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Academic Literacy as a Component of Complex Thinking in Higher Education: A Scoping Review

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Abstract

The profound transformation within higher education institutions is increasingly evident. Then, it is considered that education must adapt to meet the needs of qualification and skills development in a 21st century with diverse challenges in problem solving. This is reflected in the role that academic literacy is increasingly taking as a strategy to innovate teaching among university students. The objective of this scoping review is to complete a characterization of complex thinking in both academic literacy and higher education. All this, providing an overview on the central theme and its incidence in the production of relevant literature published in the Scopus database. About 139 research works were considered in the article, which become thematic references for the exercise proposed here. Then, a description of all the works consulted was completed, recognizing mainly their origin, citations, publication, and other aspects that will ultimately be essential to differentiate the term academic literacy from the processes of reading and writing as educational competencies. Therefore, in general, the conclusions indicate that complex thinking has indeed a relationship with academic literacy not only because of the works traced but also because complex reasoning brings together within people a series of skills that facilitate the execution of advanced actions and the solution of problems.

Keywords: academic literacy, complex thinking, reasoning for complexity, higher education, educational innovation, university.

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1. Introduction

Technological advances derived from the different industrial revolutions have led to significant changes in the way companies and societies generate diverse solutions adapted to the circumstances in order to meet certain human needs (Charter, Tischner, 2001). Thus, the generation of new products constitutes not only the basis of contemporary commerce, which can promote the general welfare within the states, but also stands as the most forceful response to the solution of problems. Strikingly, this whole situation is gestated in most cases from the academy, mainly within the higher education system, where subjects acquire various skills and abilities that allow them to become better qualified to respond precisely to the needs of societies in general. It is for all these reasons that governments today are fully aware of how important it is to implement public policies that stimulate different entrepreneurial initiatives among the population. All this because these measures can end up favoring the economic dynamics of the states and therefore can also solve certain problems related to employment, growth, and social development (Ferguson, 2016; Geyer, Cairney, 2015).

In this way, products (goods and services) are not exclusively the result of how a company analyzes the way of doing things and offers customized solutions. It is also the result of how education and the study of sciences allow people to achieve certain skills that allow them, from knowledge itself, to propose innovative solutions such as technical inventions that provide answers to the incessant questions that arise in the evolution of life itself (Meissner, Shmatko, 2019).

It is here then where the relevance and current contributions of complex thinking can be appreciated, since it can explain at a systemic level how the contemporary productive model depends on the capacity of academia and higher education. This is because the training of profiles increasingly suitable to respond to the multiplicity of needs and requirements demanded by societies in terms of solving problems at a technical level (De Roo et al, 2016).

Therefore, it can be said that the various technological, social, and scientific advances have subsequently led to various transformations in society, the economy and business.

This is why the transition of countries with economies based on industry, increasingly tend to reach economies based on information. This scenario is now a reality in which many governments and their companies are seeking to take advantage of training and capacity building opportunities. All this in a global system that is highly dependent on human resources with high quality knowledge and skills for problem solving (Rios et al., 2020).

It can be said that for the contemporary productive model, the training of people as human resources with high specific knowledge and skills is an essential input for the functioning and operability of any productive organization. In fact, globalization itself has promoted the training of these people with the massification of information and the possibilities of mobility. Stimulating successively diverse flexible profiles that are constantly learning, managing information and data, as well as solving complex problems (Van Laar et al., 2020; Marković, 2008).

Consequently, the people of this XXI century have to face unknown, unpredictable and uncontrollable problems. It is for all the above that the circumstances have pushed society to create new professions that did not exist before, which are adapted to the needs of the present (Dishon, Gilead, 2021). Many of these new undergraduate programs in higher education have also been focusing on addressing the various challenges posed by complex situations in different societies. This is the case, for example, of the depletion of natural resources, the future of energy models, possible new pandemics and many other issues including climate change. Precisely regarding this last issue, education proposes a paradigmatic system of sustainability where students develop the ability to think critically about the nature of knowledge and the ways in which knowledge is produced and validated. Therefore, educating for these skills will require changes in educational practice, pedagogy, and new approaches to learning and teaching (Holdsworth, Thomas, 2021).

Thus, within the intricate filigree of elements that can make up the systems of the present, there are strategic skills for the formation of the professional profiles of the future. This is the case, for example, of complex reasoning, which plays a key role in education in general. Given that this is understood as the ability to bring together within people a series of mental skills that facilitate the execution of advanced actions, the understanding of concepts, the use of logic, the ability to create original ideas as well as the decomposition of problems. In other words, complex reasoning within science itself constitutes in higher education a key and indispensable competence for the pursuit of success in the solution of problems in different areas. This is why it is widely linked to intelligence.

This is because those who achieve the development of specific competencies in reasoning for complexity have the ability to harmoniously relate information and data from different sources in order to propose logical solutions (Benferhat, Besnard, 2001; Zeidler et al, 2022).

