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Original article

# Diagnosis of the development of the competence to reuse open educational resources in university teaching

## Diagnóstico de la formación de la competencia reutilizar recursos educativos abiertos en la docencia universitaria

## Diagnóstico do desenvolvimento da competência para reutilizar recursos educacionais abertos no ensino universitário

**Oderay Molina Castellanos**[1] 0000-0002-8337-9102 oderay.molina@reduc.edu.cu
**Bárbara María Carvajal Hernández**[1] 0000-0002-6315-1346 barbara.carvajal@reduc.edu.cu
**Ognara García García**[1] 0000-0001-6690-7527 ognara.garcia@reduc.edu.cu

[1] University of Camagüey "Ignacio Agramonte Loynaz". Cuba.

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**ABSTRACT**

The ability to reuse open educational resources is considered key to the ethical, contextual, and collaborative integration of these materials into the teaching and learning process. It aligns with the contemporary challenges of Cuban Higher Education, marked by the digitization of knowledge and the promotion of open education. This article aims to diagnose the development of digital teaching competence and the ability to reuse open educational resources among university professors at the University of Camagüey. To this end, a cross-sectional descriptive study was conducted between January and December 2023. The study's dimensions and indicators were defined through an epistemic analysis of the research topic, which allowed for the delimitation of its essential

components and internal relationships. Theoretical methods such as analysis and synthesis were used to understand the structure and characteristics of the phenomenon, while inductive and deductive methods were employed to generalize and validate the conceptual foundations of the topic. Empirical methods included surveys and document review. It was concluded that there are weaknesses in the mastery of digital tools, the ethical use of open licenses and the pedagogical integration of open educational resources, although strengths such as interest in training and a positive attitude towards innovation are highlighted, which allow for the projection of a contextualized pedagogical strategy for the development of this competence within the framework of Cuban Higher Education.

**Keywords:** digital teaching competence; open education; training; open educational resources; reuse of open educational resources.

## RESUMEN

La competencia reutilizar recursos educativos abiertos es considerada clave para la integración ética, contextual y colaborativa de estos materiales en el proceso de enseñanza-aprendizaje. Se enmarca en los desafíos contemporáneos de la Educación Superior cubana, marcada por la digitalización del conocimiento y el impulso de la educación abierta. El artículo tiene como objetivo diagnosticar la formación de la competencia digital docente y reutilizar recursos educativos abiertos del profesor universitario en la Universidad de Camagüey. Para ello se realizó un estudio descriptivo transversal en el período comprendido entre enero y diciembre de 2023. Para definir las dimensiones e indicadores del estudio, se partió del análisis epistémico realizado sobre el objeto de investigación, lo que permitió delimitar sus componentes esenciales y relaciones internas. Se emplearon métodos del nivel teórico como el análisis y síntesis, para comprender la estructura y características del fenómeno; así como los métodos inductivo y deductivo, para generalizar y validar los fundamentos conceptuales del tema abordado. De los métodos empíricos fueron utilizados la encuesta y la revisión documental. Se llegó a la conclusión de que existen debilidades en el dominio de herramientas digitales, el uso ético de licencias abiertas y la integración pedagógica de los recursos educativos abiertos, aunque se destacan fortalezas como el interés por la formación y la actitud positiva hacia la innovación, que permiten proyectar una estrategia pedagógica contextualizada para el desarrollo de esta competencia en el marco de la Educación Superior cubana.

**Palabras clave:** competencia digital docente; educación abierta; formación; recursos educativos abiertos; reutilización de recursos educativos abiertos.

**RESUMO**

A competência para reutilizar recursos educacionais abertos é considerada fundamental para a integração ética, contextual e colaborativa desses materiais no processo de ensino-aprendizagem. Ela se insere no contexto dos desafios contemporâneos do Ensino Superior cubano, marcado pela digitalização do conhecimento e pela promoção da educação aberta. Este artigo tem como objetivo diagnosticar o desenvolvimento da competência em ensino digital e a reutilização de recursos educacionais abertos entre professores universitários da Universidade de Camagüey. Um estudo descritivo transversal foi conduzido entre janeiro e dezembro de 2023. Para definir as dimensões e os indicadores do estudo, foi realizada uma análise epistêmica do objeto de pesquisa, permitindo a delimitação de seus componentes essenciais e relações internas. Métodos teóricos, como análise e síntese, foram utilizados para compreender a estrutura e as características do fenômeno, bem como métodos indutivos e dedutivos para generalizar e validar os fundamentos conceituais do tema. Os métodos empíricos incluíram questionários e revisão documental. Concluiu-se que existem fragilidades no domínio das ferramentas digitais, no uso ético de licenças abertas e na integração pedagógica de recursos educacionais abertos, embora se destaquem pontos fortes como o interesse na formação e uma atitude positiva em relação à inovação, que permitem projetar uma estratégia pedagógica contextualizada para o desenvolvimento dessa competência no âmbito do Ensino Superior cubano.

