



The Methodology for the organization of Open Educational Resources in the career of Labor-Computer Education

Metodología para la organización de los Recursos Educativos Abiertos en la carrera de Educación Laboral- Informática

Metodologia para a organização dos Recursos Educativos Abertos na carreira da Educação Laboral- Informática

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ABSTRACT

The "knowledge society" is a phenomenon that has been gaining great importance in the educational movement, as a means for the generation and socialization of knowledge. The management of open educational resources (OER) available on

computer networks freely and free of charge, are used in teaching-learning processes. The article addresses one of the partial results of the research "The initial training of the career of Bachelor of Education-Computer Science in the Faculty of Middle Education", which proposed the study of resources or educational media in the subjects of the career in study. Methods of the theoretical and empirical level were used, all under a general dialectical methodological approach. The result was a theoretical analysis of the OER, which currently supports the theory of digital teaching media with open access. It was possible to establish a methodology that manages the organization in teacher training in the production of educational resources and their socialization, in the subjects of the - Computer Education career at the University of Pinar del Río.

Keywords: open educational movement; Open educational resources.

RESUMEN

La "sociedad del conocimiento" es un fenómeno que ha venido cobrando gran trascendencia en el movimiento educativo, como medio para la generación y socialización del conocimiento. La gestión de los Recursos Educativos Abiertos (REA), disponibles en las redes informáticas de manera libre y gratuita, son utilizados en los procesos de enseñanza-aprendizaje. El artículo aborda uno de los resultados parciales de la investigación "La formación inicial del profesional de la carrera de Licenciatura en Educación-Informática en la Facultad Educación Media", la que propuso el estudio de los recursos o medios educativos en las asignaturas de la carrera en estudio. Se utilizaron métodos del nivel teórico y empírico, todos bajo un enfoque metodológico general dialectico-materialista. Se obtuvo como resultado un

análisis teórico de los REA, lo que sustenta en la actualidad la teoría de los medios de enseñanza digitales con acceso abierto. Se logró establecer una metodología que gestiona la organización en la formación del profesorado en la producción de recursos educativos y su socialización, en las asignaturas de la carrera de Educación Laboral-Informática en la Universidad de Pinar del Río.

Palabras clave: movimiento educativo abierto; Recursos Educativos Abiertos (REA).

RESUMO

A "sociedade do conhecimento" é um fenômeno que vem ganhando grande importância no movimento educacional, como meio para a geração e socialização do conhecimento. A gestão de Recursos Educativos Abertos (RCE), disponíveis em redes de computadores gratuitamente e sem custos, são utilizados nos processos de ensino-aprendizagem. O artigo trata de um dos resultados parciais da pesquisa "A formação inicial do profissional do curso de Educação-Informática na Faculdade de Educação Secundária", que propôs o estudo dos recursos ou meios educativos nas disciplinas do curso em estudo. Foram utilizados métodos de nível teórico e empírico, todos sob uma abordagem metodológica dialético-materialista geral. O resultado foi uma análise teórica da AER, que atualmente suporta a teoria dos meios digitais de ensino com acesso aberto. Foi possível estabelecer uma metodologia que gerencia a organização na formação de professores na produção de recursos educativos e sua socialização, nas disciplinas da carreira Educação-Informática Laboral da Universidade de Pinar del Río.

Palavras-chave: movimento educacional aberto; Recursos Educativos Abertos.

INTRODUCTION

In the last decades, in the international context a series of educational practices are presented that have in common the development of emerging pedagogical tendencies that seek not only methodological novelty, but to achieve qualitative results from the involvement of students.

UNESCO (2010) assumes as its main objective "... quality education for all throughout life", that is why one of the qualities of higher education at the present time is the constant updating of knowledge for professional successful performance of the students. There is a development and evolution of the training models, ranging from traditional education, with the use of printed materials from lending services in libraries, the use of computer networks or the Internet as a tool to bring such training closer to the students, although there is evidence of the increased use of mixed or hybrid learning.

The open access movement (Ortega, 2016) is one of the main initiatives that have emerged in response to the high prices of textbooks and scientific journals for an important part of the academic community, a factor that has manifested itself both in countries developed as developing.

