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Eliciting Complex Thinking Through Open Educational Resource Projects

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Abstract

Since the COVID-19 pandemic, the use of Open Educational Resources (OERs) has increased due to its advantages for academic activities and educational quality. Hence, Higher Education Institutions (HEIs) have sought to develop strategies to promote curricular and extracurricular activities that favor developing disciplinary and transversal competencies such as complex thinking and its meta-competencies: critical, systemic, scientific, and innovative thinking, oriented to favor problem-solving among students and the academic community. The main objective of this study was to analyze how using OERs in virtual education can promote the development of complex thinking as a transversal competency in higher education. We analyzed the content of 65 educational projects in a webinar aimed at promoting the adoption of OERs in the professional practice of the educational community. Each project had to comply with specific requirements, from the project's identification and description to measuring and evaluating the results and its impact and added value. Once all the projects were reviewed, the responses were classified into defined categories for better presentation; the sub-competency of complex thinking promoted by each project element was identified qualitatively. The results highlight how an OER can, through concrete activities, elicit complex thinking and its sub-competencies in higher education. The present study adds new evidence to the literature regarding boosting OERs as a tool to develop competencies aligned with UNESCO recommendations and contribute to fulfilling the Sustainable Development Goals in education.

Keywords: *Complex Thinking, Open Educational Resources, Higher Education, Educational Innovation.*

Introduction

The quality of higher education depends on the resources, activities, teaching, and institutional practices carried out, which have become more relevant after the COVID-19 pandemic due to the growing adoption of hybrid, virtual, and distance education modalities. In this context, Open Educational Resources (OERs) are a viable option to favor student learning and developing transversal competencies. In general terms, OERs refer to those tools that allow access to teaching

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materials from any place at any time with internet access. According to Murphy (2013), open educational resources and open education practices can lower costs, increase students' participation in higher education, and boost access to new knowledge for different people worldwide. All of this innovatively, enhancing various multimedia tools, software, and information communications technologies, allows the production of new content and material to complement educational processes (Abdulrahaman et al., 2020). That is why higher education institutions are more interested in open educational resources and practices; however, several challenges must be overcome to achieve their potential including criteria associated with coverage, such as rurality, infrastructure, and especially economic and political issues that are still timidly addressed by governments' policies worldwide (Ramirez-Montoya, 2015; Herrero-Olarte & Baena-Rojas, 2022).

The United Nations Educational, Scientific and Cultural Organization (UNESCO, 2019) established a series of recommendations for using OER, understood as materials for teaching, learning, and research that can be in any medium, digital or otherwise. The main characteristic of OERs is that they are public or released for access under an open license that allows an approach at no cost to the user. As essential elements of the educational structure, OERs represent an approach to innovative educational modalities.

In the same way, Urquiaga et al. (2018) consider that OER can innovate the traditional structures of education, as they open the opportunity for the community of teachers and students to have dynamic, interactive, and flexible materials that facilitate access to knowledge in a self-taught or guided manner. OERs favor innovation in the various education systems because they allow reformulating the principles under which it is possible to build education and, in turn, influence its different spheres, especially in universities and virtual environments (Menzli et al., 2022; Wilson, 2018). The use of various OER components has increased in the day-to-day educational endeavor (Hilton, 2019; Joosten et al., 2020).

Similarly, complex thinking considers meta-competencies that contribute positively and differentially to students' development of problem-solving skills and their optimal performance in different scenarios. Thus, it is possible to say that complex thinking comprises several elements involving different domains and is relevant to teaching and learning processes (Du, Su, & Liu, 2013; Suárez-Brito, et al., 2022; Baena-Rojas et al., 2022). But how can OERs favor complex thinking in higher education? This paper describes the impact of an educational resource on

promoting open educational practices and how it contains the elements for developing complex thinking as a competency.

In this manner, the current paper describes different elements that shape an open and online educational activity and how this relates to the development of specific meta-competencies in a concrete, systematic and structured way. As a result, complex thinking is boosted as an essential construct for creating and developing new strategies that foster problem-solving in students and the higher education community.

Theoretical Framework

Open Educational Resources for the Development of Complex Thinking

Open Educational Resources (OERs) have been booming due to their advantages to teaching-learning environments. Among them is their free access due to the open license that supports them, which allows their use, adaptation, and redistribution without limitations or restrictions and with an interdisciplinary perspective (Bagchi, 2022; UNESCO, 2017; 2019; Tang, 2021). Miao and collaborators (2020) also mention that OER's digital formats facilitate their reuse, sharing, and adaptation to any educational environment because they can be presented in open textbooks, complete online courses, audio files, illustrations, animations, and other means. Because of this, OERs can increase the quality of education at different levels.

The innovative nature of OERs and their scope contribute to the educational quality demanded by present and emerging technological innovation. UNESCO (2019) proposes that integrating OER in educational policies and practices from primary to higher education allows their full potential to achieve quality education at all levels of teaching-learning, which is directly linked to the fulfillment of the specific targets of Sustainable Development Goal 4 (SDG 4) in terms of quality in educational environments and equal access for all (UN, 2022a). Educational sustainability, promulgated by the Sustainable Development Goals (SDGs) (UN, 2022b), requires innovation in open teaching-learning environments through virtual platforms that add value to education, reduce implementation costs, and increase access (García-González & Ramírez-Montoya, 2019; Ramírez-Montoya et al., 2022).

