

Towards a Competence Framework for Open Scholars: Acknowledging the Dearth of Epistemic Competences

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Abstract

This study addresses competences of the Open Scholar. It draws on a theoretical framework reaching out to sustainability education, responsibility and activity theory to describe competences. Competences of the Open Scholar are understood within the context of Higher Education institutions' three missions: teaching, research and service to the community. The systematic literature review of three key concepts, Open Educator, Open Researcher and Open Scholar performed on a total of 811 articles between 2011 and 2023 as well as the content analysis performed on 10 competence frameworks highlight a dearth in epistemic competences. To fill this gap, the study raises awareness of the importance of initiating the development of scholars' capabilities in areas that can enable them to ask questions at the level of purpose and paradigm. Capabilities to address these deeper levels are presented as a way of enhancing the responsibility of scholars. Responsibility is framed in-line with its Latin root, *respondere*, i.e., providing a response and drawing on a semantics of care, respect and concern (instead of the foregrounded framing of responsibility in terms of subjectivity, power and causality). Furthermore, identifying *not-yetness* and addressing uncertainty are presented as key competences of the Open Scholar.

Key Words

Scholars, Openness, Competences, Sustainability, Not-yetness

Introduction

Most of the time, Open Education (OE) is framed from the perspective of information technologies. Especially with Open Educational Resources (OERs) because technology combined with the 5 R - retain, revise, remix, reuse, redistribute (Wiley, No date) – is facilitating their sharing and dissemination. Within a general tendency to address techno-pedagogical issues, technology, practice and policy have taken centre stage in scholarly discussions regarding academic scholarship in Open Education (e.g. Zawacki-Richter & Jung, 2022). This is to the detriment of the older core disciplines of education, namely history and philosophy, which experts are now calling for to be revived as key enablers to develop education (Peters, 2017; Tesar et al., 2022).

With regard to competences, specifically competences of the open educator, they have also been framed starting from practice and leaving the underlying question of paradigm unaddressed (Nascimbeni & Burgos, 2016). Considered from the lens of the three levels of learning - cognitive, metacognitive and epistemic (Bateson, 1972, cited by Salonen et al. 2023), practice is a necessary step. It allows the community to gain maturity and address the third level which is more related to deeper levels of knowledge and knowledge construction. For instance, addressing practice is a

prerequisite to ask questions about the purpose of using technology in education. Indeed, the cognitive level which focuses on content and existing rational knowledge, provides a solid foundation to consider reality. The metacognitive level reflects about the premises of this knowledge and examines them critically. The epistemic level addresses an epistemological change which critically studies the premises and knowledge generated through a given paradigm to highlight their weaknesses. Usually, this happens when a transformative experience occurs in practice.

This article addresses competences of the Open Scholar. In line with the three levels of learning, its ambition is to address the second and the third levels. It starts from competences acknowledged by practice in Open scholarship and reaches out to the 3 missions of universities, namely teaching, research and service to the community. Building on a systematic literature review between 2011 and 2023 that is complemented with an analysis of 10 competence frameworks and an exploration of 186 abstracts of under-represented literature (see Appendices 1 and 3 and the DOI of the dataset), this article adopts a theoretical framework combining sustainability education (Sterling, 2021), responsibility (Raffoul, 2018) and activity theory as framed by Coulet to explore competences (Coulet, 2011, 2019).

Guided by an overall qualitative research question, *how can competences of Open Scholars be identified to empower them as responsible scientific actors?* the article is structured as follows. First a definition of key concepts is provided followed by the theoretical framework. Then comes the method section and the findings which include the results of the systematic review and the analysis of competence frameworks. Finally, the last part discusses the study's highlights, its limitations and next steps for this research.

Defining key concepts

The research is framed by three key concepts: scholarship, responsibility, and competence. Each of these concepts is presented below, based on a review of the literature that helped us to identify their specificities.

Scholarship

The literature defines a scholar from different perspectives, mainly differentiating actions performed on one hand with output produced on the other. Boyer (1990, p. 16) suggests to move beyond the teaching vs research divide to consider the concept of scholarship as a representation of the “full scope of academic work”. Surely, scholarship means engaging in original research. But the work of the scholar also means stepping back from one's investigation, looking for connections, building bridges between theory and practice, and communicating one's knowledge effectively to students” (p. 16). The scope reaches out to four functions:

- Discovery which relates to the creation of new knowledge in a specific area or discipline and to the strengthening and broadening of the understanding of what research and the pursuit of knowledge are;
- Integration refers to broader meaning making of specific research findings through for example interdisciplinary, interpretive or integrative work. These are testimonies of undergoing “intellectual sea change”: “one that is perhaps as momentous as the nineteenth-century shift in the hierarchy of knowledge, when philosophy gave way more firmly to science” (p. 21);
- Application refers to the relationship between academia and the wider world. It is a dynamic process of knowledge creation where theory and practice “vitaly interact, and one renews the other” (p. 23);
- Teaching refers to sound proficiency of the knowledge field, capacity to “build bridges between the teacher's understanding and the student's learning” (p. 23), and learning through teaching by transmitting, transforming and extending knowledge with learners. Without the “teaching function, the continuity of knowledge will be broken and the store of human knowledge dangerously diminished” (p. 24).

Weller (2011) wrote about the digital scholar, largely associating the digital with the citizen, peer-to-peer, possibilities of the internet and the web that took form for instance in connected learning (Downes, 2012; Siemens, 2005). This perspective actually echoes to what Wenger (2004) called emergent learning governance, i.e. “learning governance bubbles up from a distributed system of interactions”, opposing it to stewarding learning governance, i.e. “learning governance derives from

a concerted effort to act as the keeper of a process” (p. 30).

The Open Scholar as defined in the literature is clearly a continuation of these emergent and peer-to-peer understandings.

“The ‘open scholar’ began to emerge in the literature in 2009 (Anderson, 2009; Burton, 2009) and developed rapidly thereafter. Open scholarship was characterised as a “new type of education and scholarship context” which sought to maximise social learning, media richness, participatory and connectivist pedagogies, ubiquity and persistence, open data and research, and connections (Anderson, 2009). Weller (2011) proposed a definition of the open scholar encompassing open digital identity, open networking practices, use of open tools, and open publishing. Veletsianos and Kimmons (2012) also proposed a definition of open scholarship as a set of phenomena and practices related to scholars’ uses of digital and networked technologies for both research and teaching, all underpinned by “grounding assumptions regarding openness and democratization of knowledge creation and dissemination” (para. 3). Veletsianos and Kimmons articulated three major forms of open scholarship: open access and open publishing; open education (including OER and open teaching); and networked participation, also called networked participatory scholarship” (Cronin & Maclaren, 2018, p. 133).

In conclusion, scholarship is about learning, as an essential attitude of scholars for themselves and with regard to sharing with others, it is a dynamic social activity. It is in its essence community-driven, connected and connecting and implies networking and technology. Scholarship in this sense is understood in a similar way to the impetus that motivated the creation of the World Wide Web in the 1990s: to exchange knowledge rapidly and worldwide among scholars (CERN, No date). This is in line with Leonelli (2023, p. 43) who frames Open Science as judicious connection, “predicated on a process-oriented view, whereby research is understood first and foremost as an effort to foster collective agency, grounded on intimate forms of relationality and trust, among widely diverse individuals and groups – an agency that is often enacted through recourse to various technologies, shared interpretations of research outputs and collaborations with non-human agents”.