**Palavras-chave:** competência em ensino digital; educação aberta; formação; recursos educacionais abertos; reutilização de recursos educacionais abertos.

## INTRODUCTION

Contemporary higher education is undergoing a transformation marked by the digitization of knowledge and the rise of open education. In this context, open educational resources (OER) are becoming key tools for pedagogical innovation, enabling free access, contextual adaptation, and redistribution of educational content under open licenses. Their effective implementation requires

university professors to develop specific digital skills that allow them to integrate these resources ethically, critically, and collaboratively into their teaching practices.

OER, defined according to the 2019 UNESCO Recommendation, as teaching, learning and research materials available under licenses that allow their free use and modification, promote equity, knowledge sustainability and collaboration among educational communities. Its distinguishing feature compared to other digital resources is precisely the incorporation of open licenses, which enable its reuse and adaptation in diverse contexts. However, its use in university settings faces multiple challenges, among which the educational, technical, and attitudinal gaps of professors stand out. Studies by Marín *et al.* (2022) and Ramírez Montoya (2022) show that, although teachers recognize the value of OER, difficulties persist in their effective reuse, especially regarding the mastery of digital tools, the understanding of open licenses, and contextualized pedagogical integration.

Digital teaching competence (DTC), understood by Cabero Almenara and Palacios Rodríguez (2020) as the ability to consistently apply a set of attitudes, knowledge, and skills aimed at planning, directing, evaluating, and continuously reviewing teaching processes mediated by digital technologies, constitutes a cross-cutting axis for addressing these challenges. Strengthening this competence not only fosters pedagogical innovation but also positions teachers as active agents in the construction of open educational ecosystems (Medrano Vásquez *et al.*, 2022). Within this competence, the ability to reuse OER acquires particular relevance, as it implies mastery of the five Rs: retain, reuse, revise, remix, and redistribute, that support the pedagogy enabled by OER (Wiley & Hilton, 2018). This competence also requires metadata management, respect for intellectual property, and the application of flexible pedagogical designs that respond to the needs of the context.

The systematic incorporation of OER into university teaching faces structural and training limitations that hinder its effective integration. This idea is considered in the research proposal by Pérez Vargas and Cortés (2023), who point out that the development of digital competencies in Cuban Higher Education is limited by insufficient technological infrastructure, a lack of training programs, and inadequate teacher preparation for integrating Information and Communication Technologies (ICTs) into their teaching practice. The authors emphasize that these limitations hinder the acquisition of digital competencies in increasingly virtual and educationally transformative environments.

In this sense, teacher training in the competence of reusing OER is an urgent need, demanding a transformation of the teacher's role towards that of a critical prosumer of digital content, capable of designing meaningful learning experiences in collaborative environments (Gabarda Méndez *et al.*, 2023). The reuse of OER should not be understood as a passive exercise in consuming materials, but as a critical process that involves contextual adaptation, ethical attribution of authorship, respect for open licenses, and active participation in communities of practice.

As Ramírez Montoya (2022) argues, developing teaching competencies related to OER requires not only mastery of technological tools for content editing and evaluation, but also the integration of pedagogical criteria that respond to the characteristics of the student body and the challenges of the digital environment. Within this framework, teacher training focused on open knowledge becomes strategic for strengthening more inclusive, sustainable, and relevant educational ecosystems.

In line with these findings, the Cuban context has shown significant institutional progress: the Ministry of Higher Education (MES) has established concrete guidelines to promote open education and the use of OER through initiatives such as the University Data Network, the University Press, the Virtual Health Library, and the Open Educational Resources Repository. Furthermore, the 2019 development of the draft Strategy and Policy for Open Science and Education, within the framework of the project " Information and Communication Technologies Supporting Educational Processes and Knowledge Management in Higher Education" (ELINF), belonging to the VLIR - USO NETWORK University Cooperation Strengthening of the ICT role in Cuban Universities for the development of society (ELINF) program, demonstrates a growing commitment to teacher training in digital competencies geared towards openness, collaboration, and knowledge management, in line with international trends.