In the same way, Miao et al. (2020) consider that the quality of free access to OERs allows their coverage on a large scale, also encouraging creative use by teachers and students, which impacts not only educational environments but also organizational contexts, and people's lifelong learning (Trust et al., 2022). This is why the use of OERs at all levels of education is one of the critical implementations to improve educational quality.

The characteristics that define OERs make them especially attractive for use in higher education as adjuvants in the teaching-learning processes due to their easy access, diversity of materials, cost reduction, reach to a greater number of students or users, and positive impact on academic performance and the development of disciplinary and transversal competencies (Guijosa, 2018; Tang, 2021; Rodés and Motz, 2022; Vázquez, 2019). González-Pérez and Ramírez-Montoya (2022) propose that current educational paradigms must include developing holistic competencies that integrate technological tools and learning strategies with the appropriate technology to build such competencies in students. Likewise, the authors propose thinking skills, knowledge application, research practices, and the promotion of digital skills as teaching categories for the development of particular competencies in students, especially complex thinking, one of the most relevant in recent years, which can be developed through different strategies such as using OERs (Vázquez, 2019).

Complex thinking refers to acquiring multidimensional knowledge, a way of thinking seen as a union between unity and multiplicity (Morin 1990; Lipman 1997). Silva (2020) states that in the different proposals on complex thinking, there are similar characteristics regarding its construction as a type of thinking that approaches knowledge from multidimensionality and applies interdisciplinary, multidisciplinary, or transdisciplinary methods.

In turn, Ramírez-Montoya et al. (2022) see complex thinking as a mega-competency composed of the meta-competencies of critical, systemic, scientific, and innovative thinking, which favor solving problems in complex environments, both in the classroom and outside it. Each meta-competency has particular aspects; critical thinking implies conceptualizing, applying, analyzing, synthesizing, and evaluating information acquired or generated through observation, experience, reflection, reasoning, or communication. For its part, systemic thinking involves the development of analysis and understanding of complex global phenomena by students; innovative thinking involves creative capacity and the generation of disruptive proposals, and scientific thinking is a

higher-order process that allows students to face the era of global competencies with evidence-based problem-solving (McGillivray et al., 2016; Ramírez-Montoya et al., 2022).

Thus, some critical student skills must be developed in higher education, for instance, complex thinking to realize students' competencies development and human potential and the capacity for innovation to solve new problems to succeed in this rapidly changing and competitive world. Another relevant skill in students must be creative behavior. The latter, usually boosted for complex thinking, contributes to the quality of life, as feelings of satisfaction and pleasure usually accompany creativity. Some studies affirm that students' skills do not happen only inside people's heads but result from the interaction between their thoughts and the sociocultural context. In this regard, there is no doubt that improving student skills is a viable educational goal. In higher education, the importance of fostering students' skills, especially creativity, has been widely recognized due to the need to prepare young people for the uncertain and complex world of work, which requires individuals to use their different abilities (Silva, 2020).

Thus, developing different skills and abilities in higher education students does not just depend on the teacher's role or how HEIs plan their teaching processes. This entire complex process also relies on access to tools usually provided by the education system, which depends on governments and specific international organizations. That is why the OERs as resources require the effective intervention of these last stakeholders; then, the OERs can effectively promote creativity and various competencies in higher education students (Cinque, 2017; Van Allen & Katz, 2019).

In sum, it is possible to establish that OERs are based on licensing, publishing, and sharing research data, as some universities and professors relinquish these patents sometimes. The OERs can represent years of research developing the software or devices that impact higher education as tools. However, some institutions depend on government support or international organizations' funds. Therefore, raising awareness and understanding of what is possible in higher education through OERs is relevant but not easy, particularly if the international community does not develop policies to achieve this purpose (Hatzipanagos & Gregson, 2015).

The main objective of this work was to analyze how the use of OERs in virtual educational contexts can promote the development of complex thinking as a transversal competency. Specifically, we were interested in answering the following research question:

Which elements that comprise Open Educational Resources promote skills characteristic of the meta-competencies of critical, systemic, scientific, and innovative thinking in students and the higher education community?

Method

3.1 Participants

The study's participants were 65 education professionals, 53 females (81.5%) and 12 males (18.5%), from 13 countries.

Figure 1 shows their geographical distribution, with a greater concentration in America (mainly in Mexico and Paraguay) and Spain as the only European country (Argentina n=1; Chile n=2; Colombia n=5; Costa Rica n=1; Dominican Republic n=2; Ecuador n=3; Guatemala n=1; Mexico n=35; Paraguay n=10; Peru n=1; Spain n= 2; Venezuela n=2).