The foregoing fosters the opening and democratization of knowledge aimed at expanding possibilities and opportunities for access to information, which requires providing the teaching-learning process of Open Educational Resources (OER),

developed and managed by universities under Common *Creative* open licenses, that reduce the problems derived with the Copyright to be able to use or share, distribute, reuse or modify the works (López, G., 2007).

In the "print and digital teaching-learning media management policy in Higher Education Institutions" designed by the Ministry of Higher Education (MES), actions, legal norms, economic valuations, etc., are clearly expressed, to be followed for a correct organization of this process (MES, 2016).

In correspondence with the above, the article delves into theoretical aspects of educational resources in open, which supports the elements for the implementation of a methodology that guarantees the organization of the process of elaboration of the teaching means for the subjects of the career Labor and Computer Education.

What are Open Educational Resources (OER)?

UNESCO, in its document *A Basic Guide To Open Educational Resources* (OER), defines OER; In its simplest form, it describes them as any type of resources (including curricular plans, course materials, textbooks, video, multimedia applications, audio sequences, and any other material that has been designed for use in processes of teaching and learning) that are fully available for use by educators and students, without the need for any payment for rights or licenses for their use (UNESCO, 2015).

The term OER was first used in 2002 at a conference organized by UNESCO, who defined it as those materials that, aided by ICT, could be consulted, used and adapted by the user community for non-

commercial purposes (Johnstone, 2005). The definition currently used by UNESCO on OER is those "digitized materials offered free, and openly for teachers, students and self-taught, to be used and reused in teaching, learning and research" (UNESCO, 2019).

The term is practically synonymous with others as open course materials, although the latter can be used to refer to a specific and more structured subset of OER.

OERs have emerged as a concept with great potential to support educational transformation, although their educational value lies in the idea of using resources as an integral method of communicating curricula in educational courses (that is, resource-based learning). Its transformation power lies in the ease with which these resources, once digitized, can be shared through computer networks or the Internet itself; essentially, there is only one key difference between OER and any other type of educational resource that is its publication license. Therefore, OERs are simply educational resources that incorporate a license that facilitates their reuse and potential adaptation, without having to request prior authorization from the copyright holder.

Openly licensed content can be produced in any medium: printed paper texts, audiovisual or multimedia resources for computers.

Many learning courses use OERs, but that does not necessarily mean they are the same for online learning; in fact, many of the currently produced open resources can be shared in digital format and others can be for distribution in printed format.

Although the use of OER can provide support for open learning or open education, both distinguish each

other. Open learning is a conception of education, whose objective is to eliminate all superfluous barriers to learning and, at the same time, provide students with a reasonable chance of success within an education and training system, focused on their specific and localized needs in multiple areas of knowledge. This incorporates several key principles (UNESCO, 2019):

- Learning opportunities must exist throughout life and must include both education and training.
- The learning process must focus on students, structure themselves from their experience and stimulate independent and critical thinking.
- The teaching offer must be flexible so that students can increasingly choose where, when, what and how they learn, as well as the pace in which they learn.
- Prior knowledge, previous experience and proven skills should be recognized, so that students are not prevented, without need, from accessing educational opportunities based on the lack of appropriate qualification.
- Students must be able to accumulate credits from different learning contexts.
- Providers must generate the right conditions to offer the student a fair chance of success.

These principles of open learning are supported by educational materials and resources in various formats and supports; OERs are part of these and are well received by users and students.

Indications of the Ministry of Higher Education of Cuba

In the MES teaching-learning media management policy, printed and digital, a

group of indicators are manifested to be taken into account and that should be a pattern for the execution of strategies in each of the Higher Education Institutions (HEIs) (MONTH, 2016). It indicates the responsibilities of HEIs regarding the generation of OER, public domain is established for OERs that are generated in each institution, types of OER, designate the governing centers responsible for the selection of OER, issue responsibilities of management and generation of educational resources and who should be the actors involved in its development. The policy establishes those moments and stages for the management of OER, as well as the main actions in the management and generation process. These indications established by the MES, establish work guidelines for development, content generation management and educational resources in open format and distribution.

What is the transformative potential of OER in education?