Taking into consideration the timeliness and relevance of the topic, Given the shortcomings in the theoretical foundations identified through epistemological analysis, an initial diagnostic study was conducted at the University of Camagüey Ignacio Agramonte Loynaz in Cuba (hereinafter UC). This study revealed deficiencies such as: a limited understanding of the didactic approach to reusing digital resources; difficulties accessing and distinguishing open repositories; a lack of proficiency in tools for adapting, publishing, and distributing content; and weak collaborative exchange within virtual teaching communities. Furthermore, it was found that methodological work plans do not systematically incorporate this competency as part of ongoing teacher training.

This result was part of the institutional project Digital Education in the University Context (Edudig) and is currently part of the sectoral project Ecosystem for Open Science in Universities of the Ministry of Higher Education (MES), as well as the lead author's doctoral research. Its purpose is to diagnose the current state of the competence to reuse OER among university professors, as a basis for designing pedagogical actions that strengthen their development in open, collaborative, and contextualized environments.

## MATERIALS AND METHODS

In this research proposal, the reuse of OER by university professors is assumed as a professional competence, a synthesis of pedagogical, didactic, digital and ethical knowledge of university professors in their teaching role, which is expressed in an integral performance during the process of knowledge construction and the transformation of the educational context into an open and collaborative learning ecosystem.

This descriptive, cross-sectional study was conducted between January and December 2023 and adopted a mixed-methods approach with a predominantly qualitative focus. The epistemic analysis of the topic was considered in determining the dimensions and indicators. The dimensions identified were: DTC training that the university professor possesses for the creation of digital content; digital educational resource management in the open education ecosystem; digital readiness for the reuse of open educational resources.

The study population consisted of specific subjects or sample types. Type 1 subjects were professors with the main teaching ranks of Full Professor, Associate Professor, and Assistant Professor, as obtaining one of these ranks requires a minimum of three years of teaching experience. Type 2 subjects included academic administrators (Vice Deans of Teacher Training, Director of Computerization, and Head of the Educational Technology Department). Type 3 subjects were students enrolled in programs within the Faculty of Computer Science and Exact Sciences. A sample of 288 subjects was determined; however, information was only available from 193 subjects, who provided it voluntarily.

The survey was used to collect information, applied to 90 professors (type 1 subjects), which allowed for the collection of data on the behavior of the dimensions and indicators previously mentioned. Data was also collected from type 2 subjects (13 academic administrators), allowing for a comparison

of their perspectives with those of the professors. All this information was corroborated through the analysis of the activity's output in the General Analytics of the Moodle Virtual Teaching and Learning Environment (EVEAS) at the undergraduate level and with a group questionnaire administered to 90 students (type 3 subjects).

Based on the declared dimensions, a structured questionnaire was developed and applied, which was distributed via Google Forms. The questionnaire included 12 questions, which were distributed as follows:

- Dimension *DTC training that the university professor possesses for the creation of digital content* (three questions), which include cognitive, instrumental and attitudinal indicators.
- Dimension *digital educational resource management in the open education ecosystem* (six questions), in which specific indicators of the competence to reuse OER are assumed.
- Dimension *digital readiness for the reuse of open educational resources* (three questions). The indicators are associated with postgraduate training received in relation to the reuse of OER, methodological work oriented towards the reuse of OER, and knowledge and use of intellectual property licenses for the reuse of OER.

Descriptive statistical analysis was used to obtain the results, employing Microsoft Excel. The information obtained was triangulated and served as the basis for interpreting the current state of the OER reuse competency development process among university professors.

## RESULTS

The most significant results obtained from the analysis are presented below.

It was found that few courses are offered that allow for the comprehensive development of each area of DTC. 75% of professors approach these topics through self-study. These results reveal a lack of postgraduate programs that promote the training of university professors in creating digital content (Figure 1).