It is precisely at this point where the central theme of this work takes the expected transcendence. This is because academic literacy in higher education becomes an essential element to promote, not only from reading but from other much more complex skills, all the human potential. Essentially, so that individuals can develop as qualified people from the perspective of knowledge and competence formation (Carlino, 2005; Castelló, 2014). For this reason, it is possible to affirm that within higher education it is vital that students also master certain communicational skills in order to achieve high academic literacy competencies. Precisely because these skills can allow, from written and printed materials as well as multimedia materials, that professionals are not only relating diverse contents to each other; but also renewing their capabilities from the availability of recent information to keep all their knowledge updated to the new realities (Van Deursen, Van Dijk, 2011; Domínguez et al, 2018). In fact, within higher education, academic literacy involves within its raison d'être, the set of notions and strategies essential to participate in the discursive culture within the different disciplines within knowledge. In other words, academic literacy also has to do with the activities of production and analysis of texts essential for learning at the university. It even has to do with all the pedagogical background that impacts the learning process; all of this, considering also practices associated with language and thought, all of which are proper to the scope of a scientific and professional community (Carlino, 2013).

It should also be added that within academic literacy, the role of the curriculum and the way in which institutions of higher education within the academy structure their teaching processes is profoundly important. This is because universities should strive to ensure that students reach a level of awareness that allows them to know how information acquisition processes occur in general. Therefore, students and then professionals must be able to adapt quickly to the changing conditions experienced not only in their fields of action but also in scientific knowledge in general (Khusainovaet al., 2015; Stehle, Peters-Burton, 2019).

In this sense, the main objective of this study is to establish a literature review that investigates the behavior of publications related to academic literacy and higher education in the framework of reasoning for complexity. The consultation of related works will then proceed from Elsevier's Scopus database considering its remarkable and recognized impact at the level of scientific production internationally. In this way, the present study will make a notable contribution to the understanding of the subject in terms of the recognition of the main generating regions of scientific material of this type, outstanding authors, referential works by citation, among other aspects. The above, since not only the most relevant works on the delimited fields are compiled, but also conceptual precisions and outstanding relationships will be established with respect to the subject under study and its incidence in the transformation of professional profiles.

2. Methodology

The present approach to complete this scoping review considers five stages (Arksey, O'Malley, 2005), see Figure 1, where a rigorous process of transparency is implemented, which is emulated in this research in order to ensure the reliability of the results of the study. In any case, it is also important to add that a scoping review seeks within scientific research to outline in a general way the key concepts and terms that make up an area of research (Mays et al., 2001). Likewise, this type of approach, where certain types of scientific publications are analyzed, seeks to recognize the main sources and types of works available in order to characterize a topic at a descriptive level, especially when an area is complex or has not been exhaustively reviewed.

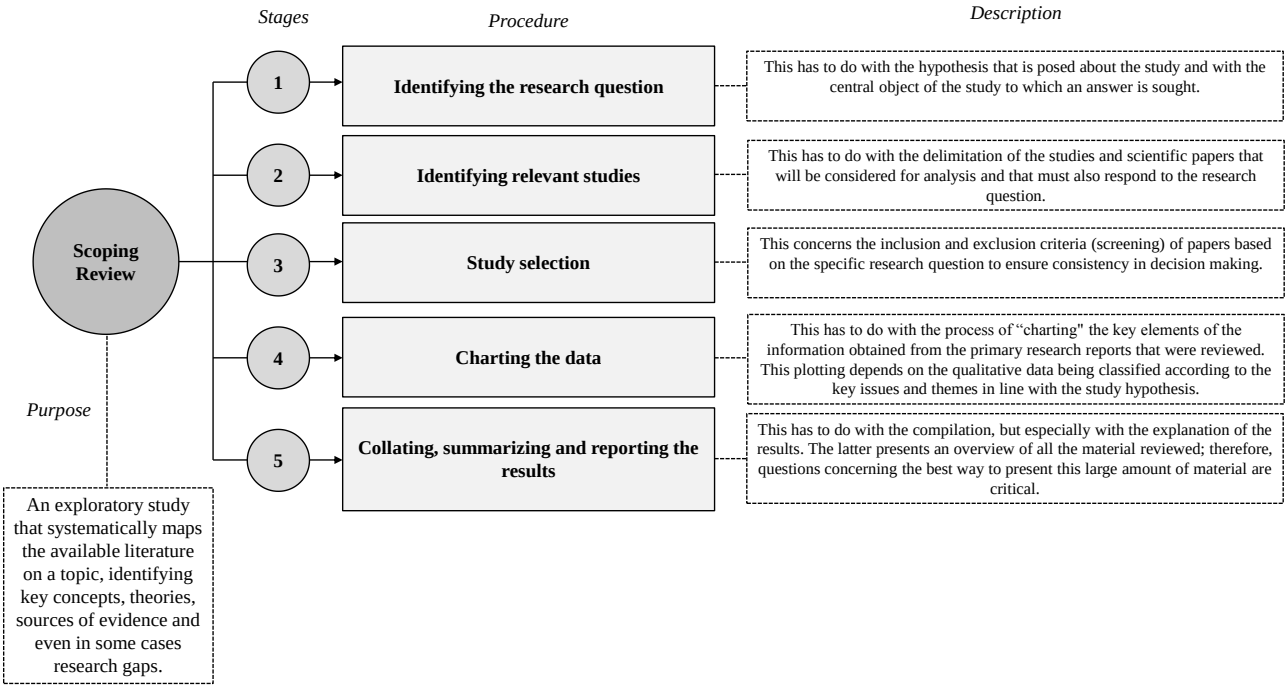

Fig. 1. Representation to carry out a Scoping review
Source: Own elaboration based on Arksey and O'Malley (2005)