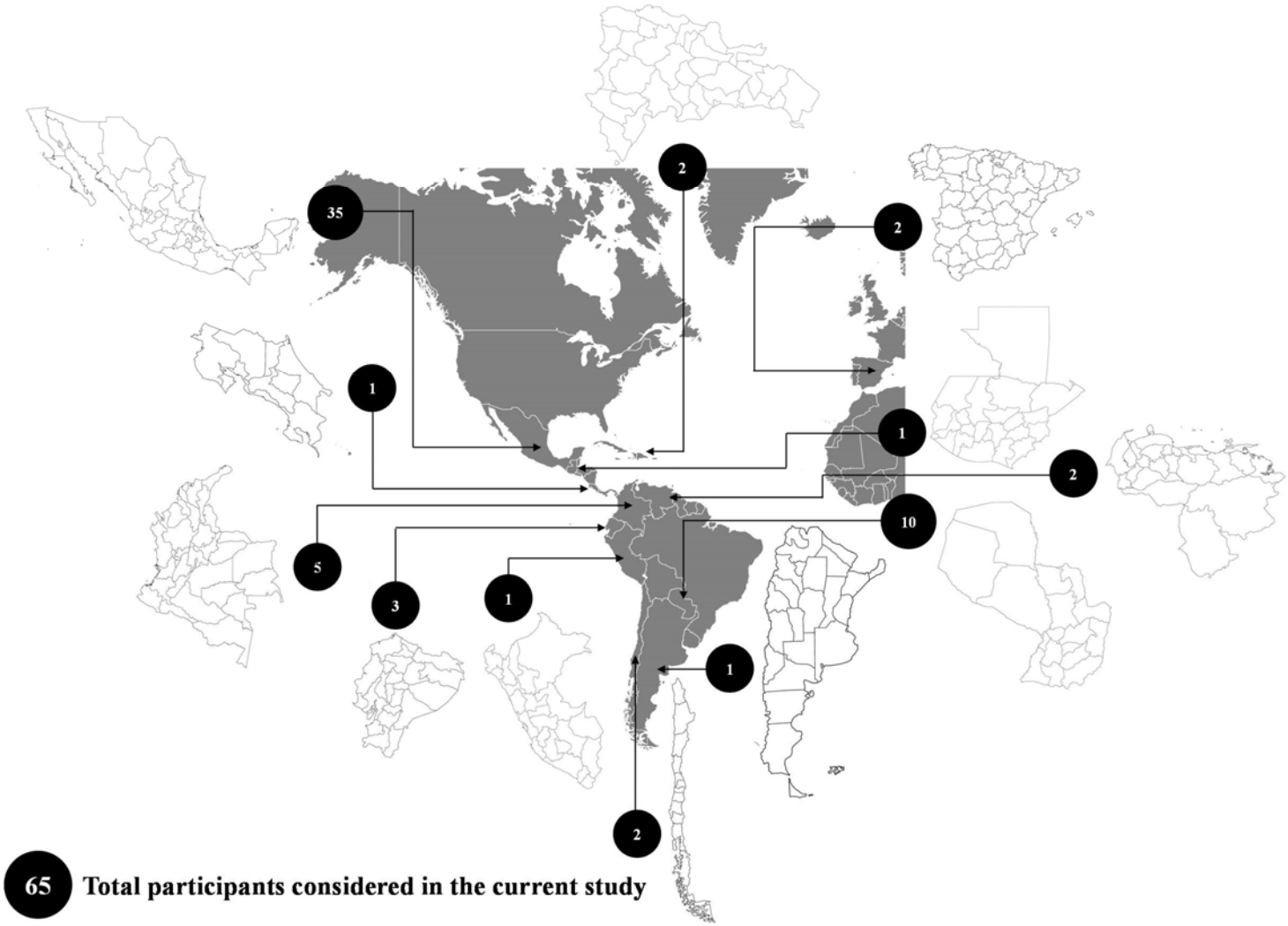


Figure 1.
Geographical distribution of the participants of the webinar "*Elaboración de plan de ruta para la adopción de Recursos Educativos Abiertos*".

(Elaboration of a roadmap for the adoption of Open Education Resources) imparted by oeSTEAM Lab (2022), during March 2022.

Regarding the professional characteristics of the participants, the highest percentage reported being teachers (38.5%), followed by professionals with a bachelor's degree (30.7%) and academicians (20%). Other professional profiles were participants with a master's degree (3.1%), researchers (1.5%), and students (6.2%). The educational level attained by the participants mainly was graduate (61.5%), followed by a bachelor's degree (27.7%) and high school (10.8%).

We analyzed the content of 65 educational projects carried out by the participants within the framework of the webinar "Elaboration of a roadmap for the adoption of Open Educational Resources" Parts 1 and 2 (WUN_UNESCO, 2022) included in the project "oe-STEAM Lab-Community STEAM OER Latam (oe-STEAM Lab, 2022). This project "*…seeks to cooperate and facilitate the transition of the NETWORK STEAM Latam towards the STEAM-OER-LATAM Community, with the collaboration of Siemens Stiftung, TEC (Tec District and Institute for the Future of Education), and the UNESCO OER Latam Chair, aimed to promote open education in STEAM Territories*" (oe-STEAM Lab, 2022). The overall webinar project consisted of the main session plus a series of nine webinars (including the one analyzed here) focused on promoting good OER practices in higher education, with the participation of prestigious researchers from Chile, Mexico, and Germany as speakers.