Responsibility

From Aristotle to Kant through to Ricoeur (Ricoeur, 1994), the concept of responsibility has been framed in terms of subjectivity, power, free will, cause, agency and accountability. Legally, responsibility initially meant the individual obligation to repair damage and was thus focused on a fault that happened in the past. It then focused on the future, remaining in the semantics of obligation and imputation, to consider responsibility for the consequence of one’s actions (Raffoul, 2018).

"In the course of a historical deconstructive genealogy of responsibility, four motifs that govern the traditional interpretation of responsibility - what we could call the four "fundamental concepts" of the traditional account of responsibility - appear.

First, the belief that the human being is an agent or a subject, i.e., the reliance on subjectivity (subjectum in its logical or grammatical sense of foundations) as ground of imputation. [...]

Second, the notion that the subject is a voluntary agent, i.e., the reliance on the voluntary and so-called "free will". [...]

Third the reliance on causality. To be the "cause of" and to be "responsible for" are conflated". [...]

Fourth, the assumption that the responsible subject is a rational subject, that the basis for ethical responsibility is rational agency" (Raffoul, 2018, pp.237-8).

In addition, “Responsibility has traditionally been associated with a project of appropriation, understood as the securing of a sphere of mastery for a willful subject” (Raffoul, 2018, p. 239).

The meaning was then redefined shifting from the individual fault to be repaired to the social anticipation of a risk. This could have promoted solidarity, but it is the more utilitarian concept of security that it promoted instead. It also resulted in a disproportionate extension of the sphere of risks and a change in its scale in relationship to space and time. With the trilogy power-nuisance-responsibility, Jonas articulated his thought. As far as our powers extend, so does our capacity to cause harm, and so does our responsibility for damage. Responsibility is thus reported upfront into

preventive approaches guided by a heuristics of fear and downstream by potential destructive effects of our action (Ricoeur, 1994).

Jonas' thought rests on a semantics of respect, care and concern rather than the former semantics of authorship, subjectivity and accountability. Responsibility becomes synonymous of caretakers.

The next step then is to move away from the modern dissociation of human vs non-human, wiping the "anthropocentric enclosure" to explore the "being-with it [which] is the matter of a communication between singularities, where no privilege to human Dasein can be granted" (Nancy, 2000 cited by Raffoul, 2018, p. 242). In-line with the "being with" comes the perspective of science that is conducted with and for society. Responsible research in the context of Open Science is framed within ethical principles, including honesty, objectivity, integrity, carefulness, Openness, intellectual property, confidentiality, publishing, mentoring, respect for colleagues, social responsibility, non-discrimination, competence, and human subjects' protection. It involves the democratic governance of research purposes, responsiveness to societal needs, and the framing of responsibility as a collective activity (Owen et al., 2012).

Indeed, the Latin etymology *respondere* indicates that it is foremost a response, an answer. "Derrida considers that any sense of responsibility must be rooted in the experience of responding, and belong to the domain of responsiveness" (Derrida, 2005 cited by Raffoul, 2018, p. 245). The idea then is to frame responsibility in a semantics of care, not based on the subject as initiator but the subject as respondent of an "inappropriate character of existence" (in reference to the project of appropriation cited above) (Raffoul, 2018, p. 246). Furthermore, the future is conceptualized as unpredictable, breaking with the mechanistic perspective (Salonen et al., 2023). "Derrida speaks of a responsibility to the future, to the arriving of the *arrivant*, a "future that cannot be anticipated; anticipated but unpredictable; apprehended, but, and this is why there is a future, apprehended precisely as unforeseeable, unpredictable; approached as unapproachable" (Raffoul, 2018, p. 240).

Finally, authorities, instead of restructuring the "control from something externally imposed to something internally enacted" (Kuhlmann, 2022, p. 72) should, through responsibility, give authorisation (Meirieu, 2017, pp. 93-94). An authorisation to respond with care, respect and concern as caretakers for the future of humanity and the planet through science and education amongst others.

To summarise, a responsible scholar is understood here as: i) a respondent of an "inappropriate character of existence"; ii) someone who is given authorisation to act with care, respect and concern; iii) someone who conceptualizes the future as "unapproachable". Finally, this understanding reaches out to using free will within this overall frame of care to respond as a rational and ethical scholar.

Competence

The concept of *competence* can be traced back to Noam Chomsky's *linguistic competence*, which initially referred to the innate capacity of the human brain to produce and understand natural language. This idea was adopted by linguists and experimental psychologists. Linguists like Hymes expanded on it, introducing the concept of *communication competence* which emphasised the capacity to connect linguistic output with the goal of communication, viewed as a learnable skill rather than an innate trait (Bronckart & Dolz, 2002). In experimental psychology, competence replaced intelligence and was defined as a collection of various competences.

Over time, competence gained prominence in the analysis of work practices and vocational training. In the evolving work landscape, characterized by the need for adaptability and individual initiative due to technological advancements, traditional certification systems became outdated. Competence-based approaches took precedence, aiming to cultivate more versatile and complex skills applicable in diverse work situations, enabling real-time decision-making. This shift marked a departure from behavioristic thinking that quantified competence based on the number of tasks performed to a cognitive approach focused on strategy-driven activity.

Ergonomists also contributed to the competence-based approach by shifting the focus from job positions to individual workers, emphasizing that competence complements the concepts of tasks and activities when describing and explaining professional activities (Aubret & Gilbert, 2003; De Montmollin, 1984).

The concept of competence in the organisational context was introduced by the American

psychologist McClelland, who believed that diplomas or qualifications could not predict worker performance. He introduced the idea of competence, which incorporated social and emotional aspects, emphasizing the role of motivation and emotions in performance (Aubret & Gilbert, 2003). In organisations, human resources (HR) management adopted the competence-based approach, influencing educational institutions to incorporate competence into pedagogical goals, curricula, and student evaluation (Coulet, 2011). Notably, in HR management, competence is viewed as a characteristic of an individual, regardless of the organisational context.

Numerous definitions of competence have emerged from various researchers across different disciplines, including sociology, psychology, ergonomics, and management. These definitions vary in their focus on cognitive processes and the inclusion of social and motivational aspects. To summarise, competence, as understood in the reviewed literature, involves several key aspects (Fedorova, 2020).

First, it is closely tied to action, emphasising the practical application of knowledge and skills. Second, it represents the goal-oriented ability to handle specific tasks within a given context. The concept of competence encompasses various elements, including knowledge, functional competence, and behavioural competences, as described by Coulet (2011). The characterisation of competence necessarily involves the description of the organisation processes of the activity. Thus, a combination of knowledge, skills, attitudes cannot fully describe the competence as it manifests itself in the activity, since they do not shed light on how the activity dynamically evolves and how it is organised (Dufour, 2010). For Coulet, the description of the processes that underlie competence remains largely metaphorical, aligning with the perspective of Cros and Raisky, who view competence as a hypothetical construct and a pure social construction (Cros & Raisky, 2010). Competence is thus a dynamic, context-dependent, and multi-faceted concept that encompasses cognitive, social, and motivational aspects. It is not a binary trait but exists on a continuum and is observed through action and adaptation to specific tasks and situations, thus it is questionable whether a competence, as opposed to performance, can be assessed in terms of achievement/non-achievement.

Coulet proposes a model of competence which is of interest to this study because of its integration of the theoretical and cognitive poles on one hand and the experiential and social poles on the other hand. We will thus follow Coulet's approach to defining competence: "A competence is a dynamic organisation of activities that are mobilised and regulated by a subject in order to cope with a given task, in a given situation" [« une *organisation dynamique* de l'activité, mobilisée et régulée par un sujet pour faire face à une tâche donnée, dans une *situation déterminée* »] (Coulet, 2011, p. 17).