In this way, considering a methodology just like this, each stage within this study is specifically delimited by the following basic parameters and research questions (O'Flaherty, Phillips, 2015):

1. Identifying the research question: in this case, the central question is... *what is known about the existing literature on academic literacy in higher education in the context of complex thinking?*

Although they can also be considered complementary questions, supported by the objectives, such as:

- What are the key terms most frequently used in scientific articles in the context of higher education?
- What are the most frequent terms related to the concept of academic literacy?
- What methodological approaches have been used for the study of academic literacy?
- What are the main countries where academic literacy studies have been carried out?
- What is the sample/population in which the concept of academic literacy has been studied?
- What is the impact of publications on the concept of academic literacy?

2. Identifying relevant studies: in this specific case, all the documents related to the central theme according to the search criteria (see Table 1) and keywords, indexed in Scopus, regardless of the period of publication, are considered.

3. Study selection: in this case, papers and studies that are irrelevant because they do not meet the criteria established according to the central theme on complex thinking, academic literacy and higher education are rejected.

4. Charting the data: in this case, the present stage is carried out in the results section of this article where the authors analyze which are the most suitable potential figures to answer the research questions in line with the hypothesis of the article.

5. Collating, summarizing, and reporting the results: in this case, the results of the study should take into account that this section should not only present the most relevant figures, values and indicators, but also that all of these should clearly explain what is happening with the documents analyzed.

Some studies also suggest adopting a broad definition of key words for the search terms in order to obtain "broad coverage" of the available literature (Arksey, O'Malley, 2005). Hence, the key concepts and search terms were developed to capture literature related to "complex thinking

and academic literacy within higher education." While there may be a variety of databases where various documents can be tracked; in this case, Elsevier's Scopus is used exclusively as a starting point for tracking the material to be analyzed. The descriptive linked key search terms adopted to guide the search are described in Table 1.

Table 1. Search terms to adopt in Scopus

Search criteria and keywords for this study
(TITLE-ABS-KEY ("academic literacy") OR TITLE-ABS-KEY ("academic alphabetization") OR TITLE-ABS-KEY ("digital alphabetization")
OR TITLE-ABS-KEY ("digital transformation") AND TITLE-ABS-KEY("higher education")) AND (complex*) AND (LIMIT-TO (PUBYEAR, 2022)
OR LIMIT-TO (PUBYEAR, 2021) OR LIMIT-TO (PUBYEAR, 2020) OR LIMIT-TO (PUBYEAR, 2019)
OR LIMIT-TO (PUBYEAR, 2018) OR LIMIT-TO (PUBYEAR, 2017))

Source: Own elaboration

Finally, with the purpose of closing this section, it is essential to point out other approaches that suggest that to achieve the greatest possible rigor in the identification of primary evidence, it is necessary to consider practical aspects of time and budget limitations, which is why inclusion and exclusion criteria are considered in studies of this nature (Kenny et al, 2013).

Table 2. Inclusion and exclusion criteria for the present study

Criteria	Inclusion	Exclusion	Details to consider
Period	2017-2022	Documents that are not part of this range	Search date June 2022
Language	Any language	None	In this case the documents correspond to languages such as English, Spanish, Russian and other African languages
Type of document	Article	Book, Book Chapters, Conference Proceedings, and others	Although there was no restriction for the initial search. After identifying the documents, it was decided to work only with articles
Study focus	Educación superior	All other non-higher education	In this case, documents related to postgraduate studies was allowed
Central topics	Complex Thinking, Higher Education and Academic Literacy	None	All fields of knowledge were considered under the following core concepts

Database	Scopus	WOS and others	Only the publisher Elsevier was considered

Source: Own elaboration

3. Results

After identifying the research in the database and using the search criteria previously indicated, with 141 documents in total, a cooccurrence graph is made in order to identify some patterns that are repeated among all the works considered for this study (see Figure 2). It is ideal to point out that a cooccurrence graph refers to the visual representation of the networks that show the number of times that certain words or concepts are repeated. Thus, this coincidence makes it possible to establish the relationships of dominance and possible frequency in the selection of themes represented by the lexicon of terms applied in the body of the texts considered in a study as in a bibliometric exercise or as in this case in a scoping review (Engels, Kulczycki, 2022).

