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## Evaluation of open digital resources for digital and media competence from an educational-communicative perspective

### *Evaluación de recursos digitales en abierto para la competencia digital y mediática desde una perspectiva educomunicativa*

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#### **Abstract**

The creation and use of Open Educational Digital Resources emerges as one of the priority elements of Digital Competence in Education in its digital and media aspect, fundamental for the construction and dissemination of reliable knowledge in the face of the spread of fake news. This paper proposes and describes a process of educommunicative evaluation of this type of resources aimed at training students and teachers in Digital Competence in Education in the field of higher education. For this purpose, a specific Likert-type scale questionnaire (CEREDA) has been developed, which has proved to be reliable when evaluating digital resources. The results report a validation of the questionnaire and the resources evaluated, establishing associations that indicate the qualities that digital resources must have in order to be considered innovative, as well as finding significant differences between teaching staff and students in the perceptions they express about the level of accessibility of the resources created and evaluated.

#### **Keywords**

ICT; educommunicative evaluation; educational material; digital competence; media competence

#### **Resumen**

*La creación y uso de Recursos Educativos Digitales en Abierto emerge como uno de los elementos prioritarios de la Competencia Digital Docente en su vertiente digital y mediática, fundamental para la construcción y divulgación de conocimiento fiable frente a la expansión de las noticias falsas. Este trabajo propone y describe un proceso de evaluación educomunicativa de este tipo de recursos dirigidos a la formación de estudiantes y profesorado en Competencia Digital Docente en el ámbito de la educación superior. Para ello se ha elaborado un cuestionario propio de escala tipo Likert (CEREDA) que se ha mostrado fiable a la hora de evaluar recursos digitales. Los resultados informan de una validación del cuestionario y de los recursos evaluados, estableciendo asociaciones que indican las cualidades que debe reunir los recursos digitales para ser considerados como innovadores, además de hallar diferencias significativas entre profesorado y alumnado en las percepciones que manifiestan sobre el nivel de accesibilidad de los recursos creados y evaluados.*

#### **Palabras clave**

*TIC; evaluación educomunicativa; material didáctico; competencia digital; competencia mediática*

## 1. Introduction

The commitment to free and universal access to information responds to a process of social evolution that understands the access to information and education as a human right that must be provided to all citizens. In addition to the constructions and development of public education systems typical of the 20th century, this vision of education and the communication of knowledge in the midst of the technological revolution in the area of information and communication is directed towards the development of a digital and media competence made up of numerous skills, including the production and dissemination on the web of educational materials based on contrasted, validated and reliable knowledge. One of the challenges of our society is to develop professionals and citizens with the ability to generate and consume information and objects of knowledge based on scientific research, which requires greater training in Educommunication and educational resources to improve educational contexts and enhance the dissemination of quality information and knowledge.

Pandemic and vaccination disinformation, climate denialism or disinformation campaigns are part of the political strategy of sectors that use fake news to achieve their goals, despite the fact that these generate altered states of public opinion aimed at generating hate speech, usually against vulnerable minorities. This is a strategy that has some success in current societies due to the neglect of education systems towards the development of adequate and comprehensive digital and media literacy, especially amongst university students.

This paper presents the results of the evaluation of educational materials, co-created by several European universities in the framework of a research project, which were intended to be freely available for the implementation of training courses in digital and media competence for university staff, both in the role of teachers and students. The materials have, therefore, been evaluated by teachers and undergraduates, taking into account the characteristics of the material and its usefulness in meeting the training needs and expectations of teachers and students.

After we had contextualised the field in which this work is framed, the article provides the materials that have been evaluated, the variables used for the evaluation, the instrument developed, the characteristics of the sample and the statistical tests to which the instrument has been subjected. The results section shows the reliability and validity values of the questionnaire, as well as the means, standard deviations and correlations of the variables. Finally, the discussion and conclusions assess the main findings of the study and the future lines of research that it opens up.