Theoretical framework

The theoretical framework has been constructed around two main axes: sustainability education and activity theory framed for competences. The link between the two is to be found in "systemic levels of knowing" (Sterling, 2021, p. 7). This suggests that human knowing operates on multiple levels, with foundational levels, i.e. paradigm, shaping and informing more immediate and everyday levels, i.e. practice. It also suggests that there is a relationship in which experience at the level of practice can influence foundational levels. This happens specifically when a transformational experience radically revises one's worldview (Sterling, 2021) and explains authors' choice to examine competences, i.e. practice in action. In this section each axis, sustainability education and activity theory is described in detail and it is shown how they contribute to answering the research question framed around the concept of responsibility as responding with care, at the ontologic and epistemic levels.

Sustainability education

Sustainability is framed from the conception of Stephen Sterling (Salonen et al., 2023; Sterling, 2007, 2021). Sterling explains the 4Ps which draw on the three levels of learning (Bateson, 1972) outlined in the introduction. He proposed the Triang model, which is based on a large grain granularity, and later the Planetary Social Pedagogy, which offers a concrete way to implement it. The 4Ps refer to Paradigm, Purpose, Policy, and Practice. The image of the iceberg is here very helpful to understand the 4Ps. The emerged parts are policy and practice. Purpose and paradigm represent the immersed part of the iceberg that determine what happens in emerged parts. Nevertheless, purpose and paradigm are seldom addressed, not considered at all or taken for

granted. Paradigm shapes and limits how policy and practice are implemented. In the academic literature on education and education technology, the vast majority of studies address policy and practice at different levels of granularity (e.g. in higher education: Tight, 2019).

According to Sterling, two major paradigms co-exist. The mechanistic one focuses on parts; in education, it translates basically into “learning about the world in order to act upon it” (Salonen et al., 2023, p. 618). The holistic one focuses on the whole and translates basically into “learning to become with the world around us” (Salonen et al., 2023, p. 618).

The Triang model is a conceptual artefact to actually reflect about the paradigm, starting from the purpose. It addresses specifically epistemology and axiology (purpose), ontology (operationalisation) and methodology (effect). See table 1 & Figure 1.

Seeing domain	Knowing domain	Doing domain
Perception	Conception	Practice
Affective dimension	Cognitive dimension	Intentional dimension (design)
Epistemology (+ axiology)	Ontology	Methodology
Ethos	Eidos	Praxis
Concern (purpose)	Conception (operation)	Consequence (effect/impact)

Table 1: Triang model: dimensions and interpretations of paradigm. Sterling, 2021, p. 7

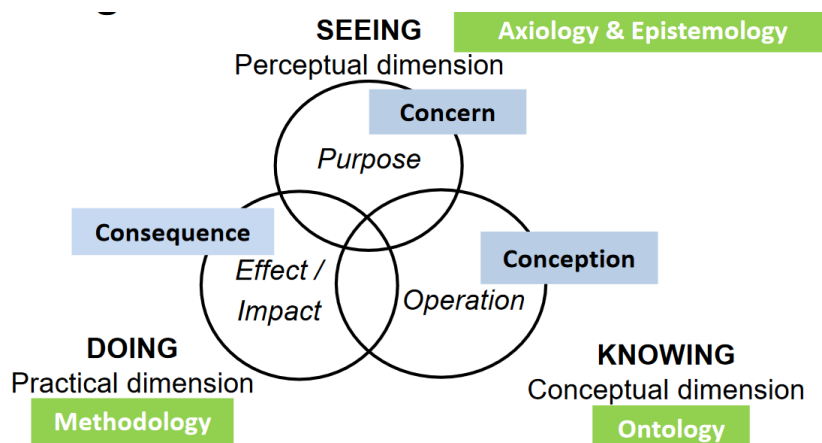


Fig. 1: Triang model: dimensions of paradigm—key domains in relation to the university. Sterling, 2021, p. 7

Activity theory framed for competence

Activity theory is traced back to Soviet psychology of the 1920s and it began to spread internationally in the 1970s. Several approaches exist and have been reviewed recently (Fauquet-Alekhine, 2020). “Theories of activity provide methodological tools that facilitate the analysis of occupational activities in technological contexts. According to Barabanschikov (2007), the synthesis of the approaches of Russian psychology reveals a series of important properties of activity: there is no activity without subject and object, the activity is conscious, and it is social in nature” (Fauquet-Alekhine, 2020, p. 24).

One of the key foundations of the model introduced by Coulet (Figure 2) is the concept of a *scheme* itself introduced by Vergnaud. A scheme is described as a “functional dynamic totality” (Vergnaud, 2011a, p. 283). Here, the term *totality* suggests that it is an identifiable unit of human

activity that comprises several interconnected and inseparable elements. A scheme is a component of representation that serves the function of generating activity and behaviour within a given situation (Vergnaud, 2007, p. 7).

A scheme consists of several elements (Vergnaud, 2011b):

- Goals, sub-goals, and anticipations: This aligns with the concept of competence as a goal-oriented activity, even when these goals are not explicitly stated. Anticipation refers to expected outcomes.
- Rules of action, information gathering, and control: These actions are influenced by both the goal and the representation of the objects involved in the activity. They account for the temporal dimension of the activity.
- Situational inferences: These involve adaptations and adjustments made by an individual in response to the specific circumstances they encounter.
- Instrument as a physical or symbolic tool (artefact) associated with schemes of utilization that are appropriated by an individual. Therefore, an instrument is not something given but rather something that the individual must develop (Rabardel, 1995).
- Operative invariants: These components are primarily cognitive and include concepts-in-act and theorems-in-act. They relate to the interpretation and processing of information and are responsible for identifying objects, their relationships, and transformations. The primary function of operative invariants is to extract and select relevant information and derive useful consequences for action, control, and subsequent information gathering. In-act-concepts are objects relevant to the situation that assist in completing a task or achieving expected results. However, these objects, on their own, cannot facilitate inferences or predictions. Therefore, a system is needed to connect these free variables and make statements (theorems) that hold true in the given situation. These in-act-theorems enable us to justify the activity we are engaged in. Metaphorically, in-act-concepts can be thought of as the building blocks from which the in-act-theorems (statements held as true) are constructed, and the sole reason for the existence of in-act-concepts is to enable the formation of in-act-theorems, which, in turn, facilitate the organisation of activity and inferences. It should be noted that it is on the level of operative invariants that we expect to identify the epistemic components of competence.

The benefits of such a description of competence are manifold. First, it does not consider a skill as a mere collection of disparate elements listed together but rather as a cohesive set of interconnected data, aligned with a well-defined theoretical framework. Second, this type of description allows for the delineation of more general or more specific patterns, making it possible to adjust the level of detail according to the intended goals for the framework. Third, this approach to describing competence enables the identification of broader or more specific patterns, providing the flexibility to tailor the level of detail based on the intended objectives. Finally, this framework is flexible, meaning that the content within each category is never exhaustive (Coulet, 2011, 2019).