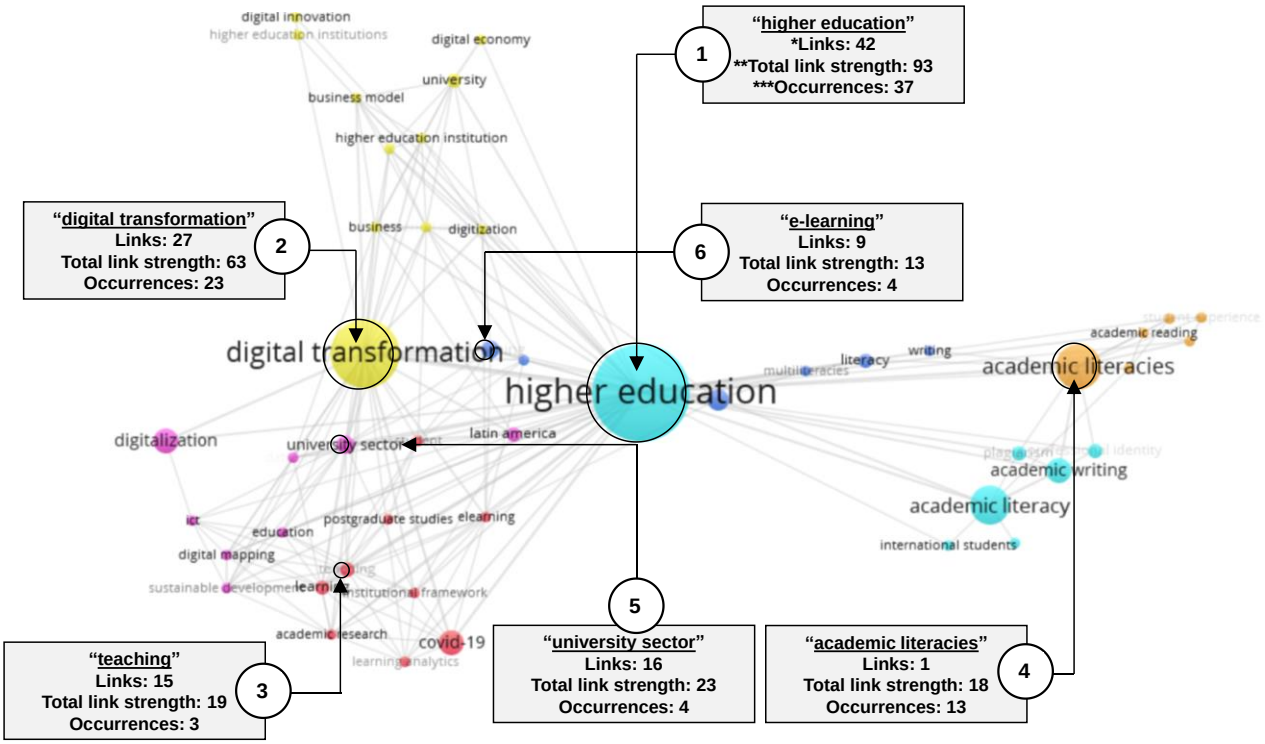

Fig. 2. Co-occurrence in the current study according to the pointed criteria

Notes:
* A link is a connection or a relation between two items. Each link has a strength, represented by a positive numerical value. The higher this value, the stronger the link. The strength of a link may for example indicate the number of cited references two publications have in common.
** The total link strength is an attribute that indicates the total strength of the co-authorship links of a given researcher with other researchers considered within the current case of study.
*** The occurrences attribute indicates the number of documents in which a keyword is repeated. This item indicates the total number of repetitions of a term in all documents considered in a specific study (Van Eck, Waltman, 2017).
Source: Own elaboration based on Scopus (2022)

Thus, it can be said according to Figure 2 that with all the documents considered in this scoping review study, six clusters are generated that reveal the current trends in scientific research according to the search criteria indicated above (see Table 1). Thus, the main concept that is repeated

according to the co-occurrence figure is in first place, "higher education" with 37 coincidences; in second place, "digital transformation" with 23 coincidences; in third place, "teaching" with 19 coincidences. Then, in fourth place, "academic literacies" with 18 matches; in fifth place, "university sector" with 4 matches and finally, in sixth place, "e-learning" with 4 matches.