- Improve the quality of learning materials through peer review processes.
- Reap the benefits of contextualization, personalization and localization.
- Emphasize openness and quality improvement.
- Increase training for the creation and use of OER as part of the professional development of academic staff.
- Address the needs of particular student populations, such as people with special needs.
- Optimize the deployment of institution staff and their budgets.
- Offer the service to students in their local languages.
- Have students participate in the selection and adaptation of OER so

that they become more actively involved in the learning process.

- Use locally developed materials with due recognition.

The transformative potential of OER also includes the benefits of sharing and collaborating between institutions and countries, as well as the creatively disruptive role of OERs in opening new educational models. (Ortega, 2016).

How can education benefit by taking advantage of OER?

The most important reason for the use of OER is that openly licensed educational materials have enormous potential to contribute to the improvement of the quality and effectiveness of education. The challenges of increasing access, combined with the continued deployment of ICT infrastructures in schools, indicates that it is increasingly important that they support, in a planned and deliberate manner, the development and improvement of the curricula, the design of ongoing programs and subjects, the planning of contact sessions with students, the development of quality learning and teaching materials and the design of effective assessments, activities all aimed at improving the teaching and learning environment, together with the control of costs through increased resource-based learning.

According to Trillo Miravalles (2012), the transformative potential of education that OER have, revolves around three intertwined possibilities:

1. The greater availability of relevant and high quality learning materials can contribute to preparing more productive students and educators. Because OERs eliminate restrictions on copies of resources,

they can reduce the cost of access to educational materials. In many systems, the payment of royalties for the use of textbooks and other educational materials constitutes a significant proportion of the total cost, while the processes of acquiring authorization to use copyrighted material can consume a lot of time and money.

2. The principle that allows the adaptation of the materials provides one of the many mechanisms for the construction of the student's role as an active participant in the educational process, since he learns better by doing and creating, and not by reading and absorbing passively. Content licenses that encourage student activity and creativity through the reuse and adaptation of those contents can contribute significantly to the creation of more effective learning environments.
3. OERs have the potential to increase training by allowing institutions and educators to access, at low cost or free of charge, the means of production necessary to develop their competence in the production of educational materials and carry out the necessary instructional design to integrate these materials into high quality learning programs.

The deliberate opening, therefore, confirms that:

- Investing in the design of effective educational environments is extremely important for good education.
- One of the keys to productive systems is to take advantage of common intellectual capital,

instead of duplicating similar efforts.

- All things being equal, collaboration will improve quality.
- Since education is a contextualized practice, it is important that it is easy to adapt imported materials from different environments when necessary and that should be encouraged rather than restricted.

How can Open Educational Resources be shared or socialized?

Once the resource has been developed and issued its open license, it must be stored in an online repository, so that other networked users have access to it.

There are several options when it comes to the place where these resources can reside:

1. Use an institutional repository: many organizations, especially universities, are creating their own collections and making them accessible online, such as OER. If whoever prepares or develops the material works for such an institution, the expectation will be that the OER developed under the auspices of that institution must reside in their own repository. Repository administrator guidance should be sought.
2. Selection of an open repository: several repositories willingly accept contributions from different locations. Open repositories require that the person submitting the resource make a record and log in before loading it. They also ask for information about the resource so that it can be cataloged and labeled. That is necessary to allow search devices to find it. The

submitted resource will be examined by a review team to ensure its quality before incorporating it into the repository database.

3. Construction of online OER: it is also possible to build *online* resources; some websites promote their development within their environments.
4. Employment of social networks: the world of social networks has also opened up new possibilities to publish OERs online. A site like *Flickr* (www.flickr.com) allows its users to publish photographic material with *Creative Commons* licenses, while *YouTube* (www.youtube.com) allows the same for materials in digital video format. Networks such as *Twitter* and *Facebook* can be used to disseminate knowledge of materials published on the Internet through shared links.

How much can I alter OER in pedagogical objectives?

In most cases, users have enormous freedom, as far as the license permits, to alter educational resources in order to adapt them to contextual needs whether the license restricts or not; The ¹ *Creative Commons* open license with "No Derivative Work" restriction cannot be altered and must be used "as it is". This right is not reserved very often in OER.

