-governmental, non-partisan and

non-profit association, founded with the aim of developing free knowledge. Wikimedia Association of Serbia is the official national partner of the Wikimedia Foundation and an institutional member of Creative Commons Global Network.

Creative Commons Serbia aims at achieving the highest level of exchange of creativity and knowledge in Serbia, in accordance with international and national standards and introducing CC licenses into the national legal system. Creative Commons Serbia is being supported and promoted by a group of individuals comprised of scientific researchers, architects, curators, journalists and artists, as well as several institutions, such as the Section of librarians of the Association of Institutes of Serbia, Section of museum librarians of the Association of Museums of Serbia, Youth Center Belgrade, Bureau for Culture and Communication Belgrade, Center for New Media Novi Sad, Independent Journalists Association of Serbia, and the Free Software Network.

It also closely cooperates with the Serbian Academy of Sciences and Arts (SASA institutes, library and gallery, and the Library of the SASA Institute of Technical Sciences), Matica srpska, the oldest cultural-scientific institution of Serbia (MS gallery in Novi Sad), University of Belgrade (Faculty of Mathematics, Faculty of Chemistry, Faculty of Physics, Faculty of Philosophy, University Library "Svetozar Marković" - Department of Scientific Information, University Computer Center), University of Niš (Faculty of Natural Sciences and Mathematics, Teacher's College, University Library "Nikola Tesla"), University of Kragujevac (University Library, Faculty of Philology and Arts), Archaeological Institute Belgrade, National Library of Serbia (Department of Scientific Information, Department of Protection, Conservation and Restoration), Central Institute for Conservation, Library of the Belgrade Polytechnic, Media Center Belgrade, as well as a number of other libraries, museums, galleries, archives, and professional associations.

Although a lot has been done in promoting open licenses, they have not yet been widely accepted by Serbian teachers at all levels of education. One of the problems lies in the fact that educational institutions, in general, still fail to fully recognize the value of open education, and hence do not encourage their teaching staff to use open licenses.

2.4   Resources

On the **BAEKTEL portal** there are currently 78 items indexed, classified by type as: Lessons (24), Exercises (21), Best Practices and case studies (17), Portal (11), Guidelines and other (5). Detailed statistics by target group is

presented in Figure 2, and can be outlined as follows: Students (29), Learners (20), Employes and others (16), Unclassified (13).

Employees, Students	4
Learner	16
Learner, Employees, Students	2
Learner, Manager, Employees, Students	1
Learner, Students	4
Learner, Teacher, Manager, Employees, Students	4
Learner, Teacher, Students	2
Manager,Employees,Students	1
Manager,Supervisor,Employees,Students	1
Students	29
Teacher	1
(blank)	13

Figure 2. Classification of BAEKTEL portal content by type

Topics of content (titles and keywords) are visualised by a word cloud in Figure 3. It can be seen that computer science, modeling and language technologies are dominant.

Figure 3. Word cloud of Baektel portal content subjects

OERs are mostly developed as MOOCs using eDX, 18 of them with video content, 34 classified as courses and 18 as documents, mostly presentations (html and ppt) and pdf documents.

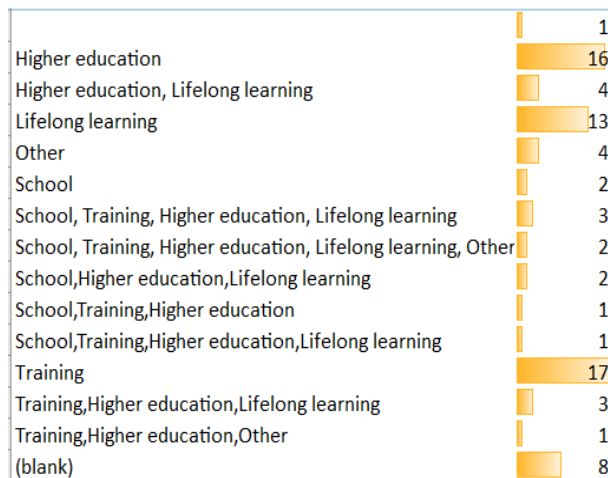The educational level the OERs are aimed for is presented in Figure 4.