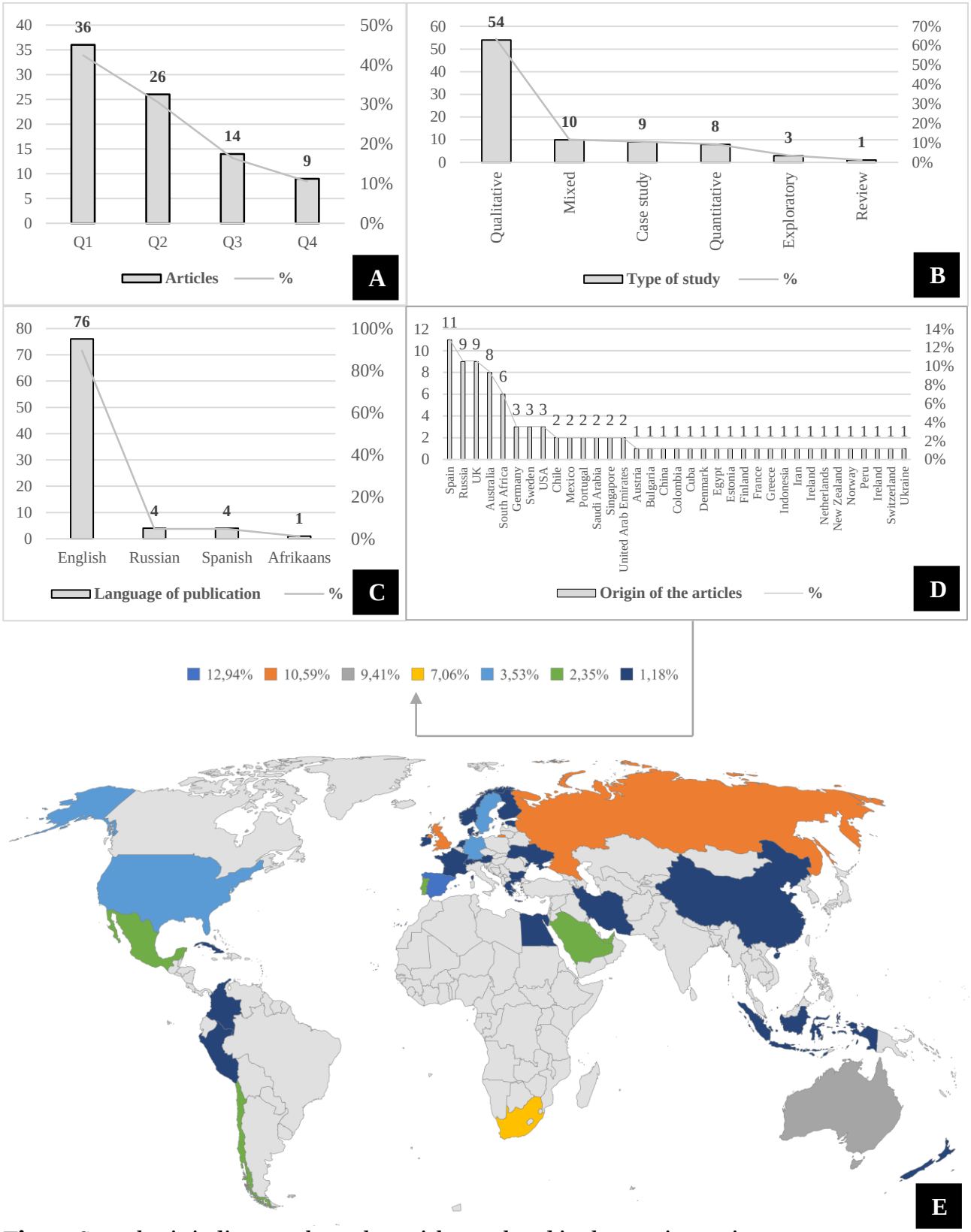

Fig. 3. Some basic indicators about the articles analyzed in the scoping review
Source: Own elaboration based on Scopus (2022)

Subsequently, the current study filters the search, recognizing exclusively the articles (specifically 85) respect any other type of document. The above, considering that mostly of all these types of documents traces in Scopus are precisely articles and because these last also come from publications or scientific journals categorized on quartiles exclusively. In this way, Figure 3 emphasizes in some facts which may be of interest in a scoping review to analyze these group of articles as in this case. Then, it is possible to identify four sections (A, B, C, D and E) which describe, in first place, the quartiles of considered journals where publications come from. In second place, the type of study of the considered articles. In third place, the language of these papers and lastly, in fourth place, the origin of the articles.

It should be added, according to Figure 3 that "A section" in the current scoping review 42 % of articles, 36 in this case, belong to journals categorized in quartile 1 (Q1). 31 % of articles, 26 in this case, belong to journals in quartile 2 (Q2). 16 % of articles, 14 in this case, belong to journals in quartile 3 (Q3) and 11 % of articles remaining, 9 in this case, belong to quartile 4 (Q4).

Regarding “B section”, 64 % of articles, 54 in this case, are focused on qualitative studies followed by 12 % of articles, 10 in this case, focused on mixed studies. Later, 11 % of articles, 9 in this case, are focused on case study; also 9 % of articles, 8 in this case, focused in quantitative and the rest of the papers correspond to 4 % with 3 articles and 1 % with 1 article that belong to exploratory and review respectively.

“C section” shows a remarkable primacy in the language of publication because with 89 % of analyzed papers, 76 in this case, English occupies first place followed by Russian and Spanish with 5% equivalents to 4 papers both occupying second place and lastly, Afrikaans with 1 % with 1 article in third place.

Finally, “D section” indicates that 13 % of papers, 11 in this case, come from Spain in first place; 11 % of papers, 9 in this case, come from Russia and United Kingdom (UK) both in second place; 9 % of papers, 8 in this case, come from Australia in the third place. All of them followed by the rest of countries which indicate the origin of the articles.

4. Discussion

In current educational processes, learning has a mainly collaborative influence between teachers and students, although it is increasingly evident that the latter, especially at the higher education level, tend to assume a more relevant responsibility regarding the need to become more qualified and competent for their future work. Therefore, reading, writing, but above all exercising critical thinking in higher education, are present and future needs of societies and their productive model based on knowledge. All this, where organizations and companies in general require individuals with greater ability to adapt to the circumstances and above all with diverse skills to meet the new challenges of contemporary societies (Quitadamo, Kurtz, 2007; OECD ..., 2017).