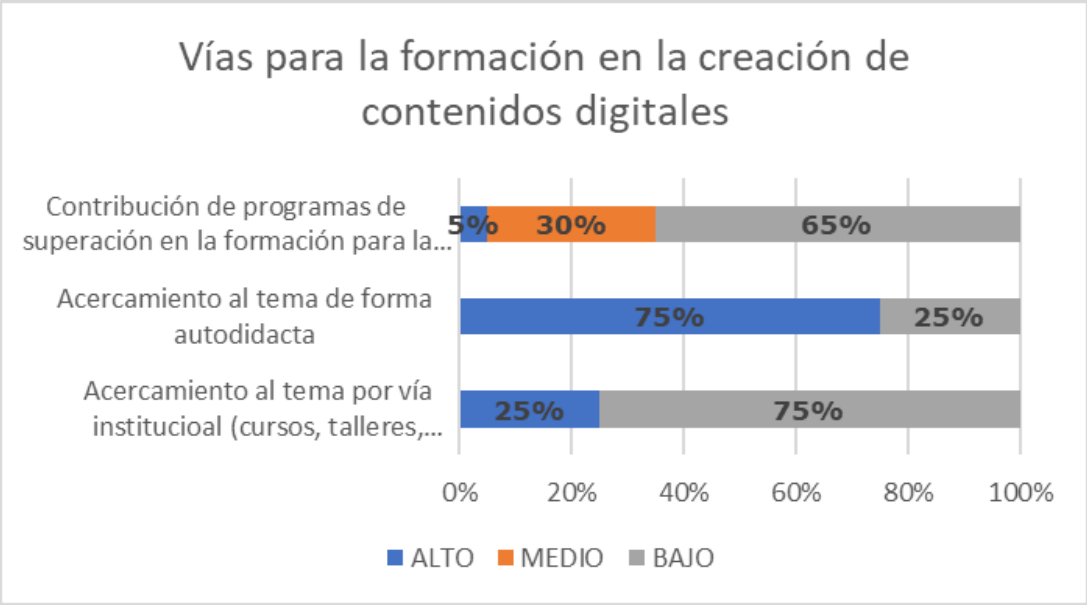


**Figure 1.** DTC training that the university professor possesses for the creation of digital content

The most favored areas of competence are information literacy and communication, since 89% are at the High levels and Environment. Specifically in the area related to the creation of digital content for the DTC, 86.7% of teachers are aware of the potential of digital content in the teaching -learning process, as they include digital resources as an important component in their course planning. They believe that digital content allows them to adapt content to students' educational needs, facilitates collaboration, and offers diverse forms of interaction and participation (Figure 2).

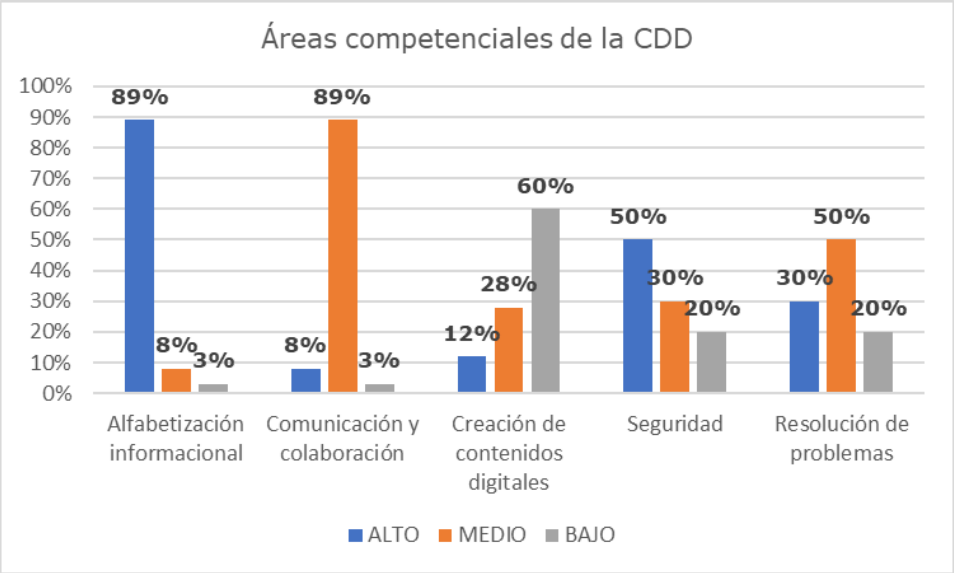


**Figure 2.** Competency areas favored by the DTC

Regarding the proficiency in Web 2.0 tools for creating digital content, the results show a low level, as only 8% use tools such as Canva, Genially, and video editors to create interactive, automatically graded activities and infographics. They generally use Word and PowerPoint to create study guides and electronic presentations (Figure 3).