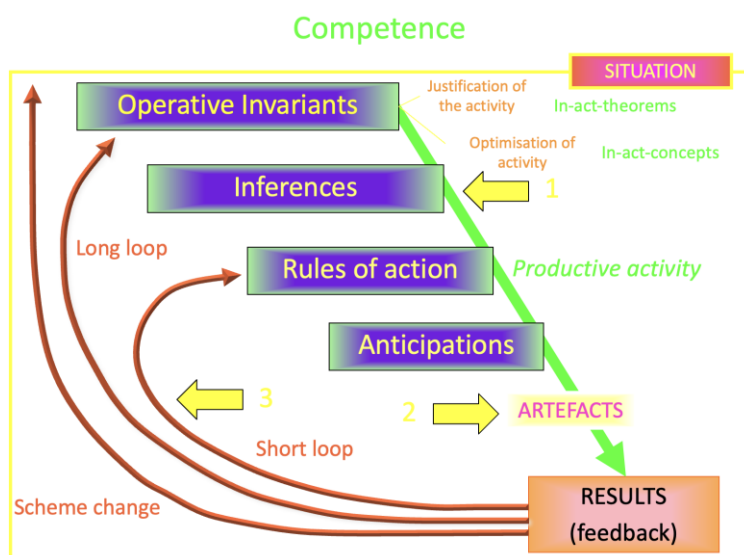


Figure 2: Dynamic Competence Model (Coulet, 2011)

The theoretical framework is presented in great detail because this paper, together with the results of the documentary analysis it provides, lays the groundwork for a future empirical study.

Research methods

In this study, two methods have been used. The first concerns the systematic literature review. The second addresses the analysis of existing competence frameworks. Each method is addressed individually below, guided by the overall research question. It is qualitative in its orientation with a descriptive purpose (Marshall & Rossman, 1999) and reads: *How can competences of Open Scholars be identified to empower them as responsible scientific actors?*

Systematic literature review

The systematic review was performed, in Spring 2023, on the last 12 years (2011-2023) using Google Scholar with the Publish or Perish application (Harzing, 2016). Lexicometric analysis (Labbé & Labbé, 2013) carried out in IRaMuTeQ (Interface of R for Multidimensional Text and Questionnaire Analysis) to explore abstracts retrieved (Ratinaud & Déjean, 2009; Reinert, 1993). Reporting of the entire bibliographic process (Albero & Las Vergnas, 2022) was guided by the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) statement (Moher et al., 2009; Sarkis-Onofre et al., 2021). For the literature search using the query "Open Scholar", 211 studies were included; for the query "Open Researcher", 445 studies were included; and for the query "Open Educator", 155 studies were included. For details, please see Appendix 2, Figures 12, 13 and 14.

Review of competence frameworks

A document analysis has been conducted in Spring 2023 on existing frameworks and training courses when a framework was not available (Appendix 1). Content analysis was chosen and performed on these 10 documents (Sabourin, 2009).

Frequency and patterns of use of competences were recorded by two researchers for each of the 3 categories, Open Education, Open Science and Open Community (Sabourin, 2009; Savin-Baden & Howell Major, 2013), chosen in alignment with scholars' activities and Higher Education institutions missions.

Results

Findings for the systematic literature review

The search query *open scholar*

The similarity analysis performed on the corpus derived from the 211 abstracts (Figure 3) reveals the existence of a lexical entity centered around the word *open*. Open scholarship translates into research, education, practice and community with learning, access and digital as related entities.

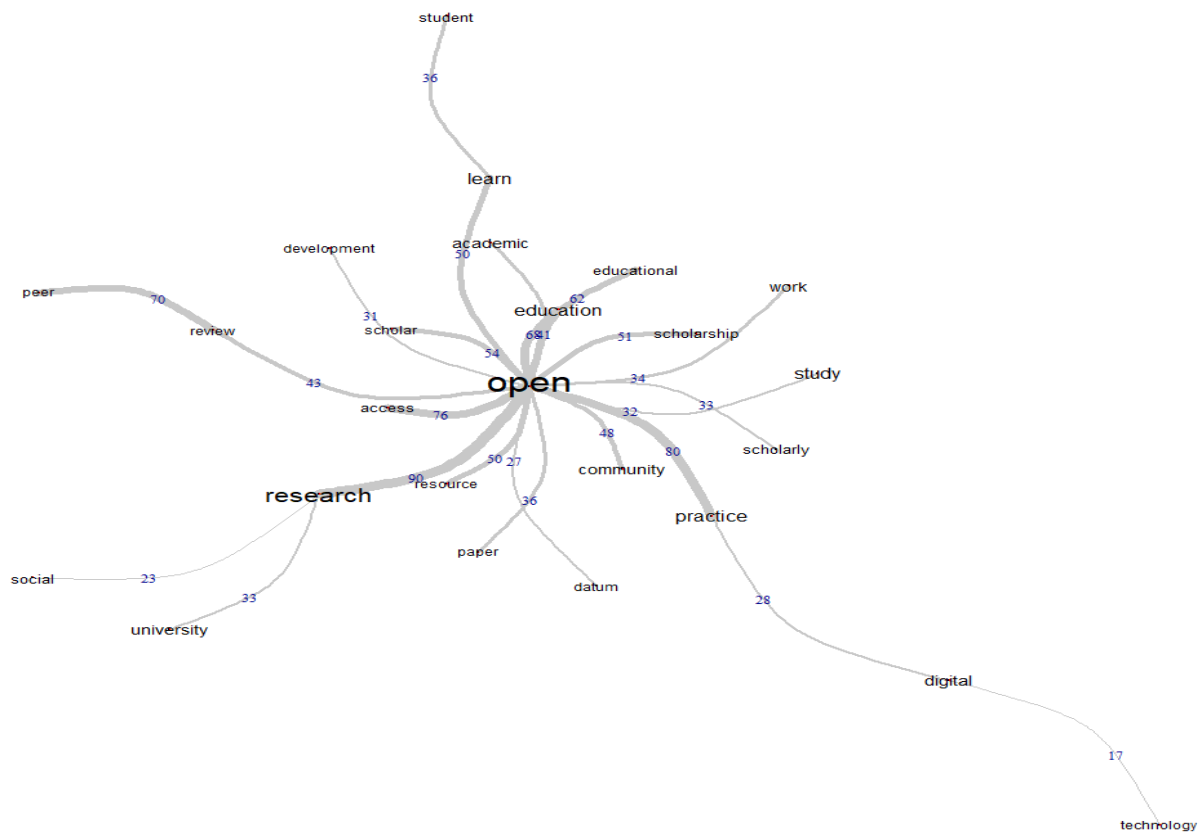


Figure 3: Similarity analysis using Iramuteq software for the search query *open scholar*

Search query *open researcher*

The similarity analysis performed for the query *open researcher* (Figures 4 and 5) shows the existence of two large lexical communities: the first one is centered around the word *research* (936 text segments containing this form) and the second one is centered around the word *researcher* (719 text segments containing this form). The two words "research" and *researcher* are strongly associated (204 occurrences).

The word *research* is mainly associated with forms like *datum* (134 occurrences), *paper* (82 occurrences) and (82 occurrences) and *publication* (68 occurrences). The second lexical entity relates to the researcher, with related words such as *ORCID* (210 occurrences), *contributor* (153 occurrences).

6) reveals the existence of a lexical entity centered around the word *open* (561 text segments containing this form). In this entity, the word *open* is closely related to words such as *practice* (109 occurrences), *learn* (86 occurrences), *resource* (94 occurrences) and *OER* (78 occurrences). This suggests that open educators are concerned not only with the openness of educational resources, but also with the ways in which learners engage with, practice and access these resources.