Likewise, complex thinking as a construct tends more and more to stop being just a conceptual notion under construction, since its original theoretical approaches lead to the establishment of new ways of thinking, reflecting and even investigating in the present in order to approach both truth and objectivity. Which, in short, ends up refining and structuring better its field of action and, above all, its essential characteristics that end up permeating the sciences in general (Berlin, 1990; Tsoukas, Hatch, 2001; Jörg, 2011; Malaina, 2015). Precisely, educational sciences as a discipline that studies the theoretical practices and techniques to analyze, understand and explain the complex problems that occur in different spaces (both formal and non-formal learning); constitute an important tool for the implementation of certain principles of complex thinking. In this way, it is clear that complex thinking can be useful to seek certain means for the solution of problems inherent to the human condition. All this, just as higher education itself intends, since the latter, from a didactic dimension, allows access to knowledge in order to understand certain issues that constitute a means to achieve certain purposes (Wisdom, Leavitt, 2015; Guthrie, Osteen, 2016; Dowd et al., 2018).

According to the above, higher education is then an essential element to better train individuals who hope to better understand the reality that surrounds them as well as to achieve certain professional objectives for their individual future as well as their group future within society. Although the very fact of accessing this position as a university student, after leaving behind secondary education, requires all these individuals to perfect certain skills that ultimately lie both within the framework of the strategies of the university education system itself, as well as

their own teachers. All this, in an academic setting that must be suitable for students in order for them to be able to maintain and adapt in this position that demands particularly high skills and thus avoid dropping out of school. It is then where academic literacy emerges as an essential component within the contemporary model of higher education; in which case, it is not only enough to train students to read and write better, but also to go further by adapting to the technological realities and new scenarios of communication and understanding of any medium that leads to the transmission of information. In this sense, as shown in Figure 4, from complex thinking, academic literacy, and higher education itself, there must be a synergy that ensures that students not only adapt to the university, but also achieve their ultimate purpose of reaching a series of specific knowledge that will allow them to access the labor market (Goodwyn, Stables, 2004; Dale et al., 2011; Hammer, Green, 2011; Kimberley, Thursby, 2020).