The particular objectives of the webinar were:

- To promote awareness of OER known and make their advantages visible.
- Develop capacities for the use of OER.
- Strengthen a STEAM-Mexico community for Latin America through scientific dissemination.
- Implement OER in vulnerable communities.

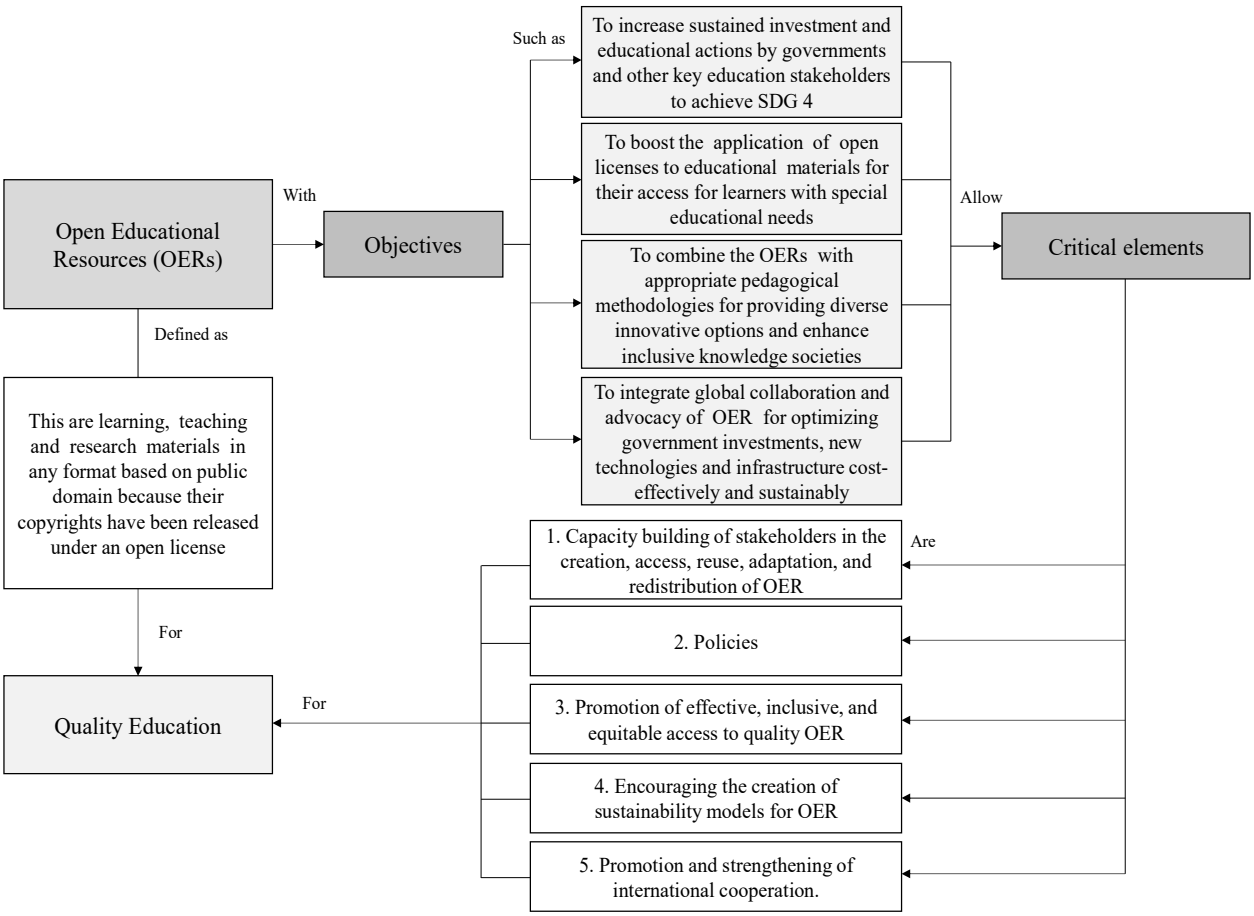
During the webinar, reviews were done on teacher training for developing skills or competencies necessary for using OER at different educational levels through workshops, courses, and webinars. The projects were linked to educational inclusion and the increase in coverage and were carried out through public, innovative and non-profit programs through governmental, business, foundations, academia, and others, both nationally and internationally. Therefore, different projects were presented as examples, such as the Blended Experiment (EB, 2022), designed under a blended-learning model for use, co-design, and interdisciplinary adaptation of OERs in Latin

America in different contexts involving energy and environmental issues during the emergency of the pandemic period, and the OportUnidad project, which considered the use of OERs in higher education (Hernandez & Sandoval, 2016).

The second session of the webinar reviewed the conceptions of OERs, their processes, structure, generalities, and examples of their uses. Likewise, the practical guidelines on Open Education were analyzed: access, content, pedagogy, collaboration, and research (open science, open access, open data), which is associated with the correct use of the characteristic license of OERs, i.e., open licenses, which make possible the proper development of such guidelines.

3.2 Description of the activity

During the webinar just described ("Elaboration of a roadmap for the adoption of Open Educational Resources"), a practical activity was designed to generate projects using OERs, which was the object of analysis of the present work. As requirements, the projects generated had to be contextualized in one of the five Critical Elements of the Recommendations for OER generated by UNESCO (2019). (See Scheme 1 below)



Scheme 1.