## 2. State of the art

### 2.1. The digital context

The developed societies to which the countries of the European Union belong are undergoing social, economic and democratic institutional transformations, including education, due to the growing presence and influence of digital technologies (Area and Adell, 2021). Hence, one of the main educational policies of the European Union currently consists in the acquisition and improvement of digital and media competence in the field of education, aimed at both students and teachers (Vuorikari, Kluzer and Punie, 2022) in order to prevent the school from lagging behind society (Paredes-Labra, Freitas and Sánchez-Antolín, 2019).

These policies have proved to be effective in socially and educationally adverse contexts, such as the COVID-19 pandemic, so that previous experiences in online teaching were a success factor during the pandemic and a certain post-pandemic effect is maintained, conditioned in any case, by the digital training of educational centres (Alija Alija, 2021). European policies are also concerned with training in the field of Digital Competence in Education. Thus, the Reference Framework for Digital Competence in Education (DigCompEdu) identifies a set of skills considered a priority in the digital field, among which is the training of teachers in the creation and use of digital resources as one of the characteristics of this competence (Ministry of Education and Vocational Training, 2022). These skills are also structured around different levels that indicate the level of management and ability to integrate digital technologies into educational practice (Cabero-Almenara et al., 2020).

### 2.2. Media literacy and educommunication

At the same time, the media competence of the citizenry is shown to be a growing problem in modern societies which, ultimately, turn to educational institutions to provide a formative response (Buckingham, 2019) to the deficiencies which, through information, deform democratic institutions. As a tool, educational technology per se does not guarantee the acquisition of skills or the democratisation and advancement of knowledge (Mesquita-Romero, Fernández-Morante and Cebreiro-Lópe, 2022), but must necessarily be accompanied by educational action. This educational action expected of schools should be aimed at digital and media literacy at all educational stages, accompanied by active methodologies concerned with stimulating people's critical thinking in all the areas of their lives

which are influenced by digital technology (Rey, 2022).

The intensification of the vision of information as spectacle perverts its formative character and undermines what has been considered until now as trusted sources of knowledge for citizens (Mejía, 2022). For the European Union, this is a circumstance that must be addressed, among other fronts, through education. Citizens must have the necessary skills to better understand and navigate the Internet safely, with the ability to identify and flag misinformation that may pose a potential risk to the public or individuals in particular (European Commission, 2022).

From the field of education, this situation requires a greater effort to educate in the way in which knowledge is rationally constructed in order for citizens to develop the skills that allow them to perceive the difference between falsified news in the media or social networks (Pérez Tornero et al., 2018) and information based on validated and contrasted knowledge (Pérez Tornero et al., 2018).

Despite such an adverse context, the reality is that the development of media competence in students or teachers as it is currently approached, i.e. in isolation, without being integrated into a pedagogical model and a more general educational context (Petterson, 2018), is not able to respond to such social challenges on its own (Castañeda, Esteve and Adell, 2018). Even in virtual learning contexts, the development of environments and materials that address the educational process from an educative perspective, by promoting the training of new competent researchers in a complex and changing context, is still not frequent (Osuna and López, 2015).

It will, therefore, be necessary to understand media literacy education as part of a model that has broader educational aims, committed to universal access to information and knowledge through the pedagogical treatment of all the elements that make up the teaching-learning process in formal contexts.

### **2.3 Digital Open Educational Resources in digital and media environments**

It is precisely this pedagogical vision that situates Open Educational Digital Resources (OER) as one of the integrating strategies offered by academic literature for the acquisition of digital and media competence through the production, use, reuse and development of training programmes based on these freely and universally accessible resources, which also emerge as an element of cohesion between research and educational practice (González-Pérez, Ramírez and García-Peñalvo, 2022) in higher education. Thus, universities are placed in a privileged position from which to produce, distribute, evaluate and promote open educational materials generated from research, while at the same time giving the academic community the responsibility to participate in decision-making on the necessary changes in the use of digital technology, the communication of knowledge through social media and online education (Czerniewicz et al., 2021). Furthermore, it brings important benefits to these institutions in the field of international collaboration and cooperation through open knowledge, sharing in an increasingly internationalised context (Nascimbeni et al., 2021) where accreditation of collaborative knowledge building becomes an important quality factor.