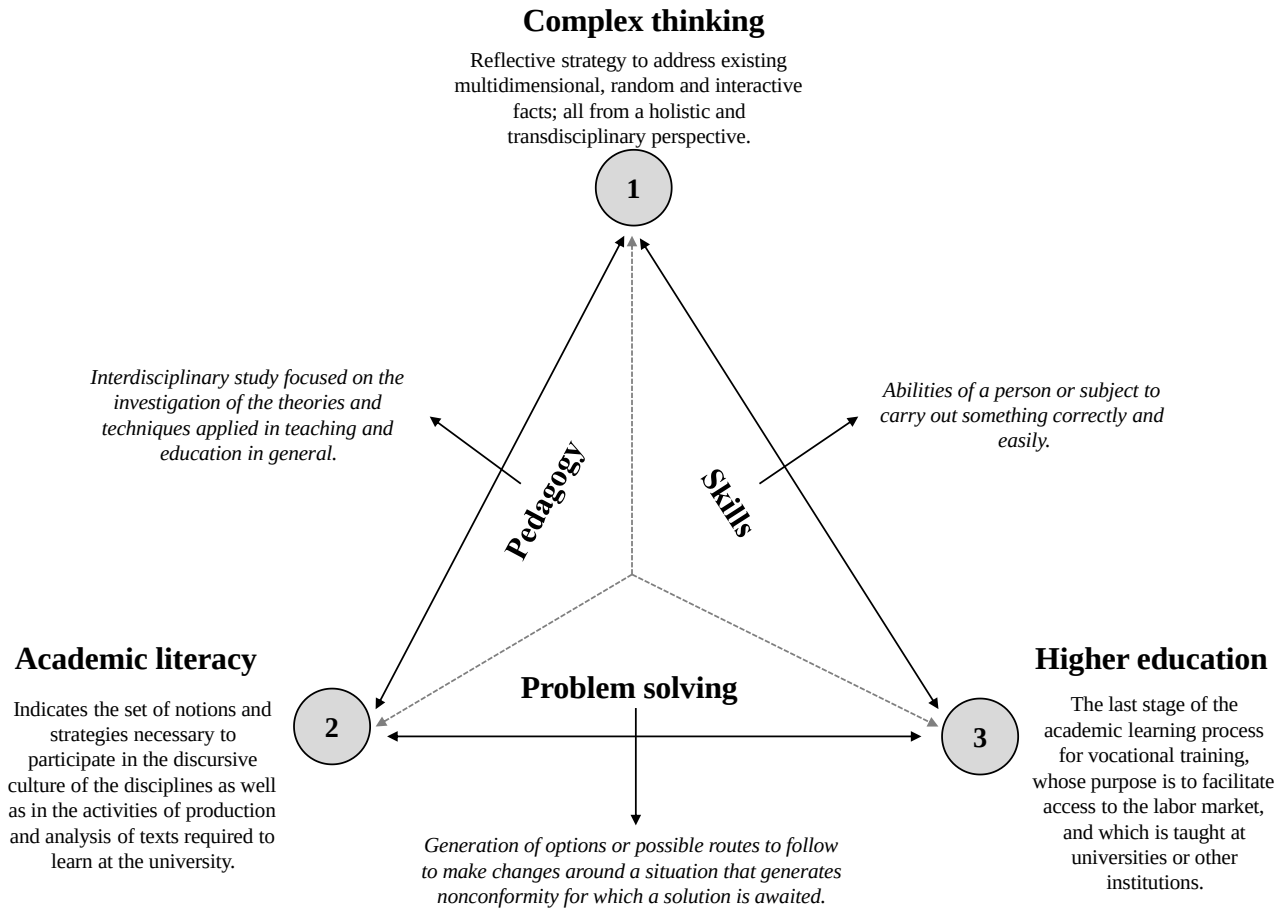

Fig. 4. The role of complex thinking trough links with academic literacy and higher education
Source: Own elaboration based on Ovens, Hopper and Butler (2013) and O'Flaherty and Phillips (2015)

Thus, from the logic of complex thinking, it is obvious that within the higher education system, academic literacy and the reforms that are carried out must be effective. That is to say that, at the level of content in university programs, these must respond not only to achieve the purpose of educating from what is expected, but also to make adjustments that consider, due to different circumstances of the educational models in secondary education, the possible deficiencies with which students arrive. In the same way, literacy and reforms must also respond by adjusting their contents according to what evidence shows that future professionals require from the feedback received from different professional fields. Therefore, higher education is dynamic, like the very nature of complex thinking, because it is always adjusted taking into account the before, during and after in order to produce the best possible results in terms of qualified professionals (Lea, Street, 1998; Haggis, 2003). Thus, it can be said that the higher education system is only a set of elements that depends, from the logic of complexity, on specific stages. This means, see Figure 5,

that the formative processes that can be seen in the curricula of higher education programs within universities are, after all, a consequence of how academic literacy generates synergies among the axes of education (Gravett, Kinchin, 2020; Heron et al., 2021).

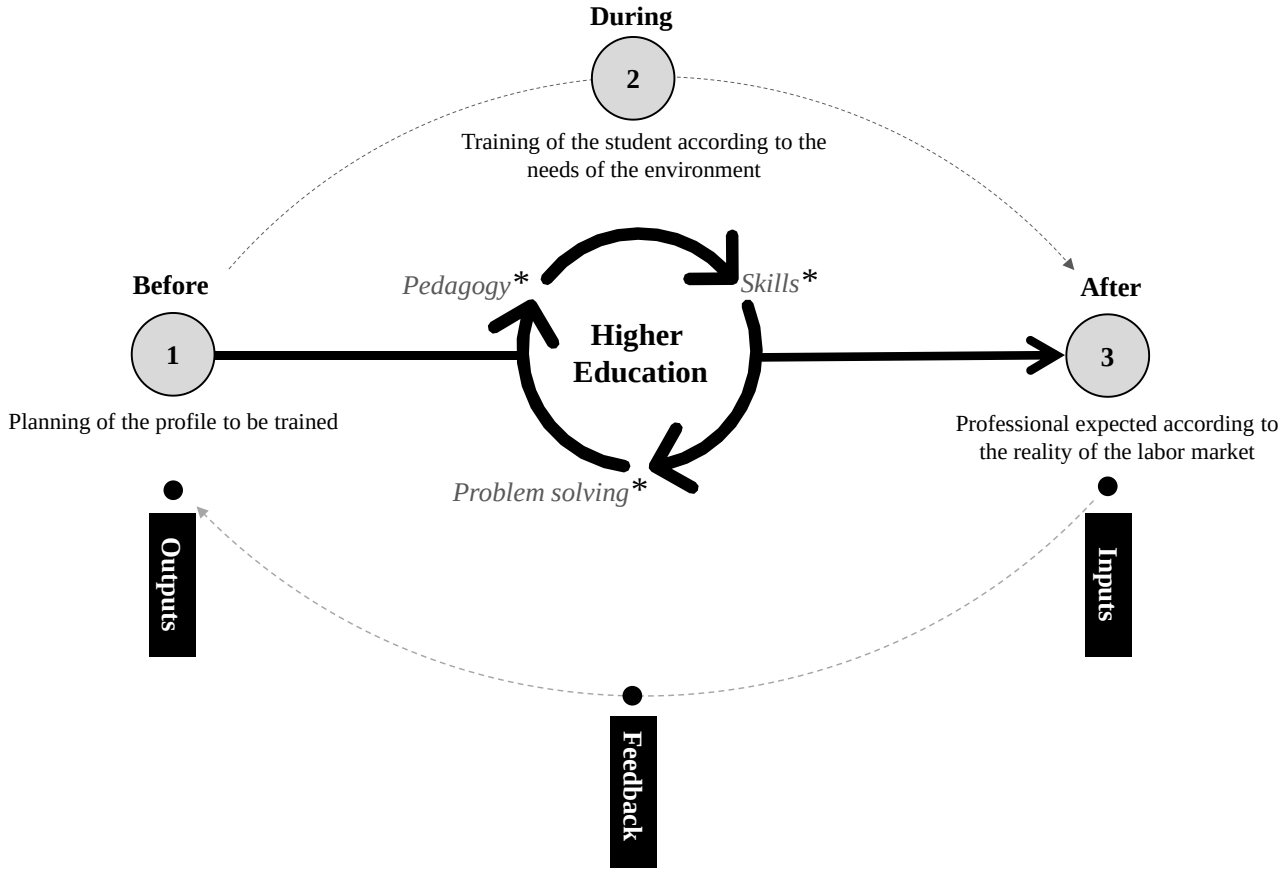

Fig. 5. Dynamic axes and stages within the higher education process
Source: Own elaboration based on Henderson, Ajjawi, Boud and Molloy (2019)