Critical elements and recommendations for OERs. (Source: Own elaboration).

Similarly, to ensure the materialization of all these initiatives, it was essential to consider some additional items as well:

1. Stakeholders' capacity in the creation, access, reuse, adaptation, and redistribution of OER.
2. Development of support policies.
3. Promotion of effective, inclusive, and equitable access to quality OER.
4. Encouraging the creation of sustainability models for OER.
5. Promotion and strengthening of international cooperation.

3.3 Data analyzed

The elaboration of each project was reviewed for compliance with the following points related to the sub-competencies of complex thinking:

Critical Thinking

1. Identification of those responsible for the project.
2. Description of the project.

Systemic Thinking

3. Explanation of what it contributes, its benefits, and potential impact, in alignment with the Recommendation on Open Educational Resources - OER generated by UNESCO (2019).
4. Synthetic objectives of the project.
5. Target.
6. Need, problem to be solved, and motivation for creation.

Innovative Thinking

7. Innovation.
8. Strategic analysis.

Scientific Thinking

9. Expected results.
10. Approach to evaluate the results.
11. Impact and added value

To present the information contained in each project, regarding the eleven points mentioned above, we verified that each project complied with points 1, 2, 3, 4, and 11; the other elements were classified as follows:

- 5. Target: Teachers, students, students with disabilities, school community, high school, children and adolescents, and the category of "other."
- 6. Need or interest in the following areas: Academic, government, industry, or social contexts.
- 7, 8. Innovation and Strategy: The project contemplates using ICTs, face-to-face interactions, OER, social media, virtual modalities, and "other" strategies.
- 9. Results: The project results manifest in an action, an interest, a product, or the specification of an update and development.
- 10. Approach for evaluating results and impact: The project states a qualitative, quantitative, mixed, or other methodology.

The two sessions that made up the webinar were conducted synchronously, leaving the record open for later consultation (WUN_UNESCO, 2022a; 2022b), while the project activity was conducted asynchronously by the participants. Deliverables were collected through a web form, and all data were treated confidentially under the ethical guidelines of the research.

Lastly, it is essential to consider the potential impact of new models of higher education, particularly those depending on OERs, which can be based on a complex thinking model to assess likely barriers and outcomes in a specific context within higher education systems. Therefore, although OERs may benefit students, complex accreditation systems in higher education usually require funding sources. This is the existing status quo with HEIs, which require broader international cooperation and engagement to promote changes in the current educational systems, precisely OER initiatives (Marshall, 2012).

Findings

Each participant presented a project, so we analyzed the content of 65 contextual projects aimed at promoting and using OER. We observed that all the projects had the elements of the Critical Thinking sub-competency in identifying those responsible, describing the project, and including a Statement of Impact and Added Value.

Regarding Systemic Thinking meta-competency, all projects identified a Critical Element. More than half of the projects (55.4%) were aligned with Critical Element 1, *Capacity building of stakeholders in the creation, access, reuse, adaptation, and redistribution of OER*, followed by Critical Element 3*, Promotion of effective, inclusive, and equitable access to quality OER* (23.1%), and Critical Element 4 *Fostering the creation of sustainability models for OER* (13.8%). Critical Element 5 Promotion and strengthening of international cooperation and Critical Element 2 *Development of support policies had lower percentages* (6.2% and 1.5%, respectively). Figure 2 shows the graphical proportion of the critical elements proposed by UNESCO (2019) in the participants' projects. Also, all participants stated clear and synthetic objectives of their projects.