	1
Higher education	16
Higher education, Lifelong learning	4
Lifelong learning	13
Other	4
School	2
School, Training, Higher education, Lifelong learning	3
School, Training, Higher education, Lifelong learning, Other	2
School,Higher education,Lifelong learning	2
School,Training,Higher education	1
School,Training,Higher education,Lifelong learning	1
Training	17
Training,Higher education,Lifelong learning	3
Training,Higher education,Other	1
(blank)	8

Figure 4. The educational level the OERs are aimed for

Petlja portal hosts various materials dedicated to learning of programming, mostly python, in primary school. Video lectures are on youtube, classified by school grade. For Grade 6 there are 4 video collection with a total of 28 videos. There is also a collection of 16 Jupyter notebooks

for python, Interactive manuals for Python and C#, Graphics programming using Pygame, Collection of algorithmic tasks, and the like.

The Open Education Initiative Portal features 14 OERs selected from other portals, that are evaluated as good quality and might be interesting for a wider audience. Apart from several OERs related to programming and web design, it includes learning materials on Social Networks analysis, GIS application in geology, Lexical Analysis in Natural Language Processing, Security in IT etc.

Khan Academy published mathematics and IT OERs generally for young children. Mathematics OERs are related to Early mathematics, Kindergarten, Arithmetic, followed by Introduction to algebra, Basics of algebra, Algebra I, Basics of geometry. As to materials related to Computer Science and Information technology, they joined the Popular Hour of programming within the Global Movement of Education Week in Computer Science and Code.org. Namely, within a one-hour introduction to computer science and programming small OERs are published.

Portal Napon, as an aggregator for open science repositories in Serbia, integrates at the moment 29 repositories with scientific research papers, reports and data collections.

2.5   Curriculum and teaching methodology

Regarding curriculum and teaching methodology in Serbia there are two approaches to OER initiative. Some teachers create and publish individual OERs while others develop MOOCs (Massive open online courses). Although there is a high degree of similarity between individual OERs and MOOCs, there are also significant differences. The first difference is (non) variability: one of the main features of the OERs is that they can be changed and combined independently of their authors, while a MOOC do not change, except possibly periodically, by their authors. The second difference is coverage: OORs offer individual teaching materials, and less often curriculum units and courses, while MOOC complete courses with supporting materials. The third difference is the author's' participation: the OOR concept does not provide for the active participation of their authors in their use. The authors place their materials on the Internet for free use, but after that they do not commit to their further maintenance or modification. On the other hand, MOOC includes the

active participation of the institution that published them and interact with MOOC users. The last important difference is availability. Unlike the OOR, which are available at any time, MOOC has a start and end date, with a schedule to be followed, including tests and quizzes, as well as evaluations at the end of the course."

The most common MOOC platform in Serbia is edX. Possibilities of Moodle MOOC and edX were compared by Blagojevic and Milosevic (2014) . This paper describes MOOC platforms as places where huge number of courses exist in different areas. Most well-known universities use EdX platform with possibility of obtaining the certificate. Both mentioned MOOC platforms (edX and Moodle MOOC) provide possibilities of consultation with the teacher, evaluating the acquired knowledge and all learning materials at one place.

Table 1 gives well known platforms in Serbia for OER according learner/teacher could examine curriculum and teaching methodology.

Table 1. OER well known platforms in Serbia

	Name of platform	Address
1.	Open educational resources	http://oer.rs/resursi/
2.	Khan academy Serbia	https://www.youtube.com/user/KhanAcademySerbian
3.	Baektel platform	http://edx.baektel.eu/
4.	Petlja	https://petlja.org/

While analyzing given platforms we can conclude that most of them use existing solutions (like Youtube and edX) and smaller number develop their own solutions. Curriculum is usually mapped from blending learning with additional possibilities of OER and MOOC. Teaching methodology is related to specific teaching style of teachers who use OER. It is usually based on specific target group, goals and teaching materials.