Thus, from the logic of complex thinking, it is obvious that within the higher education system, both academic literacy and the reforms to be carried out must be not only effective but especially innovative. In fact, several studies show that currently universities and other higher education institutions also involve, in various disciplines of knowledge, scientific research as an essential component to improve the results in the training of profiles and the formation of professionals. The learning and teaching model is then also the result of the implementation of various mechanisms derived from the deliberate selection of technical and scientific material. Which, even delve in detail on the curricula and curricular content, since within the academic literacy can end up enhancing job skills such as problem solving of students and future professionals (Koutsantoni, 2006; Willison, 2018). Academic literacy is therefore a deep and structural concept that goes beyond the development of reading skills as traditionally believed. It has to do with how higher education institutions are concerned with adapting their training models to the requirements of the environment. It also has to do with the way in which the curriculum is structured in order to ensure that students can become integral and qualified professionals; all of this, starting from the way in which they are directed and trained in pedagogical terms (Karvalics, 2013; Chang, 2014).

Within the above logic, students should also be interested in following the approach of the educational system in which they participate. This in order to be able to perform appropriately in different disciplines, whatever the field of knowledge in which students are involved. This is why some competencies are becoming more and more relevant, such as scientific research. The latter,

which allows perfecting any academic competence within any branch or field of knowledge itself, given its own nature of deepening and continuing to deepen at a theoretical and practical level in any discipline (Castillo-Martínez, Ramírez-Montoya, 2021).

Regarding academic literacy, it is important to add that it also refers to the dispositions and mental habits that allow higher education students to have appropriate conversations to think, read, write and speak, showing interrelation and mastery at different levels. Then, students must have the ability to differentiate different logical, emotional and personal arguments; in addition, to have skills that allow them to define, summarize, detail, explain, evaluate and many others related to critical thinking. Therefore, academic literacy in higher education is more than a process of qualification in terms of elements alluding to reading improvement capabilities within the student community. It has to do in parallel with how the academy is structured from the way and the approach in which it is taught and learned (ICAS ..., 2002; Romero, Álvarez, 2020; Liyanage et al., 2021).

It seems evident then that from complex thinking, students, teachers, employees, employers, and in fact all individuals, in most cases, due to their transit within the education process, must face problems full of singularities that are increasingly difficult to handle. In any case, while it is true that not all people gain access to higher education, it is an almost incontrovertible fact that the training and development of people's capabilities are usually attributed to the educational systems within any state or paradigm of society. Therefore, academic literacy within higher education marks a clear path to overcome all the new challenges of XXI century full of technological advances as well as social situations that require a proactive training that usually begins at an early age and is consolidated within higher education (Herde et al., 2016; Zajda, 2018). Finally, it can be said that the ability to solve problems, from the complexity itself, is one of the most fundamental skills both for daily life and to make the productive structure of any society feasible, the latter being the guarantor of the economic and social development of any state (Chevallier, 2016; Kocak et al., 2021; Zanuto, Fraga, 2021).

5. Conclusion

The first part of the results showed an intense relationship and co-occurrence in some concepts that are frequently repeated among the 141 documents considered according to the search criteria indicated in Table 1. These are the 6 clusters in this case higher education, digital transformation, teaching, academic literacies, university sector and e-learning. Therefore, all these concepts are not only recurrent themes among current research on academic literacy and complex thinking; but they are also the topics that condition the emergence of new potential issues for research in this scientific field.

Subsequently, it can be added that after limiting the search for papers only to scientific articles, i.e., 85 papers, most of these are found in quartile 1 (Q1) and quartile 2 (Q2). In other words, well over two-thirds, 73 % of the articles, come from journals with the highest research metrics in the Scopus database.

Likewise, within the most dominant types of studies according to the central theme of this research, those with a qualitative method are found with just over two thirds, 64 % of the articles. This is followed by mixed method and case study with 12 % and 11 % respectively. In other words, most of the papers adopt a research model and/or approach typical of the Social Sciences.

Then, as is to be expected, most of the papers, with 84 % of the articles published on the central theme of this research, have been written in English. Thus, it is evident that researchers in academic literacy and complex thinking prefer to direct their work towards journals whose articles are published in English; all this, because this can mean greater visibility of their work within the academy at the international level.

Finally, at present, the subject of academic literacy and complex thinking at the level of scientific publications is led in first place by Spain, in second place by Russia and the UK, and in third place by Australia with 13 %, 11 % and 9 % respectively. This may imply that these countries may be implementing possible reforms in their curricula within their higher education systems; all this, in order to update certain topics that may result in the qualification of their students and future professionals.

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