Consequently, an increasing number of higher education institutions are interested in promoting training in the use of OER through courses for the certification of competences or programmes for learning open educational practices (Marín et al., 2022; Schön et al., 2021). However, despite the growing interest, in the European context, teachers' lack of knowledge about OER is still the main obstacle to their use (Otto, 2021).

In a formal meaning, OERs are nothing but educational resources in digital format that aim to intervene in teaching-learning processes through research and with open access (Rodríguez-Aguilar et al., 2022). They, therefore, have an open copyleft licence that allows free use and adaptation, respecting the copyright and recognition of the creator, but at no cost to those who use them (UNESCO, 2019). This is of fundamental importance for equal opportunities in contexts of segregation and educational exclusion of students due to economic issues (Hilton, 2020; Ren, 2019; Hilton, 2020; Ren, 2019)).

In Spain, since the approval of the European DigCompEdu Framework, the production of OER must follow a universal access criterion, not only in the technical sense that allows access to the files containing the educational material, but also in the pedagogical sense. In other words, all the students at whom it is aimed (Rubio Pulido, 2022) must be allowed to have access to the knowledge that the material is intended to facilitate (Rubio Pulido, 2022). In this way, OERs are an instrument accessible to all which can promote the academic literacy of higher education students and thus facilitate their task of understanding and producing their own academic texts (Núñez Cortés and Errázuriz Cruz, 2020).

The user/student has a special role in the creation of OERs. They should not limit themselves to receiving or consuming a product uncritically, but rather the philosophy of this type of resource gives them the

potential to contribute improvements through feedback processes, thus establishing a relationship of improvement in the quality of the available resources between the academy, which generates the knowledge, and the student, who validates and improves it based on experience (Manrique-Losada, Zapata and Arango, 2020). Something similar occurs with teachers who wish to include these resources in their educational practice, who must employ a more demanding paradigm shift in research and qualitative analysis in the selection of educational resources (McBride & Abramovich, 2022).

From this perspective, it should be considered as a defining characteristic of these resources that they should have a pedagogical component based on inclusion and connectivism (Gómez Marín, Restrepo and Becerra, 2021), so that the instructional conception of the use of educational technology is overcome (Castañeda, Salinas and Adell, 2020) and students have resources with which they can interact and, in turn, reach other resources in a variety of formats that allow them to access the same information from other formal perspectives, or to continue expanding their knowledge by accessing the vast network of information sources that are within their audience. It is resources with these characteristics, those that manage to be flexible and adapt to the needs of the students, that have the capacity to generate collaborative and diverse learning contexts (Castro Rodríguez, Rodríguez and Peirats, 2017).

It is also important that these resources have a unified character, that they be constantly available in repositories for consultation, as well as the involvement of teachers with these types of resources to take advantage of their full potential for use, not only in online environments, but especially in hybrid environments (Trujillo Sainz, 2020).

### 3. Method

The objectives of the research were twofold. Firstly, the research aimed to develop a questionnaire that allowed a valid and reliable evaluation of the materials designed for the learning and acquisition of Digital Teaching Competence. Then, and once the designed questionnaire had been validated, the second objective was to determine the suitability of the designed materials in order to know the most relevant characteristics of some digital educational material to be considered innovative by its users.

The production of the OER materials subject for evaluation were co-created by teachers and researchers from Universidad Rey Juan Carlos (Spain), Universidad de Almería (Spain) and Universidad Telemática Internacional UNINETTUNO (Italy). The pedagogical criteria used for the design of the materials were Universal Learning Design, Educommunication-based assessment and connectivism.

The materials were hosted on the project website and are permanently available for consultation and download (Figure 1); WebQuests, concept maps, eBooklets and slides are available. In addition to having free access to all the materials, the participants in the evaluation of the resources attended the presentation of the materials in person at Universidad Rey Juan Carlos.