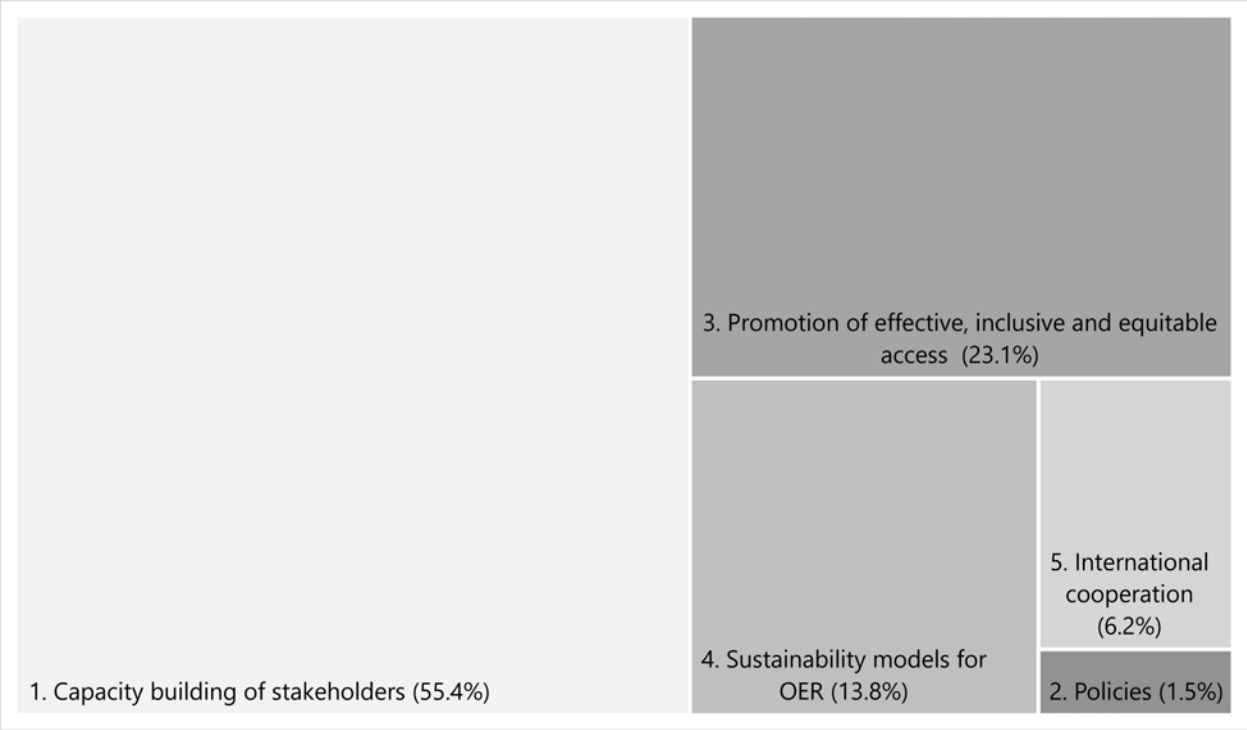


Figure 2.

Proportional representation of participants' projects aligned to the recommended critical elements of UNESCO (2019), presented during the webinar.

The projects targeted different groups and were primarily focused on the school community, involving not only students and teachers but also administrative personnel and managers (29.2%). Likewise, the projects were oriented to address different needs and problems, and we observed a main natural interest in the academic field (81.5%), but there was also incidence in the government sectors (12.3%), and to a lesser extent, in industry and the social sector (3.1% each).

Regarding the sub-competency of Innovative thinking, the type of innovative strategies proposed in the projects consisted of using information and communication technologies (26.2%), face-to-face implementations (7.7%), use of social media (4.6%), virtual modalities (3.1%), and others (27.7%). For Scientific Thinking, each project implied generating a result from the proposed strategy. After reviewing all the proposals, we classified the generation of an outcome proposed in the projects into the following categories: expected action (29.2%), such as carrying out publicity strategies, implementing Open Educational Resources in their institution, using new methodologies, and carrying out training courses; generating (12. 3%) such as using social media

to attract attention and identify actions that help define strategies; realizing a product (15.4%), such as the generation of educational resources and materials; and updating and developing processes (43.1%), such as conducting courses in virtual modality, renewing pedagogical practices, academic clubs and generating networks. Regarding projects' evaluation, most proposed a qualitative methodology (58%) based on satisfaction surveys, training, and focus groups, followed by quantitative approaches (26.2%) using statistics, rubrics, and numerical indicators and, to a lesser extent, mixed methods (15.4%).

Figure 3 shows these data graphically, illustrating the percentages of the target population, the types of strategies the participants proposed to implement in the projects, the type of product or result they proposed to derive from their strategy, and the type of methodology proposed in the webinar projects.