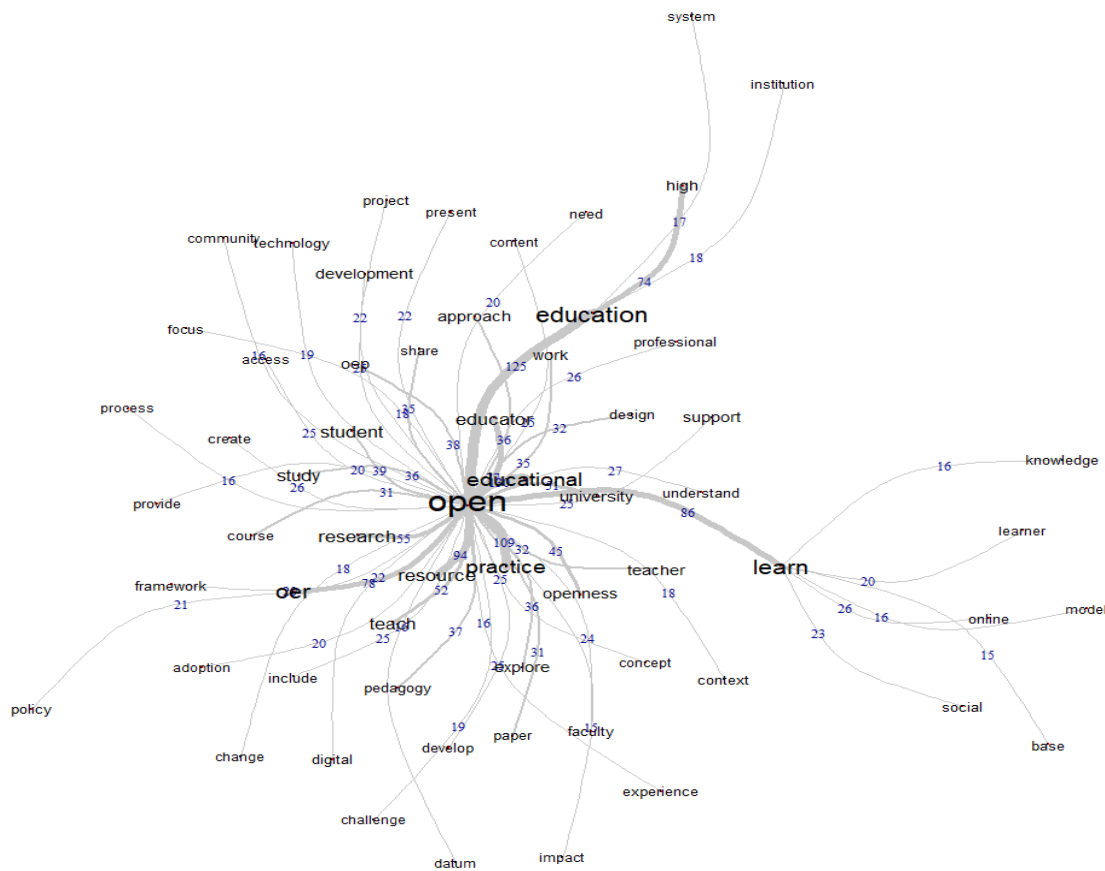


Figure 6: Similarity analysis using Iramuteq software for the search query *open educator*

Similarity analysis conducted on the merged corpus of the three dimensions, *open scholar*, *open researcher*, and *open educator*

In a final query, we decided to compile all inputs from the three previous queries, i.e. *open scholar*, *open researcher* and *open educator* and also added deliberately underrepresented literature. The compilation takes the form of Figure 7 with associated words grouped into lexical entities and distinguished by a coloured halo. Two large entities stand out.

The first one is centered around the word *open* (1919 occurrences) and relates to the words *education* (810 occurrences), *learn* (979 occurrences) and *practice* (622 occurrences).

The second lexical entity is centered around the word *research* (1552 occurrences) and *researcher* (830 occurrences). Associated words include *data* (723 occurrences), *study* (695 occurrences) and *publish* (387 occurrences). This suggests that research is strongly associated with data collection, publication of papers and research work in general.

The graph highlights a main branch connecting the words *education*, *open*, *research* and *researcher*. This underlines the importance of this association and suggests a strong relationship between open education, research and researcher. The service to the community mission of Higher Education institutions and related scholarly activities are noticeable by their absence. The same goes for philosophical aspects related to education and research. The assumption at this stage is that giving priority to professionally valued aspects of scholarship in HEIs has taken precedence on the purposes of “pure science”. The latter is defined as non-profit and oscillating in a continuum between the value of knowledge for its own sake and the social utility of science derived from its application (Weinstein, 2013)

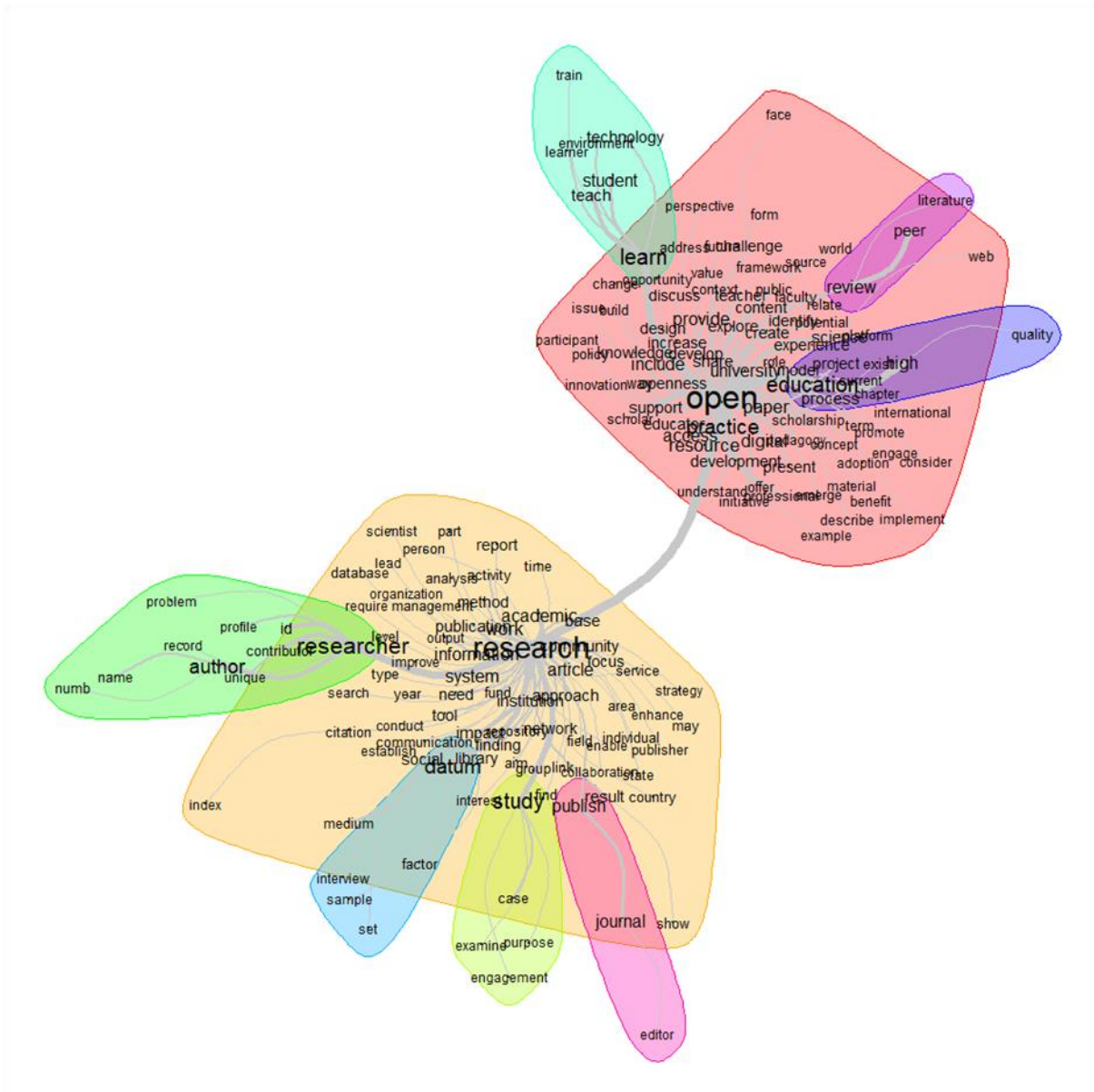


Figure 7: Similarity analysis using Iramuteq software for the merged corpus of the three dimensions, *open scholar, open education, and open educator*

Findings for the review of competence frameworks and documents

The list of competences has been identified and categorised according to the three missions of HEIs. Findings are following (Figures 8, 9, 10 and 11).