Figure 1: EU-TeachPaaS Certification Centre

## EU-TeachPaaS Certification Centre

Follow the training content available on the tabs and get certified!

We are more than happy to support you at any point.


Write us at [eu-teach@ual.es](mailto:eu-teach@ual.es) in case of any trouble

STEP 1: REGISTER

STEP 2: GET TRAINED

 Digital certification for students

 Digital certification for academic staff

 Digital certification for administration staff

Source: <https://teachpaas.eu/>

For the evaluation and validation of the materials, the Open Educational Digital Resources Evaluation Questionnaire (OEDREQ) was chosen as an instrument, developed ad hoc based on the selection of a series of quality parameters, both pedagogical and technical (Colvard, Watson and Park, 2018; Pinto et al., 2017), which OER must have and which were established as variables of the study:

- Degree of usefulness.
- Degree of innovation.
- Degree of adaptation to needs.
- Quality of content.
- Quality of design.
- Presentation of information.
- Ease of use of information.
- Level of interaction.
- Motivation.
- Quality of evaluation.

The questionnaire was designed in digital format and the data collection was carried out with the Google Forms tool (Mellado-Moreno et al., 2022). For the answers to the questions that make up the variables, a Likert-type scale was used with a response interval of 1 to 5, where 1 means that the person is very dissatisfied with that aspect of the materials, and 5 means that they are very satisfied.

For the selection of participants, a non-probabilistic sampling was carried out amongst Spanish undergraduates and teachers of the Primary Education Degree. Students and teachers of this degree were chosen because of the enriched vision they could bring to the evaluation of the resources created, being able to mobilise the theoretical and practical knowledge they had and, as a result, contribute to the research with higher quality data and an evaluation from an educational perspective.

The target population consisted in 502 participants, of which 288 participated actively, distributed between 223 students (77.4%) and 65 teachers (22.6%). Therefore, the participation rate was 57.4%. All the data collected and analysed are available for consultation and use in open access on the Zenodo platform, a repository of the European OpenAIRE programme. (<https://doi.org/10.5281/zenodo.7111158>).

For the validation and reliability analysis of the questionnaire, a construct validation was carried out by calculating the KMO sample adequacy measure and the extraction of underlying factors, as well as an internal consistency analysis by calculating Cronbach's alpha coefficient (Lacave et al., 2016). For the calibration and validation analysis, as well as for the analysis of the results, the IBM SPSS statistical package was used.

#### 4. Results

Firstly, to determine the reliability of the OEDREQ questionnaire, Cronbach's  $\alpha$  was calculated for the total and for each item if it was suppressed, obtaining a value of .853. None of the items improved the value with their suppression, thus, it was decided to continue the analysis with all the initial variables.

Next, the construct validity of the instrument was confirmed through the calculation of the sample adequacy mean (KMO) with a value of .865 and with a significance level of Bartlett's test of sphericity with a value of .000. As a last test, the extraction of factors was carried out using the principal component analysis method, which provided only 2 factors with eigenvalue greater than 1 which group and explain 58% of the variance.

Once the reliability and validity of the questionnaire had been checked, we proceeded to the frequency analysis of each of the variables. The results show a high degree of satisfaction in all the aspects about which the participants were asked (Table 1). All the variables obtained an average higher than 3.7 out of 5, and half of them showed values higher than 4.

**Table 1: Frequency analysis of the OEDREQ questionnaire variables**

	Mean	SD
Did you find the course useful? (USEF)	4,27	,638
Did you find the course innovative? (INNV)	4,11	,782
Did the course suit your needs? (STND)	4,01	,747

	Mean	SD
Quality of content (QLCT)	4,20	1,022
Quality of design (QLDS)	3,93	1,162
Presentation of information (PINF)	4,01	1,114
Ease of use of information (EINF)	3,94	1,287
Level of interaction (ITRC)	3,78	1,115
Motivation to follow the content (MTVC)	3,87	1,151
Quality of evaluation (QLEV)	3,93	1,231

Source: Own elaboration

The greatest strengths shown by the evaluated resources focus on the usefulness (USEF) of the resources for teaching and learning digital and media competences in higher education on the one hand, and the quality (QLCT) of the available co-created content on the other hand. Notwithstanding, the educational materials evaluated have shown worse results when the participants were asked about the interactive level of the resources (ITRC) and their ability to motivate them (MTVC).