According to Espana-Villegas and Caeiro-Rodriguez (2018) confirm that OER include all types of educational content (complete courses (educational programs), course materials, content modules, learning objects, textbooks, multimedia materials (text, sound, video, images, animations), exams, compilations, periodicals magazines), etc. Same authors define OERs as a

"generic denominator that includes courses and curricula", beside other mentioned educational content.

Stefanovic and Milosevic (2016) suggest a holistic approach for the design of open learning software environment and conclude that in the OER field there is a need for specific methodology.

Zancanaro (2015) conclude that collaborative learning and collaborative production is most dominant in OER implementation. Also, the same author provide activities in methodology of OER production which include adaptation of OER, digitalization of materials, defining models and frameworks, repository implementation, surveys of the OER perception, experiences.

For successful OER implementation it is not enough to create excellent OER pedagogical materials. The curricula and teaching methodology which include OER should be carefully planned. According to Kaufman and Campana (2019) teachers could even use "an old technology" like printed course, but in an appropriate way it could be successfully adopted to teaching needs in the same level as electronic educational materials.

2.6   Outcome

Implementation of OER in Serbia already produced some valuable outcomes, which affect several target groups. A very important outcome is partnership in developing, implementing and using OERs. Within the BAEKTEL project educational institutions in Serbia cooperated with several partners from regional and EU educational institutions and industry in order to develop quality OERs. This partnership gave a successful example for further cooperation in the OER domain. Sharing and reuse of OER could also be a measure of outcome. As Serbia is a country with few years' experience in OER implementation, some BAEKTEL OERs were reused from partner institutions in other countries.

The outcome of OER initiative in Serbia is visible in several aspects:

-Teachers develop skills for developing, publishing and applying OERs and MOOCs in the teaching process

With development of OER initiative in Serbia teachers developed knowledge and skills related to OERs. They introduced OERs in the teaching process, as a new way of knowledge transfer with a positive effect on students and other teachers, but also other interested individuals. Through the developing and

publishing process teachers also learn about licensing and possibilities in sharing and applying OER.

-Learners are able to use OER in education or lifelong learning

Beside traditional teaching/learning process in Serbia, blended learning is also very common. In this kind of learning teachers usually use some of learning management systems in addition to traditional teaching. In recent times, OERs and MOOCs became more popular. Learners can use meta-portals for searching adequate OERs and after that improve their skills and competencies through OERs within the chosen platform.

-OER initiative becomes more recognized in Serbia

Thanks to many enthusiastic individuals and groups and also through implemented projects OER initiative in Serbia is very active. Platforms with metadata and also with OER are established and the number of teachers and learners who use them is growing. The next step of OER initiative in Serbia is OER recognition in official university regulative.

Quantitative outcome could be given according to metadata portals in Serbia:

meta.baektel.eu: 78 open educational resources. OERs on the platform are developed by universities and industry partners and they are all used by interested individuals.

Some of open educational resources (14) are published under http://oer.rs/resursi/

The outcome could be presented as part of logical model provided by the William and Flora Hewlett foundation (Figure 5).
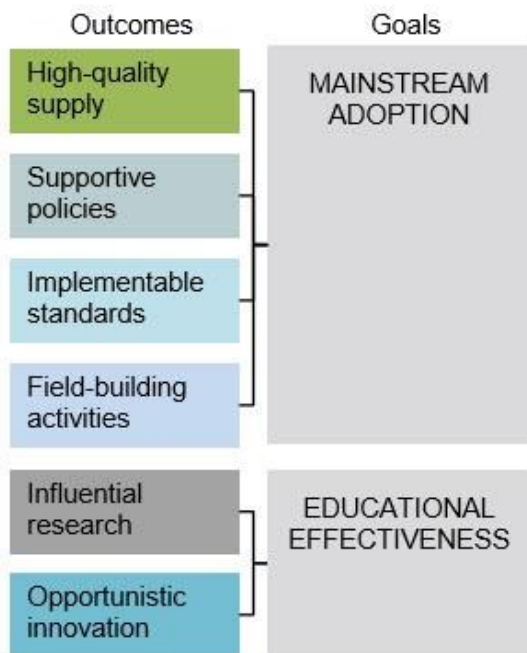
Figure 5. Outcomes and goals (William and Flora Hewlett foundation)