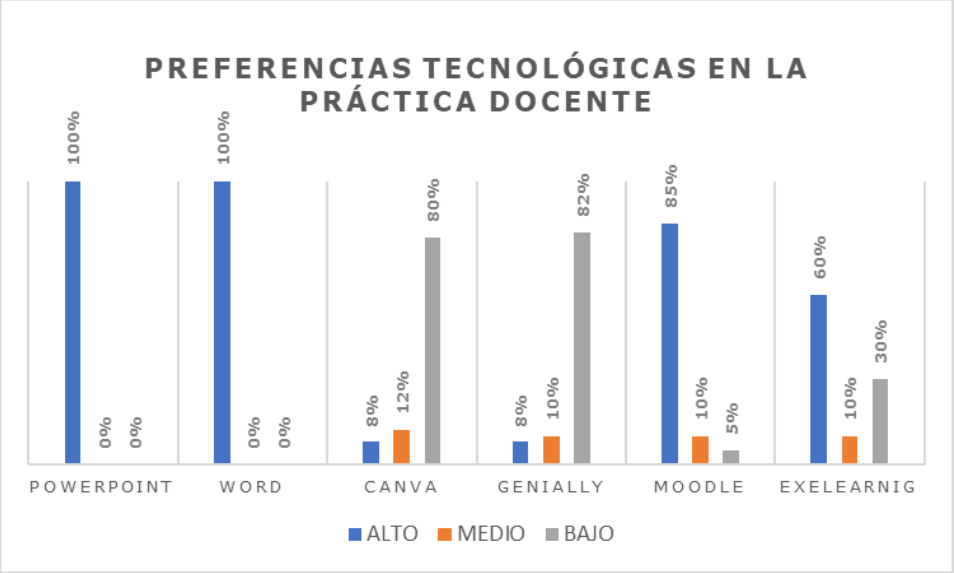


**Figure 3.** Use of digital tools for content creation

The best results were obtained in the indicator of university professors' personal interest in preparing to innovate in their teaching practice, reaching the "Highly Motivated" level, with 92% of respondents expressing their motivation to participate in courses or training that would allow them to create original, high-quality digital resources. The factors that most influence motivation include professional development, the opportunity to participate in technological innovation projects, and changes in teaching categories.

To analyze the digital educational resource management dimension *within the open education ecosystem,* the results obtained from the teacher questionnaire were triangulated with the findings from the General Analytics of EVEAS Moodle in undergraduate studies and the analysis of the activity's output. It was found that 88.6 % of teachers exhibit limitations when accessing open access repositories to locate OER, such as MERLOT and OER Commons. When selecting OER online, they demonstrate a lack of knowledge on how to do so, as they are unclear about the term "open."

Regarding the indicator related to the modification of OER, it was found that 62% of respondents stated that they almost always create their own resources, while 12% use resources identified in repositories. This demonstrates that OER are used with some frequency; however, a lack of awareness regarding the use and reuse of open educational resources persists among some teachers. They prefer to create their own resources rather than reuse those developed by other teachers.

A deeper examination of the reuse practices employed by teachers revealed that they primarily involve copying graphics and figures, as well as digitizing works by other authors, without considering the implications of copyright in the digital context. Among the reasons affecting reuse, 81% of respondents cited inadequate or incorrect descriptions, which hinder their location and subsequent reuse; 70% stated that the creation of OER (Open Educational Resources) is driven by individual rather than collective interests.

This information is compared with the resources shared in the Moodle platform courses, where 17,883 digital materials are classified under the "resources" category. Fifty percent of the materials are scientific articles by other authors, 73% are digital documents created by the instructor, 72% are textbooks in electronic format, and 7% are scientific articles published by the instructor. It is evident that the most prominent resources are teaching guides and thematic compilations from various information sources; however, these resources do not demonstrate the use of Web 2.0 tools.

The academic directors interviewed confirmed the availability of some of these online tools for university professors; however, they expressed that time and lack of knowledge of them may be causes of their little use, (Figure 4).