The vast majority of published OERs allow users to adapt the original resource. The most common ways in which OER can be altered are:

- Mix: several OER are mixed together and additional content is added to create a completely new

resource. That is common when course designers need to develop materials and resources to adapt them to a local curriculum or program. A common concern is that it is uncommon to find existing OERs that serve perfectly 'as they are'.

- Adaptation: occurs when, from the use of an OER, multiple alterations develop to adapt to multiple contexts. It is possible that the resource will be translated into other languages, but usually adaptation requires that local case studies / examples be added so that the materials are relevant to students in a given context.
- Extraction of elements: it is also possible to extract some of the elements of a resource or of a certain course and use them in a completely different context. This applies especially to multimedia elements, such as photographs, illustrations and graphics, since those who develop them often lack the knowledge or resources necessary to produce their own version of the normally used visual aids.

To a large extent, the fact that changes can be made to the original is what makes OERs - compared to other types of copyrighted material - especially useful for program developers.

What development model to use for the management of OER?

The model that will help the development of an OER in a specific way is based on the models of instructional design, conceived for planning and process control.

Stages:

1. Choice and title of the topic: at this stage the theme and objective of the OER will be determined, to continue with the other stages.
2. Analysis: it will be determined here what contents will be incorporated, according to the didactic sequence planned (modules, Learning Objects "OA", textbooks, multimedia material and diagnostic evaluations).
3. Design: the visual structure of the OER works, starting with a prototype the considerations are made for the databases of the subject evaluations and the evaluation of the application.
4. Production: at this stage it is necessary to know how and what multimedia resources will be used, of which the didactic sequence and the determination of the technological tools for multimedia development are taken into account.
5. Development: how it will be created and the resources that will be involved (software for the creation of the OER and the database), in addition to including the software development manuals.
6. Implementation: at this stage you should see the final structure of the OER and know in which repository (platform) it will be uploaded. In addition to taking into account what will be the metadata for your search.
7. Authorship: what type of *Creative Commons* license will be used will be defined.
8. Validation: compliance with the resource objectives of the students and the teacher will be verified.
9. Feedback: according to the evaluation that is made to the application, verify that it can be

improved and what new implementations it should have; Must be fit and subject to any changes.

Various actors must participate in each of the previous stages: teachers or experts in the field, software developers or specialists in educational informatics and students, who have different roles in development.

What technical-organizational conditions are identified at the University of Pinar del Río "Hermanos Saíz Montes de Oca" to establish the necessary conditions for the management of OER?

- The existence of an entity that responds to the organization of the management of OER, the Center for Learning and Research Resources (CRAI).
- The consolidation of a Computerization Department in the UPR that guarantees the management and implementation of the technological infrastructure, which guarantees the implementation of management systems and their databases.
- Availability of spaces for managing and publishing online courses (*Moodle* Undergraduate, *Moodle* Postgraduate and Distance Education) providing technical and educational support, for editing and publishing online courses.
- The technological availability for the management and publication of audiovisual materials, video conferences, educational videos and documentary videos.
- The availability of network repositories, which guarantee hosting services of educational resources, examples: CRAI site

(<http://crai.upr.edu.cu>) with *DSpace* support, which allows concentrating the scientific production of teachers of the University, its theoretical-methodological productions and its scientific results. This platform guarantees the self-management of the institutional educational resources of teachers and managers.

- The existence of a space or repository in the university network of the UPR (yet to be defined) for the management of OER of individual production of teachers, as a way for their socialization from the individual to the social or community.

From the theoretical studies, the analysis of the technical-organizational strengths of the University of Pinar del Río "Hermanos Saíz Montes de Oca", a methodology was projected that allows establishing the organization in the development of teaching means or educational resources for the Bachelor's degree in Labor-Computer Education, contributing to the improvement of the Integrated System of Means of Teaching in the career, line of work in the research project "The initial training of the professional of the Bachelor's Degree in Education-Computer Science in the Middle School. "

MATERIALS AND METHODS

The research had an explanatory character of the studied phenomenon, assumed an integral or dialectical approach. We worked with professors and subjects of the Career-Computer Education career, members of the research project. The materialistic dialectical method prevailed

that made it possible to operate with its laws, categories and principles. In the theoretical level the methods were used: analysis-synthesis and induction-deduction, for the processing of the information, the interpretation of the results and elaboration of the conclusions on the foundations that makes possible to understand the process of management and development of the OER, as well as the systemic-structural to achieve methodological coherence between the stages of the methodology provided.