In the analysis of the correlations between variables, the Pearson correlation coefficient ( $r$ ) was obtained, taking into consideration those strong correlations that yield a coefficient greater than  $r = 0.5$ . By this criterion, correlations were found between three groups of variables, which are shown in Table 2.

**Table 2: Analysis of correlations between questionnaire variables**

	USEF	INNV	STND	QLCT	QLDS	PINF	EINF	ITRC	MTVC	QLEV
USEF	1	,514*	,577*	,313	,205	,282	,146	,376	,313	,286
INNV	,514*	1	,516*	,322	,208	,235	,165	,434	,267	,265
STND	,577*	,516*	1	,302	,343	,344	,255	,372	,351	,278
QLCT	,313	,322	,302	1	,485	,418	,427	,377	,395	,396
QLDS	,205	,208	,343	,485	1	,528*	,356	,329	,475	,474
PINF	,282	,235	,344	,418	,528*	1	,433	,422	,479	,600*
EINF	,146	,165	,255	,427	,356	,433	1	,422	,428	,420
ITRC	,376	,434	,372	,377	,329	,422	,422	1	,350	,515*
MTVC	,313	,267	,351	,395	,475	,479	,428	,350	1	,478
QLEV	,286	,265	,278	,396	,474	,600**	,420	,515*	,478	1

\*. Correlation is significant at the 0.05 level (bilateral) and  $r$  value  $>0.5$ .

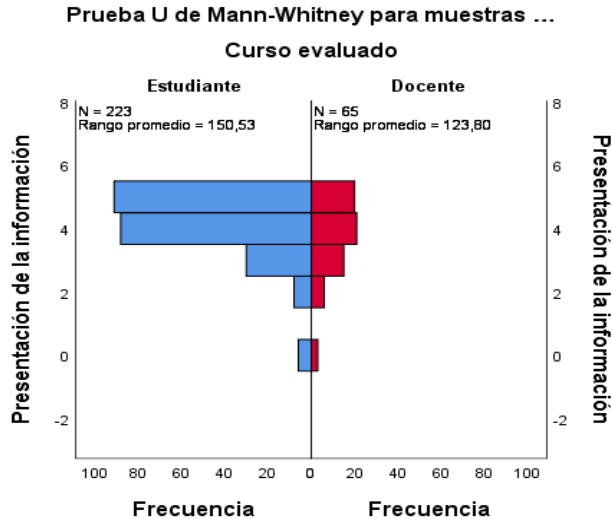
Source: Own elaboration

Firstly, a group of variables with strong correlations between them (USEF - INNV - STND) can be observed. The correlation between this group of variables makes it possible to define a triangle of qualities of quality EWRNs such as usefulness, innovation and adaptability, with both qualities needing to be present simultaneously.

Secondly, a strong correlation is found between the quality of the design of the materials and the way in which the information is presented (QLDS - PINF). Subsequently, the data also report a correlation between the quality of the assessment with the ease of use of the information and the ability to interact with the content (QLEV- EINF- ITRC).

Finally, a comparison was made between the student and teacher populations (Figure 1). For this purpose, the Mann-Whitney U test for independent samples was used, obtaining as a result that it is only possible to reject the null hypothesis in the PINF variable, where the mean satisfaction of the students (3.97) shows a significant difference with an asymptotic significance of .015 with respect to the mean of the teachers (3.85).

Figure 2: Mann-Whitney U-test for the student and teacher populations on the PINF variable.



Source: Own elaboration.

Therefore, there is a significant difference in the way students and teachers have evaluated the materials in terms of the way the information has been presented.