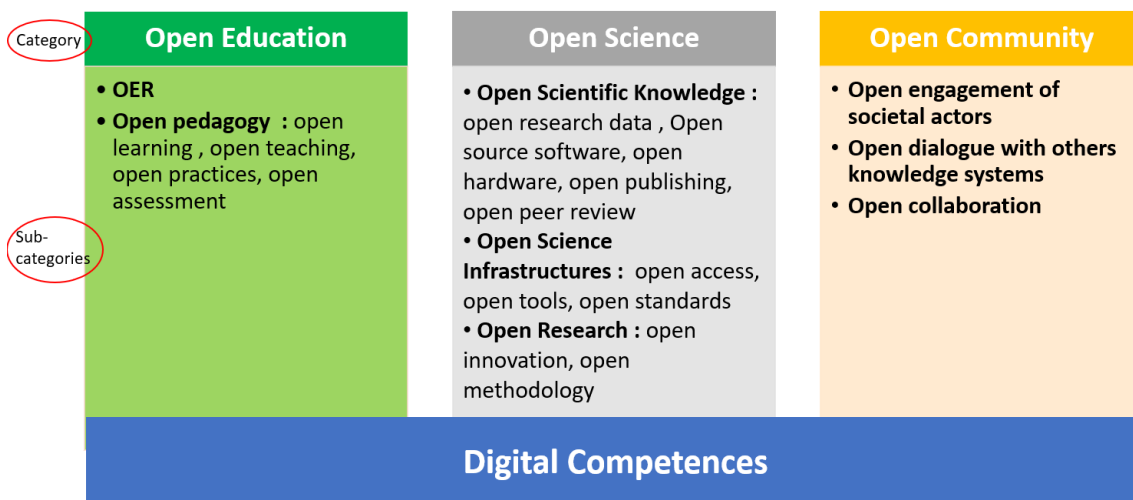
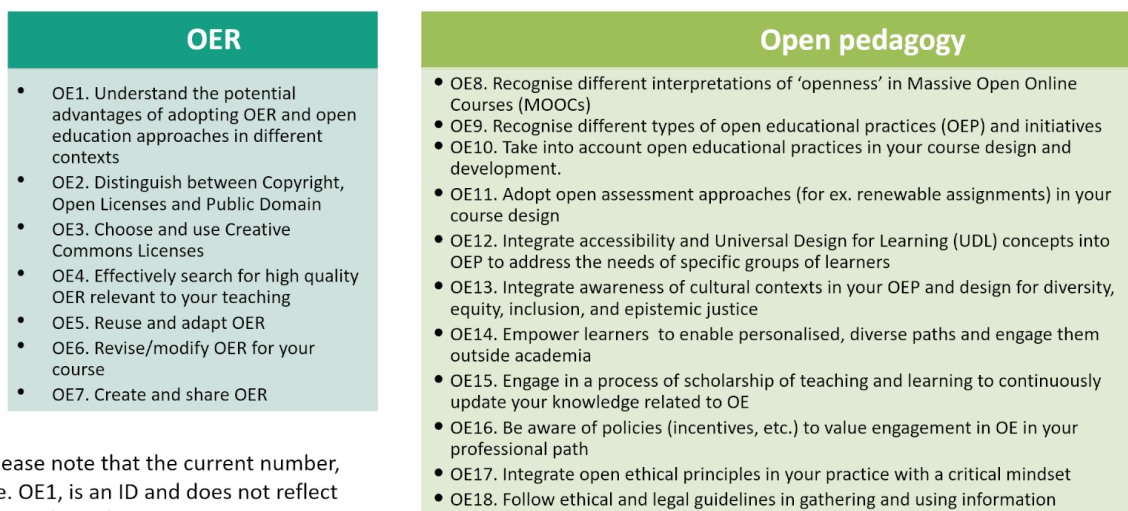


Figure 8: Categories and sub-categories of competences for the Open Scholar



Please note that the current number, i.e. OE1, is an ID and does not reflect any ordering!

Figure 9: Competences related to the Open Education / Open Educator category

Competences related to the Open Science category

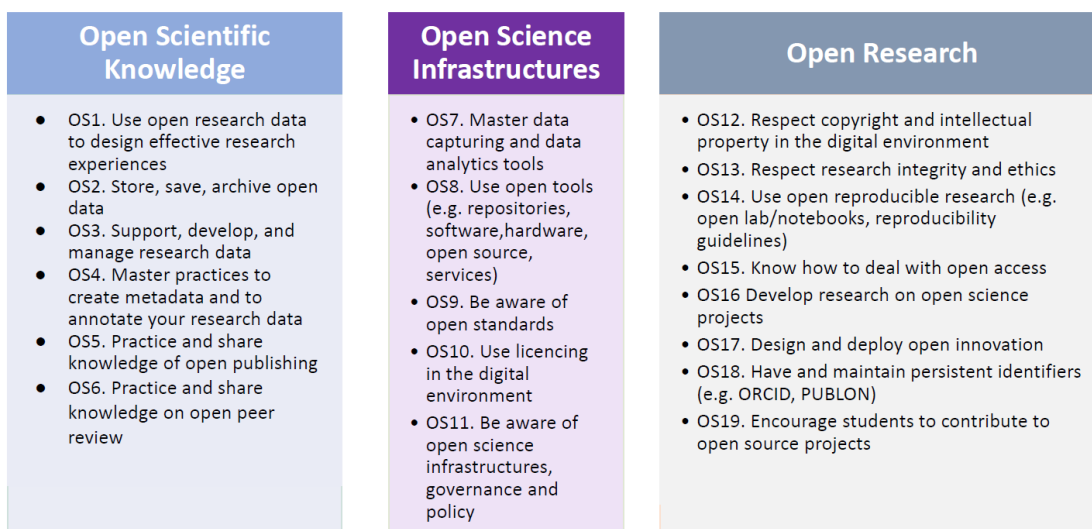


Figure 10: Competences related to the Open Science / Open Researcher category

Competences related to the Open Community category

Open engagement of societal actors	Open dialogue with other knowledge system	Open collaboration
<ul style="list-style-type: none">• OC1. Involve citizens into the research design as full participants from the research question to data analysis and interpretation• OC2. Analyze and discuss benefits and barriers of particular open paradigm, including cases from within your own region or discipline• OC3. Involve citizens, communities and professional actors to contribute with content and practices in course design• OC4. Network and advocate to share values and practices of Openness (transparency, freedom, agency, empowerment, etc.)	<ul style="list-style-type: none">• OC5. Communicate with people and stakeholders outside the scientific community (e.g. NGOs and the mainstream media)• OC6. Consider diversity in the content and in knowledge creation processes• OC7. Adopt open and transparent research practices (e.g. co-design the entire research process)• OC8. Engage in responsible research and innovation (RRI)	<ul style="list-style-type: none">• OC9. Manage contracts adopting new funding models (e.g. crowdfunding) and research reporting• OC10. Develop skills in collecting data and doing collaborative research with non-scientists• OC11. Integrate into your scholarly practice social and online collaborative tools• OC12. Contribute to and share developed software as open source to the community• OC13. Share with the community research and professional data collected on an individual basis• OC14. Contribute to collective projects (for ex. software development) to advance a given topic