All mentioned outcomes are necessary for achieving two main goals: mainstream adoption and educational effectiveness.

2.7 Stakeholders

While more and more authors in Serbia develop open educational resources, the level of awareness and involvement of stakeholders in the use and adaptation of OERs is not at a high level. There are many benefits from OERs in educational institutions, for students and teachers. Both groups are aware of the significant potential for improving their knowledge and skills while developing or using OERs.

Teachers usually develop OERs bearing in mind a specific target group. But, an OER is always "open", so the content finds another interested target group beside the initially planned. This kind of OERs for specific target groups are sometimes inadequate or not well pedagogically adjusted to all stakeholders. In order to make the developed OER adequate to wider community the process

of OER development should be well planned and done in collaboration with industry, wider community and some specific subjects who are interested in using the resources.

In Serbia the same stakeholder groups are recognized as in McGill (2008):

- The global community

- The national community

- Educational Institutions

- Subject communities (including employers and professional bodies)

- Individuals supporting learning and teaching

- Learners

Global community is recognized in Serbia as the starting point for developing and publishing OERs as a good pool of best practice examples. With raise of OER in Serbia the global community has become a stakeholder for created OERs.

National community is organized through the well-known initiatives like Serbia's Open Education Initiative (oer.rs). The Initiative provides a platform for open educational resources, which could be interesting for different stakeholders. OERs are developed in Serbian language and their content covers different fields. The main goal is to allow teachers to offer their teaching materials at all levels of education to their colleagues, students and students for free use, reuse, processing, combination and further distribution, with open licenses.

Educational institutions are currently the main stakeholder in Serbia for open educational resources. At the same time, educational institutions are mainly OER developers. Students and teachers develop and use the resources in order to increase knowledge and skills. The most common platform in Serbia are: meta.baektel.eu, oer.rs, https://petlja.org/...

Subject communities in Serbia are mostly related to industry companies, which are strongly connected to educational institutions and collaborate with teachers and/or students. In analyzing the current OERs in the aforementioned platforms, it could be noticed that the petroleum company NIS Company (nis.eu) took part in developing OERs in order to connect industry with educational institutions and provide blending learning. Also, OER development is recognized at University level. At most Universities in Serbia groups for open science are formed. Almost all PhD thesis from 2016 and

some of earlier thesis are available through an open platform under one of Creative Commons licenses. Also, Universities in Serbia have an open platform for scientific work of researchers.

Individuals supporting learning and teaching

Regarding individual support of open learning and teaching in Serbia, it is still based on the enthusiasm of teachers and students. In recent times the concept of OER has been recognized as a very important part of teaching process through many initiatives, working groups…

Learners

Learners as initial target group for OER give valuable feedback about OER quality and improvement of current state. Also, former students as current employees in industry are new creators of OERs that affect blending learning based on cooperation between academic and entrepreneurial institutions.

2.8   Impact

There are many efforts in Serbia to broaden the impact of OER initiatives. Number of OER increases rapidly, but users still belong to a group of enthusiasts or well-educated self-learners. OER impact could be also analyzed according to given stakeholders groups given in section 2.7.

OER impact on global community is related to file sharing, reuse and appropriate licensing of materials. Serbian educational institutions and also industry subjects made a big effort to develop and use OERs in order to provide new skills and knowledge. Within the BAEKTEL project (baketel.eu) they provided a platform with metadata of published OERs, which gives the possibility for searching and indexing all Serbian OERs within the global community. Also, some of the created OERs are translated into English, so that they might have produced an impact on users abroad.