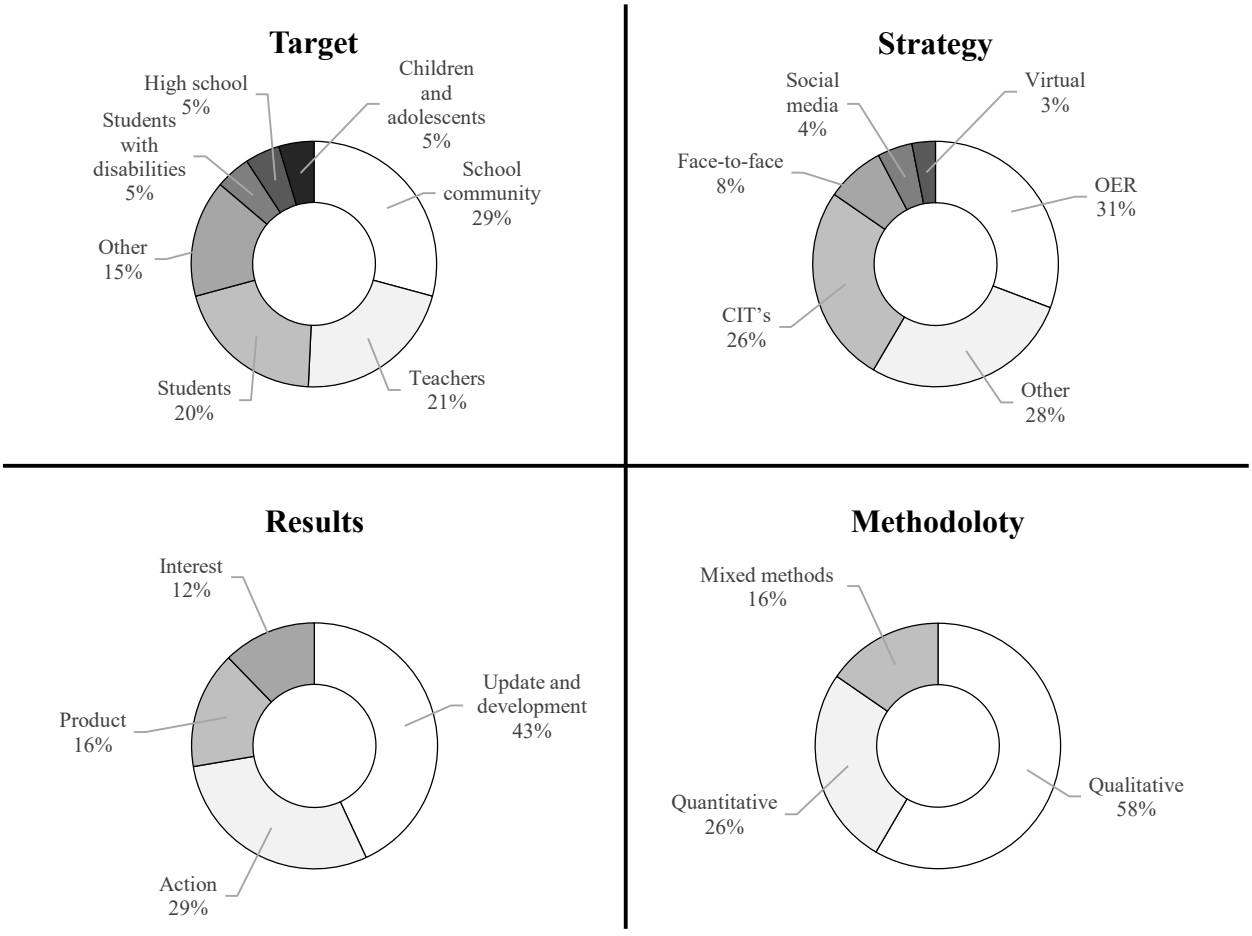


Figure 3.

The percentage of the different groups regarding the population of interest.

This figure includes target, strategy, of result, and methodology as specified in the 65 projects generated in the webinar "Elaboration of a roadmap for the adoption of Open Educational Resources" given by oeSTEAM Lab (2022), during March 2022.

Generally, we observed that most projects directed their efforts to the educational community, implementing OER and ICT, generating update and development results, and using a qualitative methodology. Thus, this section has highlighted the most relevant features of the projects developed during the webinar "Elaboration of a roadmap for the adoption of Open Educational Resources" (oeSTEAM Lab,2022) and their adherence to UNESCO recommendations (2019). In the following section, we discuss these findings and analyze their relationship with the promotion of critical, systemic, scientific, and innovative thinking skills for the potential development of the meta-competency of complex thinking.

Discussion

The research question expressed in this paper highlights the importance of considering OERs in higher education to develop competencies in the school community. In terms of impact, the webinar activity demonstrated the successful promotion of the use of OERs by students and the higher education community, having an international perspective, and aligned to the recommendations of UNESCO (2019) and the SDGs (UN, 2022b), specifically those referring to quality education, equity, and reduction of inequalities (SDGs 4, 5 and 10 respectively).

The webinar activity analyzed comprised various elements considered triggers for putting into practice skills related to the competency of complex thinking due to the structure of its content and the requirements that participants had to meet to complete the activity. Regarding critical thinking, the skill involving conceiving and applying new information is required in the first part of the project requirements, referring to identifying those responsible and describing the project. To carry out the activity, participants had to apply logical judgments regarding a situation or problem and question themselves about existing paradigms or resources in their competency area and how they could be applied to new contexts to carry out their proposals individually (Vázquez, 2019).

Likewise, the fulfillment of these points accounts for the reflective and analytical capabilities necessary to propose the best possible solution derived from observation, reasoning, and reflection, considering the context and target population. Applying these elements that conceive and identify

is an elemental starting point for developing the other sub-competencies that comprise complex thinking, described below.

Systemic thinking, which refers to understanding and analyzing complex phenomena from different points of view, was promoted in the webinar, specifically in points 3, 4, 5, and 6, referring to explaining the contributions, benefits, and impact, as recommended by UNESCO (2019), as well as the approach to achieve objectives and determine the stakeholders. Recognizing correlations between variables and the possible results of these interconnections validates this sub-competency in the academic environment by proposing congruent and orderly solutions framed globally. In this case, recognizing a global framework and the ability to influence a proposal for improvement is given by choosing one of the critical elements proposed by UNESCO for each participant's project. The results showed that most of the participants (55.4%) framed their proposal in Critical Element 1 Capacity building of stakeholders in the creation, access, reuse, adaptation, and redistribution of OER, with a strong emphasis on the educational community. While this result is not unexpected, it is noteworthy that, to a lesser extent, all critical elements were addressed. This shows the impact of the webinar on the participants' performance in exercising holistic skills and systemic thinking to provide solutions to complex situations or phenomena. It is vital to highlight the participants' attention to Critical Element 2 Development of support policies because this is an area that is not frequently addressed in the educational field. It is directly related to the ability to develop objectives in each project.