Figure 11: Competences related to the Open Community category

Discussion and Conclusion

Findings from both the literature review and the analysis of competence frameworks show that scholarship focuses on practice. Practice reported does not suggest that reflexive and epistemic capabilities are present or in the process of being developed. Research strands addressing deeper levels related to paradigm are mainly those dealing with social and epistemic justice (e.g. Maha Bali et al., 2020; M Bali et al., 2020) and cultural studies (e.g. Funk, 2021; Lambert et al., 2021; Lambert & Funk, 2022). For competence frameworks, for instance, the one that is in the making at Maricopa Community College explicitly mentions *Describe the relationship between open education and critical pedagogy, black feminist pedagogy, and social justice theory* (MaricopaCollege, No date). This type of competence is not fully reflected in the reviews conducted, and this is not surprising. Indeed, first of all, this literature review was mostly performed on articles written in English, reproducing current biases with authors acknowledging it. Second, the literature review excludes all articles written between the 1960s and the 1990s, reflecting social movements of those years, e.g. post-studies of all sorts or gender studies. Concerning education, this is all the more true in the case of those articles which were excluded by law in the 2000s in the United States (St. Pierre, 2006). This is the reason why authors deliberately added a corpus of underrepresented literature. Even if they do not weigh enough in the literature review to make a substantial difference, at least they are present.

The main highlight of this study thus is to make absence at the deeper levels of paradigm present, to acknowledge it. Actually, rather than an absence, it is a context of pre-emergence, of *not-yetness* that is noted. The aim then, is to make scholars aware of this *not-yetness* and prepare them to address it. This is considered as a full-fledged competence which is somehow related to the concept of futures literacy. It is situated at an abstract cognitive level and reaches out to axiology, ontology and epistemology (Table 1, Table 2).

Not-yetness (St. Pierre, 2019) captures the immanent nature of the activity of Open Scholar — the state of becoming, trying to reveal something that has not yet revealed itself. This process can be interpreted in light of the three levels of learning - cognitive, metacognitive and epistemic (Bateson, 1972, cited by Salonen et al. 2023). The cognitive refers to scholarly literature on competences of Open Scholars. The metacognitive step is useful to bring forward the articulation between actors' activity in their practical field and their activity as beings in constant becoming/learning. Making visible the epistemic stance vs the epistemically informed praxis or enactment of epistemic beliefs is here the effort to be carried out.

To do so, the capacity to forecast (vs predict) a desirable future (Salonen et al., 2023), starting from the purpose of Openness in academic scholarship, is necessary. Is Openness a matter of form, usually portrayed by access and the removal of barriers? Is Openness a matter of deeper content,

as for instance the acknowledgement of the diversity of knowledge systems? Is Openness a lever to address *brokenness* of current academic practices, in reference to Jhangiani (2017)? Is Openness an end in itself? Is Openness a means towards something else? What could this *something else* be? A means to contribute to the common good? A means towards responsible and sustainable scholarship? These are just some examples of questioning situated at the level of purpose. They should help scholars grasp what is at stake.

In this overall perspective of *not-yetness* and *becoming*, operationalising Coulet’s approach to competence suits well because competences are considered as evolving and dynamic (vs limited to static lists of skills).

Concern (purpose)	Conception (operation)	Consequence (effect)
Consider <i>not-yetness</i> as a full fledged variable in the landscape of competences	Equip scholars with philosophical knowledge to help them address <i>not-yetness</i>	Develop the capacity to trace back any practice to a given paradigm and be able to identify it
Accept to address uncertainty and the future as “unapproachable” as Open Scholars	Reflect about Openness, Education, Research, Community in worldwide philosophies	Develop competences to question reality at the level of paradigm and act with responsibility and creativity
Locate scholarly activities in the non-enclosed, Medieval understanding of Open (vs legal right) and unenclosed outdoor space, that later became <i>Commons</i>	Understand worldwide networked and connected conceptions of knowledge considering specificities across knowledge systems	Develop competences to being-with, to produce through judicious connection to foster collective agency and develop local common goods.

Table 2: Towards the building of epistemic competences for the Open Scholar in reference to Sterling (2021) Triang model

To summarise, this article introduced the importance for Open Scholars to develop competences situated at the epistemic level. The study draws a parallel between this dearth and the importance to reconnect education scholarship with two of its foundational disciplines, namely philosophy and history (Tesar et al., 2022).

These findings are the result of the first of five steps which limitations are following. For the systematic literature review, some data was not available, specifically abstracts on which to perform the lexicometric analysis. As a result, some nuances in the results may not be apparent. For the selection of existing competence frameworks, some are probably missing because they are work in progress and authors would be grateful to readership to contact them should they be aware of any additional relevant framework. Furthermore, competence frameworks present this fragility of being normative documents that prescribe action. What actually happens when action is taken, i.e. how academics take ownership and implement the prescribed competences in reality, remains undocumented. Finally, these outputs from existing scholarship literature somehow reflect some “unresponsibility” in the sense of the biases acknowledged above.

As a reminder, this study was guided by the overall research question *how can competences of Open Scholars be identified to empower them as responsible scientific actors* ? As a reminder also, a responsible scholar is understood as: i) a respondent of an “inappropriate character of existence”; ii) someone who is given authorisation to act with care, respect and concern; iii) someone who conceptualizes the future as “unapproachable”. This understanding of a responsible scholar reaches out to using free will within this overall frame of care to respond as a rational and ethical scholar.

In order to overcome limitations, it is now necessary to begin to explore existing competences on one hand and competences located in this liminal space of *not-yetness* on the other hand (St. Pierre, 2019). The foreseen research process reads as following:

1. Identify a list of competences of the Open Scholar from a systematic literature review and existing competence frameworks (completed with the study reported in this article);

2. Conduct interviews with 15 experts according to Coulet's (2011) methodology: experts are invited to think in advance of a situation and will explicit competences through activities conducted in this specific situation. (Experts are scholars involved in open practices, thus revealing the actors' experiences and what is relevant to them. The researcher's task is to make explicit the concepts underlying the activity using operational invariants (Vergraud, 2007), as discussed in the theoretical framework section);
3. Build a questionnaire on the basis of the initial list of competences, complemented with answers to interviews, to ask the same 15 experts which competences should be kept and which ones should be added, i.e. considering auto-evaluation for professional development as main goal for the assessment of each competence;
4. Create a questionnaire based on expert input in step 4, formulated as an auto-positioning survey. Administer it to a large sample of young scientists, i.e. doctoral students or recently graduated, in education sciences, from the partner countries of the project – Morocco, Algeria, Tunisia, Egypt and Switzerland. The aim is to have a mapping of existing competences and practices to identify strengths and weaknesses and plan appropriate training;
5. Finally, to support training, produce a matrix of competence (see Appendix 3) that will be obtained through qualitative coding of interviews.

To conclude, along with the development of the competence framework, its implementation in an auto-position tool is designed. The aim is to develop an ergonomic tool that draws on research results to assess scholars' level of Openness in research, teaching and service to the community. In its design, the tool is inspired and furthers the Open Educators Factory (Nascimbeni & Burgos, 2016), addressing the three missions of higher education institutions.

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Data Accessibility Statement

The datasets generated and/or analysed during the current study are available in the YARETA repository, <https://doi.org/10.26037/yareta:niobwc65jrcphhgaplksfh52yi> ; <https://doi.org/10.26037/yareta:2wibo7to2bqi3bzgy5agcq6vvy>

Part of the data generated or analysed during this study are included in this published in Appendix 1

Ethics and Consent

Ethics review was not appropriate for this documentary analysis step of the study.