OER impact on national community in Serbia is still in progress. OER initiative (oer.rs) with realized projects and enthusiastic teachers and students gives an excellent base for further development of OER and their effect on teaching and learning process. National community includes educational and industry institutions and also users which collaborate in order to improve OER development and sharing. Many implemented projects related to OER gave valuable results to Serbian community. Students and interested individuals are

able to practice lifelong learning with open educational resources, and teachers can improve their own experience in developing open materials.

OER impact on educational institutions is obvious in every university in Serbia. Also, many schools are included in the process of developing OERs. BAEKTEL project gave valuable results related to a platform for metadata and OER publishing. Interested educational institutions can develop their own platform or use the existing one. The next step at university level is recognizing the process of developing and publishing OERs in rulebooks for promoting university professors.

OER impact on subject communities is related to opening and sharing their own knowledge and skills through OER publishing. Employees could develop the skills that improve their presentation as authors and promotes their institution. In Serbia, subject communities in the process of developing and publishing OERs usually cooperate with higher education institutions. In the process of collaboration, teachers and students have the possibility to get insight into the industry process, while the company gets scientific knowledge from educational institutions and state of the art information in the domain field.

OER impact on individuals supporting learning and teaching in Serbia is related to knowledge and skills of individuals in the domain of creating and publishing OER and learning through OER. Individuals who create OERs usually learn some new methodology in the process (for example creating MOOC courses) and get skills related to licensing of materials.

OER impact on learners

Learners improve learning skills through open educational resources and new technology that support OERs (MOOC courses, for example). Also, learners in Serbia use the portal with metadata for searching OERs (meta.baektel.eu).

3. DISCUSSION AND CONCLUSION

The most important reason for harnessing OER is the fact that openly licensed educational resources have an exceptional potential to contribute to the improvement of the quality and effectiveness of education. Apart from responding to the demand for access to ICT infrastructure, educational institutions are also required to improve the teaching and learning environment (development and enhancement of curricula, programme and course design, planning of contact hours, elaboration of quality teaching and

learning materials, effective assessment) while managing the associated costs through increased use of resource-based learning (Butcher, 2011). The transformative educational potential of OER revolves around three related prospects which are applicable in Serbia:

1. Increasing the availability of high quality, relevant learning resources can contribute to more productive learners and educators. Since OER eliminates all restrictions regarding copying resources, it can decrease the cost of accessing educational materials. In many systems, royalty payments for textbooks and other educational materials represent a substantial proportion of the overall cost, while procedures of obtaining permission to use copyrighted material can also be very time-consuming and expensive

2. One of many mechanisms for creating roles for students as active participants in educational processes is provided by the principle of allowing adaptation of materials. Students learn best not by merely passively reading and absorbing, but by doing and creating. Content licences that encourage students' activity and creation through the reuse and adaptation of that content can make an important contribution to creating a more effective learning environment (Butcher, 2011).

3. OER has the potential to build capacity by providing institutions and educators with access, at low or no cost, to resources they need in order to advance their skills in producing teaching and learning materials, as well as by implementing the necessary instructional design to allow for an integration of such materials into high quality programmes of learning (Butcher, 2011).

Deliberate openness therefore acknowledges that:

• Investment in creating effective educational environments is crucial for good education.

• The key to a productive system is to build on common intellectual capital, rather than reproducing similar efforts.

• All things being equal, collaboration will increase the quality.

• Since education is a contextualized practice, it is vital to make adaptations of materials imported from different settings easy (where this is required), which should be encouraged rather than restricted (Butcher, 2011).

OER initiatives and open licenses options provide many benefits for educational institutions, individuals and commercial organizations (Falconer, 2013). These benefits are recognized in Serbia also:

• Offer a vast variety of freely available resources for both learners and teachers.