The theoretical study began in the 2016-2017 academic year, using theoretical materials on OERs focused on the organizational management of their design, typologies and forms of socialization so that they were available to teachers. In addition, an analysis of the various services offered by the university network was performed.

The inquiries and the documentary analysis confirm the need to manage didactic means and educational resources for the subjects of the career; the absence of educational resources and resources in several subjects demonstrates the lack of organization in the management and development of a unique media system for the subjects that is part of a sustained and progressive methodological work.

Research methods and techniques were used that facilitated the verification of evidence and the identification of the real problem that was manifested and provided the establishment of the scientific problem, object and objective of research.

General aspects are evidenced in the objective and subjective order such as: inability of teachers to manage materials and educational resources, inadequacies in knowledge and skills to develop resources and limitations of technologies that facilitate their development.

RESULTS

The main results evidenced by the research work are in the results of the analysis developed:

- The diversity of materials and educational media used in classes, the majority of unit use in the classroom, very few in support materials for the content that is imparted and almost no availability of the elaborated media, uploaded to the repositories available on the Network University used for the study career.
- In the study of educational resources used in virtual courses, it is denoted that they are not part of a system of educational materials, located in institutional repositories that facilitate their use and reuse by several teachers in their classes and in virtual courses.
- The existence of a space in the network (institutional ftp of the faculty) that is not used by teachers and career groups, in the socialization of educational materials, learning objects that are part of the OER, available to the processes of teaching-learning of students.
- Insufficiencies in the ability of teachers to project, design, develop educational materials and teaching means used in their classes.
- Limitations on the management of publication and registration of copyright.

From the analysis of the results of the irregularities and supported by the theoretical foundations on OER, the educational need to solve, through the research project, the problem expressed as the "Need to organize the process of

development of digital educational resources in the -Informatics Education career ", which allows establishing as a problem how to contribute to the management of the process of elaboration of digital educational resources (teaching means) that respond to the demands and needs of teaching-learning processes in the disciplines of the Computer Education career?

Based on the problem identified, the process of development of Open Educational Resources as means of teaching in the -Computer Education career is specified as the object of study.

Methodology for the organization of the process of development and implementation of Open Educational Resources (OER) as means of teaching in the -Computer Education career

General objective:

Manage the process of preparing OER in the -Computer Education career, which responds to the demands and needs of the teaching means in the teaching-learning processes.

Foundation

As discussed in the theoretical foundations, OER are digitized materials offered freely and free for teachers, students and self-taught, to be used and reused in teaching, learning and researches.

They are classified into various types of materials such as: learning objects, content modules for online courses, open textbooks, multimedia materials, educational software, digital presentations, documentaries, films, educational videos, virtual laboratories,

evaluation tools and instruments, simulations, role-playing games, databases, among others.

Methodology

The methodology is conceived in three stages of work that gives it a consistent structural body, which facilitates raising the knowledge in the management and development of publications in open format at the level of discipline and subjects of the career under study. In addition, a stage is planned for the projection of the improvement or training for teachers involved in the project.

A series of requirements are implemented in higher education institutions, which must be carried out through necessary actions, in compliance with the methodology and an approach is made to the typology of the most commonly used OER in the teaching-learning processes, scope and publication in the institution's university network.

Stage 1. Management and generation of OER at the level of discipline and subject

1. Identify the educational needs of the subjects:

- The identification of the educational needs of the programs. Definition of learning objectives, selection of content by each teacher.
- Presentation of an inventory of the main educational needs presented by the teaching-learning process in the subject taught by the teacher.
- Approval by the group of subject and discipline of the inventory of needs executed by the head of discipline and the head department.

2. Process of management and generation of educational resources:

- Search for educational resources that can be used to meet the needs of discipline groups.
- Prepare a project to develop the educational material or resource in the discipline group; they can be assisted by specialists in instructional design or experts in educational informatics.
- Search for materials needed for the design and generation of the educational resource.
- Prototype development and approval by the discipline group.
- Apply an assessment diagnosis with students to identify acceptance criteria, motivation, performance of skills, etc.