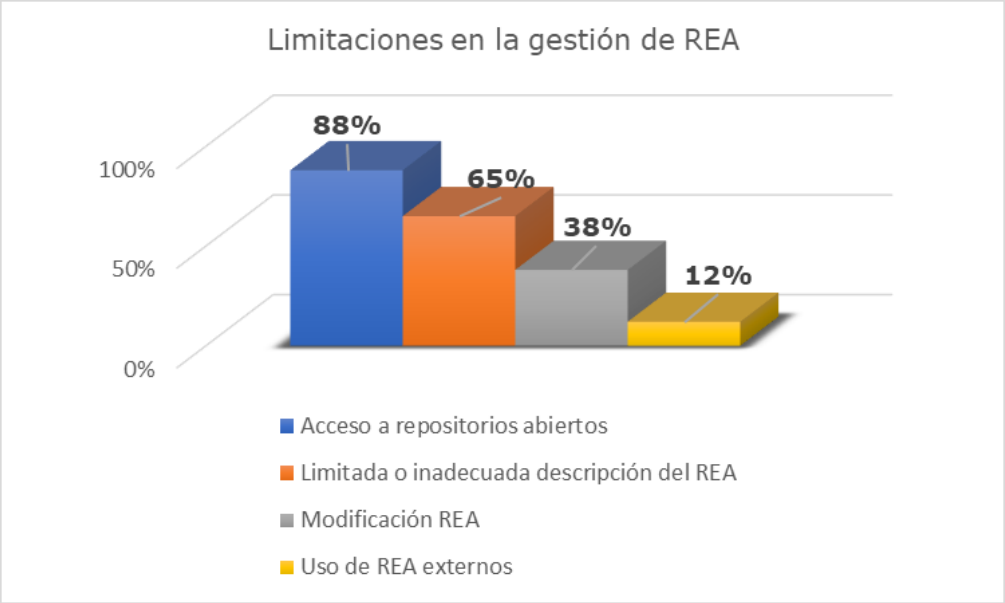


**Figure 4.** Management of digital educational resources in the open education ecosystem

The use of Creative Commons (CC) licenses in resources created by teachers was one of the indicators that showed the most deficiencies. 89.6% of teachers have no idea how the process works. They report that they do not consider these aspects when incorporating resources or teaching materials into their course preparation. Only 8.6% have used them. Among the main causes of these results are a lack of knowledge about the correct use of licenses and the belief that everything available on the web is in the public domain (Figure 5).

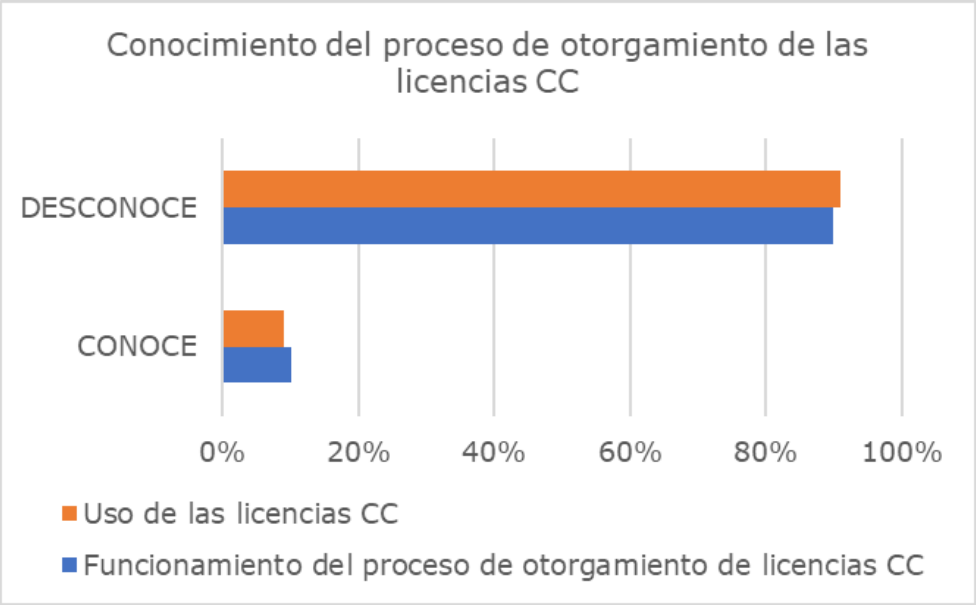


**Figure 5.** Knowledge related to Creative Commons (CC) licenses

Regarding the sharing of digital resources, 100% of the teachers surveyed reported frequently using WhatsApp as their primary method for distributing their creations, demonstrating a preference for informal and immediate communication environments. In contrast, only 6% indicated having used YouTube on occasion, suggesting a low adoption of open platforms with greater reach and visibility potential. The analyzed responses showed no evidence of the use of specific sharing features offered by applications such as Canva, which allow users to publish infographics and audiovisual resources in virtual communities, interact with other users, and reuse content under open licenses. This absence could be related to a lack of awareness of these functionalities or to institutional limitations regarding the promotion of open practices.

On the other hand, 100% of participants stated that they frequently use the Moodle environment, especially to share teaching guides, infographics, and books in PDF format. This reflects a trend toward the use of closed institutional platforms geared toward managing the teaching and learning process. While Moodle allows for the structured organization of content, its use as a repository does not guarantee open access or reuse of resources outside the virtual classroom. This situation highlights the need to strengthen teachers' competence in the pedagogical management of digital content, promoting the use of institutional exchange environments, knowledge of copyright

regulations, and participation in collaborative spaces for professional networking that foster the visibility, circulation, and contextualized use of created resources.

For the analysis of the *digital readiness dimension for the reuse of open educational resources* The results obtained from the questionnaire administered to university professors were triangulated with those found in the exploration of resources shared in courses on the Moodle platform. 7.14% of professors consider themselves highly digitally prepared to reuse OER, 21% somewhat prepared, and 71.4% not prepared at all. This indicates insufficient levels in this area. An investigation into the training received at the undergraduate and graduate levels for OER reuse confirms that it is almost nonexistent. Specifically, graduate programs lack any initiatives focused on digital training for OER reuse.