## 5. Discussion of results and conclusions

The European Union is focusing on curbing disinformation through two instruments: communication and education. An example of this is the Code of Best Practices on disinformation which, in addition to proposing the demonetisation of fake news and guaranteeing transparency in political advertising, it focuses on empowering users to deal with this phenomenon. In parallel, European education policies have focused, in recent years, on making and updating recommendations on digital and media literacy in the face of the challenges of a society increasingly mediated by information and communication technologies, promoting the development of digital and media skills. This has led to the co-creation of open digital educational resources that also serve to build bridges between academic research and educational practice. OERs are, thus, presented as a resource and, at the same time, as an educational methodology under the principles of universal access and dissemination.

In response to the first objective proposed in this work, the ability of OER to be evaluated and validated by those who have to use them in order to learn and/or teach digital technologies is demonstrated, as well as the positive impact of an interactive design based on inclusion and connectivism on their assessment. In addition, a questionnaire called OEDREQ is offered; it provides a robust validity and reliability, based on ten variables, which can be easily replicated in subsequent studies that aim to assess the quality of other OER materials in order to test their validity and reliability in pilot tests.

With regard to the second objective, the data collected indicate that the materials developed in the EU-TeachPaaS project have achieved a reasonably high level of satisfaction on the part of the participants, with the results of all the evaluation variables in the fourth quartile (>75%), which highlights the perception that the material is useful for the achievement of the proposed objectives, and that the contents are of the desired or expected quality. However, it should be noted that the evaluation of the materials indicates some weaknesses that need to be considered. Despite the variety of formats in which the information is presented and the variety of elements that allow interaction with other content available on the network, the interactive capacity of the resources has been revealed as one of the aspects least valued by the participants. The same applies to the ability to motivate the participants which, together with the interactive level of the resources, should be reviewed in future studies that aim to develop materials related to digital and media competence in higher education.

The study also indicates a number of interactions between the evaluation variables that are of interest to the area of OER evaluation. The USEF - INNV - NCS D correlation gives a broader sense of what can be considered as innovative OER materials. This correlation points to the importance of the materials being perceived by the participants as useful and adapted to their needs in order to be considered innovative, beyond the fact that the design or format of the contents may employ more or less innovative techniques.

Similarly, relationships are identified that indicate, on the one hand, the relationship between the way in which OER information is presented and the perception of the quality of its design and, on the other, how the quality of the evaluation of the courses in which OER is used can be affected by the perception of the ease with which the information is accessed and the level of interaction with it. This coincides with the perspective of critical dialogical Educommunication (Bermejo-Berros, 2021), which shows the need to establish dialectical dynamics that help the understanding of the material so that it can be considered adequate and generate significant learning in the students.

The last element of interest in the results of the study is precisely this perception of the ease with which information is accessed. The materials evaluated were more accessible for the students than for the teachers, with a significant difference between the two populations, probably due to the fact that authors such as Mariscal Vega, Reyes and Moreno (2021) suggest that there is a relationship between the age of the teacher and the level of digital and media competence. Consequently, the need to adapt the format according to the student-teacher roles should be assessed, so that the teaching profile is not harmed by the design of material aimed at students that is not adequately adapted to their level of competence.

Finally, it should be noted amongst the limitations of the study that only Spanish students and teachers have been evaluated. Since the material was designed and co-created by different European partners, the evaluation should be extended to other countries. Hence, the conclusions presented here may show a bias derived from a sample of a single nationality considering that there are initial differences in the digital and media competence of European higher education students (Llorent-Vaquero, Tallón-Rosales and de las Heras Monastero, 2020). In this sense, in studies such as that of Hillman et al. (2021), North American students highlight the better availability and ease of use of OER as their main qualities, whereas others highlight the importance of adapting them to the needs of the students (Cozart, Horan and Frome, 2021), which requires personalised adaptations and the availability of tools to evaluate the adapted materials (Kotsopoulos, 2022), such as the OEDREQ questionnaire.

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## 7. Specific contribution of each signatory

Contributions	Signatory
Conception and design of the work	1 y 2
Documentary search	1 y 2
Data collection	1 y 2
Critical data analysis and interpretation	1 y 2
Version review and approval	1 y 2

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