3. Certification and approval process:

- Approval by a group of experts, who conduct arbitration anonymously, using an evaluation system that guarantees the quality of the content and teaching materials.
- Approval of an arbitration opinion by the dean that validates the OER generated and its acceptance for publication.
- Develop a project protocol to guarantee the necessary documentation, which protects the original work, with the use of the *Creative Commons* (CC) license for publication in institutional repositories.

4. Publication process:

- Publish in an institutional repository. Join the ALMA platform (*DSpace*) of the CRAI or some

other repository that allows its socialization in the UPR university network. Contact specialists from the CRAI or documentation center.

Stage 2. Improvement and training of teachers in the management and generation of OER

- Basic postgraduate course (training) for creating virtual courses in *Moodle*.
- Postgraduate course (training) on the creation of Open Educational Resources in *eXe-learning*.
- Postgraduate course in the development of Open Educational Resources in content management platforms for learning (LMS).
- Postgraduate course in the creation of interactive video tutorials in *Adobe Captivate* in the generation of video tutorials and presentations.
- Basic postgraduate course (training) in the educational use of mobile devices for student learning.
- Training teachers-tutors of educational institutions in the different subsystems of education.
- Training for career students in the development of educational resources and in desktop and mobile applications.

Stage 3. Certification of publication and improvement

- Certification of publication of the REA by the competent body of the CRAI.
- Certification of improvement in progress related to the generation of materials and Educational Resources Open by the competent authority, secretary or the office of Overcoming.

DISCUSSION

There is a need today for the university professor to be updated in all those aspects that can broaden the spectrum of pedagogical didactics, which strengthens their work and promotes significant learning, which lead to the more effective compression of concepts applied in different areas of the knowledge. One of these aspects is training in the use of ICT applied to education.

The effectiveness of OER depends on their relevance, for which it must be evaluated according to the visual and instructional design verifying the quality of content, usability, accessibility, if the resource is useful for generating learning and has the ability to motivate and generate interest in the subject. As Burgos (2011) states, each evaluation carried out on an OER enriches the value of the same, this when considering that new knowledge is added to the previous knowledge, as well as the experience and personal judgment of the evaluator when reviewing the educational resource in question, taking as a reference each of the evaluation criteria and issuing a feedback through a clear, simple and informative wording.

In some cases, the use of ICTs is limited, so the creation and use of OER (Charnelli, ME, 2014) should be encouraged, in order to generate a university repository from which the elaborated resources can be used, both by students and teachers of each of the faculties, as well as expanding collaboration with other institutions.

Experiences of other authors (Montera, FJ 2010, Mendoza, F. 2010, Minutti, L. 2012) point out that an active policy in favor of OER can contribute to training, to school didactics, increases the prestige of the institution and It helps students in their learning. The proposed methodology

favors the organization of the process of developing educational resources for learning in a university career.

Because of the analysis of the methodology in the pedagogical collective, the reorganization of the work methods in the subjects, the projection of new forms of work in the design and conception of the educational means was implied.

We can argue as a summary that, in each career in a university center you must:

- Seek alternatives to encourage the motivation of teachers who will be part of the work team that will generate Open Educational Resources.
- Prepare, through the deans, an opinion that validates the OER generated in the university by Cuban authors.
- Design training courses to promote the generation of Open Educational Resources, use and reuse, which facilitate the development of the educational teaching process and the integral training of students.
- Ensure the protection of the original works that merit it and the use of *Creative Commons (CC) licenses* for publication in the repositories.
- Develop strategies and projects that promote the generation, use and reuse of Open Educational Resources; as well as open educational practices in universities.
- Involve students in development projects of Open Educational Resources in different formats, especially video tutorials and applications for mobile devices.

The fact that in the research project the realization of the theoretical study on OER is projected, achieves the projection of

teachers in favor of pedagogical innovation, aided by a methodology, which organizes work in the design of media and resources in the subjects.

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The authors have participated in the writing of the work and analysis of the documents.



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