Regarding the methodological lines of work, it was found that the issue of the use of ICT is present in the plans at the university, faculty and career level, although the creation of open educational resources from reuse is not explicitly stated in any of the cases (Figure 6).

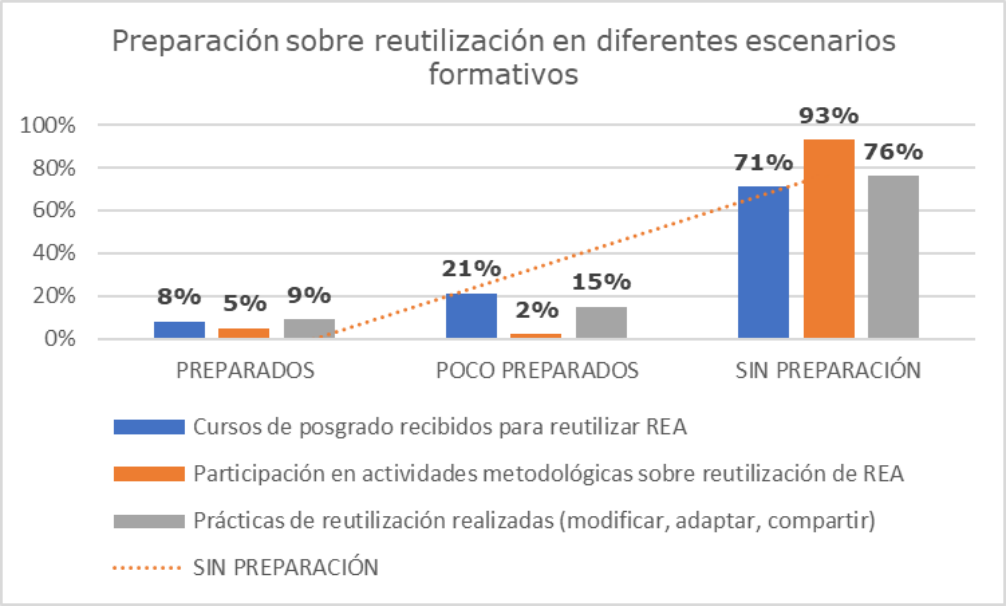


**Figure 6.** Digital readiness for the reuse of open educational resources

In order to contrast the approaches of type 1 subjects (teachers who teach), a group survey was carried out on students (type 3 subject), which yielded the following results: 100% of the students

refer to the use of PowerPoint presentations to a greater extent, and occasionally of audio resources, software and others, especially in conferences and practical classes.

In general, they expressed that the teacher makes more use of their own voice and the whiteboard. Regarding the guidance they receive to access information in digital format, only 20% indicated that they always receive guidance, 55% that they almost always do, and 25% that they sometimes do. It is clear that instructions for accessing digital resource repositories are infrequent.

The analysis of the diagnostic results based on the triangulation of the instruments allowed the identification of the resulting potentialities and weaknesses.

**DTC training dimension in university professors for the creation of digital content**

Potential

a) Teachers' interest in participating in training programs that allow them to improve their digital competence, especially in the area of digital content creation.
b) Positive attitude towards the adoption of digital tools of web 2.0 in their teaching practices.

Weaknesses

a) Limited mastery of Web 2.0 digital tools for creating digital content.
b) There are few collaborative actions among university professors that would allow the exchange of experiences on the integration of digital educational resources in the teaching-learning process.

**Dimension of digital educational resource management in the open education ecosystem**

Potential

a) The availability and wide access to Web 2.0 technological tools in the workplace.
b) The need to use digital educational resources in the preparation of the subject.

Weaknesses

a) Limited use of digital educational resources such as videos, audios, images and infographics in the preparation of the subject.
b) Scarce digital resources resulting from modifications, combinations and adaptations of existing ones.

**Digital readiness dimension for the reuse of open educational resources**

Potential

a) The use of Moodle for academic training has been promoted in postgraduate studies, which has an impact on the development of the DTC.
b) University professors attach great importance to the use of digital tools in the preparation of the subject.

Weaknesses

a) Insufficient reuse practices that do not consider adaptation, combination, and remixing.
b) Most university professors are unaware of CC licenses and their importance in the educational context.