• Do not limit the ways of adapting and re-using these resources to suit the user's context.

• Let teachers and learners see a range of alternative methods for extending and enriching the curriculum.
• Encourage the practice of sharing, improving the quality and lowering the cost of curriculum development.

Provided information in the previous subsections gives full rights to conclude in several affirmative directions, regarding OER in Serbia:
• Outcomes regarding initiatives and number of OER and also teachers/learners included in open education gives the opportunity for further successful OER development and implementation
• Licenses for open education are introduced and supported but need additional activities to be widely adopted
• Impact on stakeholder groups are evident and future OER implementation will give bigger impact on every group.

REFERENCES

Blagojevic, M., & Milosevic, D. (2014*). Massive open online courses: EdX vs Moodle MOOC*, 5th international Conference on Information Society and technology, Kopaonik, 8-11 March 2015. pp. 346-351.

Butcher, N. 2011. *A Basic Guide to Open Educational Resources (OER)*. Available from: <http://www.oerafrica.org/resource/basic-guide-open-educational-resources-oer>.

España Villegas, C.B., & Caeiro Rodriguez, M. (2018). *Open Education with OER (OPEN EDUCATIONAL RESOURCES) Ecosystem*, OE Global Conference.

Falconer, I., McGill L., Littlejohn A., Boursinou E. (2013*). Overview and Analysis of Practices with Open Educational Resources in Adult Education in Europe*. Available from: <http://ftp.jrc.es/EURdoc/JRC85471.pdf>.

Kaufman, R., & Campana, A. (2019). *OER: lessons from the field, UKSG Insights*, 32 (1): 15. DOI: http://doi.org/10.1629/uksg.464

Obradović, I., Stanković, R., Prodanović, J., & Kitanović, O. (2013*). A Tel Platform Blending Academic and Entrepreneurial Knowledge*. Proceedings of The Fourth International Conference on e-Learning (eLearning-2013), Belgrade, Serbia.

Stanković, R., Obradović, I., Kitanović, O., & Kolonja, L. (2012). *Building Terminological Resources in an e-Learning Environment*. Proceedings of The Fourth International Conference on e-Learning (eLearning-2012), Belgrade, Serbia, 2012, (pp. 114-119).

Stanković, R., Obradović, I., Kitanović, O., Prodanović, J., & Ilić, V. (2011). *An approach to implementation of blended learning in a university setting*. Proceedings of the Second International Conference on e-Learning, eLearning 2011 , 61-66.

Stefanovic N., & Milosevic D. (2017) Innovative OER Model for Technology-Enhanced Academic and Entrepreneurial Learning. In: Jemni M., Kinshuk, Khribi M. (eds) *Open Education: from OERs to MOOCs*. Lecture Notes in Educational Technology. Springer, Berlin, Heidelberg

Papić, M., Papić, Ž., Kuzmanović, B., & Aleksić, V. (2016). *Educational system in Serbia, Management and education*, VOL.XII(3) pp. 22-28.

McGill, L., Currier, S., Duncan, S., & Douglas, P. (2008). Good intentions: improving the evidence base in support of sharing learning materials. Available from: <http://repository.jisc.ac.uk/265/1/goodintentionspublic.pdf>

The William and Flora Hewlett Foundation, *Open educational resources-Breaking the Lockbox on Education* (2013). Available from: https://hewlett.org/wp-content/uploads/2016/08/OER%20White%20Paper%20Nov%2022%202013%20Final_0.pdf

Zancanaro, A. (2015). *Produção de recursos educacionais abertos com foco na disseminação do conhecimento: uma proposta de framework*, 2015.