The objectives were generated following the critical elements recommended by UNESCO (2019), which showed orderly, logical thinking that considers the influence on other actors and contexts, for example, the target to which the projects were directed, a variable in which seven possible target samples included in the projects were observed. As previously mentioned, most focused on the academic community. However, it is worth noting that despite being a higher education webinar, participants were also interested in impacting children and adolescents and students with disabilities. The latter group represents added value because, in addition to focusing on a historically unnoticed and disadvantaged population, it addresses Sustainable Development Goals 4 and 10, Quality Education and Reducing Inequalities. In the same way, innovative thinking regarding creative action and generating disruptive proposals was promoted in the webinar in points 7 and 8, where participants had to highlight the innovations of their proposals and the strategies, they would use to achieve their objectives. Thus, through doing their project, they

generated new ideas, explored different options, and proposed new designs. It is essential to insist that, as a meta-competency of complex thinking, innovation (or innovative thinking) should lead to successful results through new proposals (Ramírez-Montoya et al., 2022). In this sense, this work's results comply with these premises because the projects employed different strategies, among which using OERs and implementing ICTs stand out (31% and 26%, respectively).

In our study, the use of OERs and ICTs had two significant implications: first, the fulfillment of the webinar objectives considering OERs to attend and possibly solve complex problems in higher education, and second, the transforming character of OERs in higher education today. The webinar described in this work contributes to the visibility of open resources as a tool for addressing problems, fostering, in this process, the sub-competency of innovative thinking in the participants in this activity. Notably, the low participants' low percentage of using social media (4%) and virtual educational modalities (3%) in the webinar projects is striking. Derived from what was observed in the results section, we propose that future research and educational implementations consider using social media and virtual modalities not as isolated resources but as complementary tools to engage and motivate the target population.

The sub-competency of scientific thinking was promoted throughout the entire webinar activity, specifically in points 9, 10, and 11 regarding the approach to its results and expected impact. Although scientific thinking is implicit in the activity, these points focus on enhancing it by recognizing the effects of one variable on another within each participant's project and selecting evidence-based methods. Likewise, the method proposed in each project also contributes to the training of scientific thinking by evaluating and defining the methodological approach. This work's results showed a preference of the participants to use qualitative methodologies (58%) over quantitative and mixed approaches, which were congruent with the proposals of each project. Contributing more elements to developing scientific thinking in the proposals analyzed here, the participants used inductive and deductive reasoning bidirectionally to carry out a viable analysis and visualize the effects that their project could have in real scenarios. However, it is essential that in future projects, mixed methodologies should be considered to strengthen the scope of each research project and promote scientific thinking in the participants to more extent.

The attention to sectors other than academia was also a result of interest since a webinar with the characteristics described in this work is also helpful for developing projects that serve the government, industrial and social sectors through innovative proposals. This finding can be an

advantage of educational resources such as a webinar; its main advantage would be acquiring the necessary skills and knowledge for developing a strategic plan to create OERs. Another advantage is that all the material and content presented during the webinar is available in an open-access format, either for replication or as a guide for developing new projects with similar objectives. On the other hand, the possible disadvantages include the brief feedback in resolving questions at the end of the webinars, which would require an extension of real-time to answer all thoroughly, or, as an alternative, the scheduling of extra sessions with that express purpose.

Conclusion and Implications

Developing disciplinary and transversal competencies is one of the main goals of HEIs nowadays. For the educational community to develop these competencies, institutions must implement various strategies in curricular programs and extracurricular activities. To meet these objectives, in this paper, we presented the use of OERs in higher education as an optimal resource for developing transversal competencies such as complex thinking and its respective meta-competencies of critical, systemic, scientific, and innovative thinking. This paper describes how each element that makes up an open and online educational activity relates to developing specific meta-competencies in a concrete, systematic, and structured way.

This paper offers several contributions to promoting complex thinking competencies in higher education and adopting open practices to use OERs. First, the findings of this work contribute to an updated conceptualization of complex thinking competency and serve as an example of a practical strategy based on concrete steps and instructions aimed at developing this mega-competency. Second, this research emphasizes the advantages of using OER over other resources and educational modalities and includes their potential impact and global reach, using few human and economic resources. The case presented here shows that sixty-five projects were generated from a single activity in webinar format to solve a contextual problem using OERs either as a means or as an end. It is expected that all the projects generated from the activity described here will continue their course, impacting their contexts with the characteristics of scalability and sustainability in the long term. Third, the results presented in this work prove that using OERs as tools can generate solutions to complex problems in the post-pandemic context. Although these resources boomed at the beginning of the worldwide COVID-19 pandemic due to the virtual and distance modalities adopted in the educational environment, today, we suggest that they must

continue to be implemented and improved to achieve specific objectives in and out of the classroom. The latter is of great importance because the generation of solutions to problems of different kinds in the educational context positively impacts other sectors, such as industry and government.

Finally, educational strategies globally present a history of trial and error, from which we take those that generate the best results in their context. OERs have been used successfully since before the pandemic and continue to help meet academic objectives from an open science perspective. Developing activities that involve OERs to promote disciplinary competencies and, above all, transversal competencies in higher education optimally impacts solving complex global problems. In this way, the research generated aligns with the recommendations made by UNESCO focused on the fulfillment of the SDGs, specifically those that correspond to quality education, equity, and reduction of inequalities (SDGs 4, 5, and 10, respectively), for the benefit not only of the educational community but also the global population.

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