## DISCUSSION

The diagnostic results show that teachers' digital competence for the reuse of OER is progressing unevenly in the Cuban university context. In the area of digital content creation, it was found that, while teachers recognize the value of digital resources and express interest in training (Gabarda Méndez *et al.*, 2023), limitations persist in the use of specific tools such as Canva or Genially. This situation has been consistently documented by Cabero Almenara *et al.* (2020) and the research of Ferrando Rodríguez *et al.* (2023), who point out that the creation, adaptation, and transformation of digital content remains one of the least developed areas within teachers' digital competence, especially in contexts where instrumental practices predominate and there is little training in digital pedagogical design.

Although some studies report intermediate levels in this dimension (García García *et al.,* 2022), the findings of this research coincide with those proposed by Marín *et al.* (2022), showing that information literacy and communication skills are stronger than creative production skills. This reinforces the need to design training activities that strengthen teacher autonomy in the editing and publication of educational resources in open environments.

Regarding the use of Web 2.0 digital tools, shortcomings have been identified in the critical selection of online content and in the integration of resources appropriate to the educational context. The study by Torres Pérez *et al.* (2023) confirms that teachers tend to use basic tools from the Microsoft Office suite, while collaborative and interactive design platforms are underexplored. This technological gap limits teachers' ability to adapt and share resources in innovative ways.

Regarding resource management in the open education ecosystem, Moodle is frequently used as a repository, although with little pedagogical planning. The strategic incorporation of OER into this platform can enhance active learning (Torres Pérez *et al.*, 2023). However, the critical reuse of these resources remains limited, which aligns with Ramírez Montoya's (2022) argument for teacher training focused on the design and facilitation of learning experiences, moving beyond an approach centered solely on the consumption of digital content.

One of the most significant weaknesses is related to a lack of understanding of open licenses. Most teachers do not distinguish between the public domain and Creative Commons (CC) licenses, leading to inappropriate usage practices (Canalejas Nieto, 2022). This situation compromises the legality and quality of shared resources and limits participation in open communities of practice. As Wiley and Hilton (2018) point out, the success of an OER depends not only on its content but also on the clarity of its license, which enables its retention, reuse, revision, remixing, and redistribution.

Digital preparedness for the reuse of OER remains insufficient. Despite the availability of platforms and resources, teachers often do not modify or combine existing materials, which limits their pedagogical potential. This training gap has also been noted by Medrano Vásquez *et al.* (2022), who propose integrating legal and ethical literacy as an essential part of teachers' digital competence.

In the Cuban context, various institutional initiatives have been promoted to strengthen digital teaching competence (DTC), including the recently developed frameworks for digital teaching competence (Coloma Rodríguez *et al.*, 2024; Lamadrid Vallina *et al.*, 2024). These actions reflect a

growing commitment to digital transformation; however, their incorporation into postgraduate programs remains limited and poorly systematized, which affects their effective integration (Pérez Vargas & Cortés, 2023).

In this regard, this competency is especially relevant, since the procedures for changing teaching categories, established in Resolution 145/2023 of the Ministry of Higher Education (MES) (cited in Reyes Candia, 2026), require evidence of the design and use of open courses and virtual learning environments. Strengthening methodological work in this direction would also allow for the integration of continuing education with current regulatory frameworks and advance toward a digital transformation that promotes the critical, ethical, and contextualized use of technologies in higher education.

In summary, the findings of this research reinforce the need for a contextualized pedagogical strategy that integrates continuing education, methodological work, and current regulatory frameworks. Only in this way will it be possible to move toward a culture of critical, ethical, and collaborative reuse of OER in Cuban Higher Education.

Identifying the level of digital teaching competence in university professors is a strategic starting point for designing relevant training actions that respond both to their individual needs and to the particularities of the institutional context in which they work.

Among university professors, the area of digital content creation emerges as the most deficient in terms of training, which demands the design of strategies focused on the development of multiliteracies (technological, media, informational and critical) that enable the teacher as an active producer of educational resources.

The diagnostic assessment identified strengths and weaknesses related to the competency of reusing OER among university professors, revealing shortcomings in the use of Web 2.0 digital tools, knowledge of open licenses, and the pedagogical management of OER. These findings highlight the need to implement specific, sustained, and contextualized training initiatives.

The interest shown by university professors in innovating and participating in digital training processes represents an institutional strength that should be used to design professional development strategies focused on open education.

The study's results confirm that the competence to reuse OER is not yet sufficiently consolidated, which limits teachers' ability to integrate these resources ethically, contextually, and collaboratively into the teaching and learning process. Overcoming this gap is fundamental to moving towards more inclusive, sustainable, and open educational models.

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**Conflict of interest**

Authors declare no conflict of interests.

**Authors' contribution**

The authors participated in the design and writing of the article, in the search and analysis of the information contained in the consulted bibliography.