ACKNOWLEDGEMENTS

AUTHOR INFORMATION

Ivan Obradović
University of Belgrade, Faculty of Mining and Geology
Đušina 7, 11000 Belgrade, Serbia
ivano.obrdovic@rgf.bg.ac.rs
+381113219148
Dr. Ivan Obradović is a retired full professor of Mathematics and Informatics at the University of Belgrade. He was one of the founders of the University of Belgrade Information Center and its Director from 2005 to 2012, and Director of the University Center for e-Learning and Distance Education from 2014 to 2016. Professor Obradović has published four books and more than 100 scientific papers related to applications of artificial intelligence methods and tools, development of language resources and tools, open educational resources and e-learning application in HE. He participated in numerous domestic and international projects, including BAEKTEL, a project aimed at developing OERs in a cooperation of universities and industrial companies. Since his retirement at the University his is actively participating in the activities of the Language Resources and Technologies Society (JERTEH), of which he was one of the founders. He is the initiator of the Open Education Initiative Serbia, which is intended for all those who work in education and share the view that knowledge is a common good and that it should be available for everyone.

Ranka Stanković
University of Belgrade, Faculty of Mining and Geology
Đušina 7, 11000 Belgrade
ranka.stankovic@rgf.bg.ac.rs
+381113219212
Ranka Stanković is associate professor at University of Belgrade, Faculty of Mining and Geology, where she is teaching several courses related to informatics and geoinformatics. She

received her Master's degree in 2000 and Ph.D. 2009 at the Department for Computer science, Faculty of Mathematics University of Belgrade. Professor Stanković is interested in e-learning, open education, semantic web, information systems, database modelling, geoinformation management and artificial intelligence. Her current research is focused on building custom components that incorporate knowledge from various language and lexical resources. She is head of Computer Centre for the Mining department, Chairman of Technical comity A037 Terminology in Institute for Standardisation of Serbia and vice president of Language Resources and Technologies Society (JERTEH). She actively participated in BAEKTEL Tempus project in building and exploitation and learning platform. She published more than 100 papers in journals and proceedings of scientific conferences, most of them in the area of human language technologies and more than 15 related to TEL.

Marija Blagojević
University of Kragujevac, Faculty of Technical Sciences Čačak
Svetog Save 65, 32 000 Čačak
marija.blagojevic@ftn.kg.ac.rs
+38130302719
Assistant Professor at the Faculty of Technical Sciences in Čačak, University of Kragujevac at the Department of Information technology. Born in 1984. MSc in Technics and Informatics in 2007. PhD in technical sciences in 2014. Current research interest: data mining, artificial neural networks, e-learning, programming... Eleven years' experience in teaching and research activities. Assistant professor from 2015. Author or coauthor of more than 50 research paper. Reviewer for many scientific journals. Project and study programs reviewer. Member of partner university for Tempus project 544482-TEMPUS-1-2013-1-IT-TEMPUS-JPHES. Participant in four Erasmus mobilities. Member of Commission for self-evaluation at faculty. Member of the organizational committee of several conferences. Participant in national and international project and project coordinator for one project.

Danijela Milošević
University of Kragujevac, Faculty of Technical Sciences Čačak
Svetog Save 65, 32 000 Čačak
danijela.milosevic@ftn.kg.ac.rs
+38130302757
Danijela Milošević is full professor and dean at the Faculty of Technical Sciences in Čačak. She belongs to the Department of Information Technologies. She graduated at Military Technical Faculty in Zagreb, Croatia, and received MSc and PhD degrees at the University of Belgrade. Her expertise includes distance learning, intelligent tutoring systems, adaptive user modeling and Semantic Web. She teaches traditional, online and blended IT courses. She was coordinator of the regional Tempus project DL@WEB for improving the quality of distance learning in higher education institutions in the Western Balkans and responsible for the development of accreditation standards for study programs for distance learning. Also, she coordinated WUS MSDP project "MSc in eLearning: e-moderating Module" at the Faculty of Technical Sciences Čačak. She holds certificates for training on Quality assurance in Higher Education by EFQUEL - European Foundation for Quality in e-Learning. She is the president of Balkan Distance Education Network BADEN, and editor in chief of BADEN Newsletter aiming to disseminate and exchange the knowledge and experiences across the Western Balkan region.