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Competing Interests

The authors have no competing interests to declare.

References

- Albero, B., & Las Vergnas, O. (2022). Chapitre 4. La revue de la littérature scientifique : préalable à toute démarche d'enquête méthodique. In *Enquêter dans les métiers de l'humain* (pp. 79-98). Éditions Raison et Passions. <https://doi.org/10.3917/rp.alber.2022.01.0079>
- Anderson, T. (2009). *Open scholarship* Open Access Week Athabasca University. <http://auspace.athabascau.ca/bitstream/2149/2320/7/oas.pdf>
- Aubret, J., & Gilbert, P. (2003). Chapitre 1. L'approche psychologique de la notion de compétence. In *L'évaluation des compétences* (pp. 7-27). Mardaga.
- Bali, M., Cronin, C., Czerniewicz, L., DeRosa, R., & Jhangiani, R. (Eds.). (2020). *Open at the margins. Critical Perspectives on Open Education*. Rebus Community. <https://press.rebus.community/openatthemargins/>.
- Bali, M., Cronin, C., & Jhangiani, R. S. (2020). Framing Open Educational Practices from a Social Justice Perspective. *Journal of Interactive Media in Education*, 1. <https://doi.org/10.5334/jime.565>
- Bateson, G. (1972). *Steps to an Ecology of Mind. Collected Essays in Anthropology, Psychiatry, Evolution, and Epistemology*. Chandler.
- Boyer, E. (1990). *Scholarship Reconsidered: Priorities of the Professoriate*. The Carnegie Foundation for the Advancement of Teaching.
- Bronckart, J.-P., & Dolz, J. (2002). La notion de compétence : quelle pertinence pour l'étude de l'apprentissage des actions langagières ? In J. Dolz & E. Ollagnier (Eds.), *L'énigme de la compétence en éducation* (pp. 25-44). De Boeck Supérieur. <https://www.cairn.info/revue-recherche-et-formation-2010-2-page-105.htm>
- Burton, G. (2009). *The open scholar*. <http://www.academicrevolution.com/2009/08/the-open-scholar.html>
- CERN. (No date). *The birth of the Web*. <https://home.cern/science/computing/birth-web>
- Coulet, J.-C. (2011). La notion de compétence: un modèle pour décrire, évaluer et développer les compétences. *Le travail humain*, 74, 1-30. <https://doi.org/10.3917/th.741.0001>
- Coulet, J.-C. (2019). Compétences transversales : quelques suggestions pour s'affranchir d'un mythe. *Recherches en éducation*, 37. <https://doi.org/10.4000/ree.802>
- Cronin, C. M. G., & Maclaren, I. (2018). Conceptualising OEP: A review of theoretical and empirical literature in Open Educational Practices. *Open Praxis*, 10, 127-143. <https://openpraxis.org/articles/10.5944/openpraxis.10.2.825/>
- Cros, F., & Raïsky, C. (2010). « Référentiel ». [Benchmarking]. 64(2), 105-116. Retrieved from <https://www.cairn.info/revue-recherche-et-formation-2010-2-page-105.htm>
- De Montmollin, M. (1984). *L'Intelligence de la tâche ; éléments d'ergonomie cognitive*. Peter Lang.
- Derrida, J. (2005). *The politics of friendship*. Verso.
- Dufour, F. (2010). Approche dynamique de l'intelligence économique en entreprise : apports d'un modèle psychologique des compétences : Contribution à l'élaboration de programmes d'actions de la CCI de Rennes [Phd thesis, Université Rennes 2]. <http://tel.archives-ouvertes.fr/tel-00551654>
- Downes, S. (2012). *Connectivism and Connective Knowledge. Essays on meaning and learning networks*. https://www.oerknowledgecloud.org/archive/Connective_Knowledge-19May2012.pdf
- Fauquet-Alekhine, P. (2020). Competencies Need Actions. In *Knowledge Management in High Risk Industries: Coping with Skills Drain* (pp. 23-51). Springer International Publishing. https://doi.org/10.1007/978-3-030-49213-7_3
- Fedorova, A. (2020). Competence: being an interpreter elaboration of competence framework for

- the training of simultaneous interpreters <https://archive-ouverte.unige.ch/unige:136609>
- Funk, J. (2021). Caring in Practice, Caring for Knowledge. *Journal of Interactive Media in Education*, 11(1). <https://doi.org/10.5334/jime.648>
- Harzing, A.-W. (2016). *Publish or Perish*. <https://harzing.com/resources/publish-or-perish>
- Jhangiani, R. S. (2017). Open as Default. The Future of Education and Scholarship. In R. S. Jhangiani & R. Biswas-Diener (Eds.), *Open. The Philosophy and Practices that are Revolutionizing Education and Science* (pp. 267-280). Ubiquity Press. <http://www.jstor.org/stable/j.ctv3t5qh3.26>
- Kuhlmann, N. (2022). On the Power of the Concept of Responsibility. *Educational Theory*, 72(1), 65-83. <https://doi.org/https://doi.org/10.1111/edth.12514>
- Labbé, C., & Labbé, D. (2013, 2013-06-12). *Lexicométrie : quels outils pour les sciences humaines et sociales ? Usages de la lexicométrie en sociologie*, Guyancourt, France. <https://hal.science/hal-00834039>
- Lambert, J., Epstein, G., Joel, J., & Baggio, J. (2021). Identifying Topics and Trends in the Study of Common-Pool Resources Using Natural Language Processing. *International Journal of the Commons*, 15(1), 206–217. <https://doi.org/10.5334/ijc.1078>
- Lambert, S., & Funk, J. (2022). Open educational practices in a Cultural Capability unit: learning at the cultural interface. *Journal for Multicultural Education*, 16(5), 522-537. <https://doi.org/10.1108/JME-01-2022-0005>
- Leonelli, S. (2023). *Philosophy of Open Science*. Cambridge University Press. <https://doi.org/10.1017/9781009416368>
- Marshall, C., & Rossman, G. B. (1999). *Designing qualitative research* (3rd ed.). Sage Publications, Inc.
- MaricopaCollege. (No date). *OER Professional Development Competencies Framework*. https://docs.google.com/document/d/1fjksZ38rbk_TzrnWvE8q9egHZWlzpL03VK5Zq7G4LrE/edit#heading=h.e5d9g68fz83b
- Meirieu, P. (2017). *Pédagogie : le devoir de résister. 10 ans après!* ESF Editeur. <https://doi.org/10.14375/NP.9782710138426>
- Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Medicine*, 6(7). <https://doi.org/10.1371/journal.pmed.1000097>
- Nancy, J.-L. (2000). *Being Singular Plural*. Meridian.
- Nascimbeni, F., & Burgos, D. (2016). In Search for the Open Educator: Proposal of a Definition and a Framework to Increase Openness Adoption Among University Educators. *International Review of Research in Open and Distributed Learning*, 17(6), 1-17. <https://doi.org/https://doi.org/10.19173/irrodl.v17i6.2736>
- Owen, R., Macnaghten, P., & Stilgoe, J. (2012). Responsible research and innovation: From science in society to science for society, with society. *Science and Public Policy*, 39(6), 751-760. <https://doi.org/10.1093/scipol/scs093>
- Peters, M. A. (2017). Open Education and Education for Openness. In M. A. Peters (Ed.), *Encyclopedia of Educational Philosophy and Theory* (pp. 1693-1696). Springer Singapore. https://doi.org/10.1007/978-981-287-588-4_411
- Rabardel, P. (1995). Qu'est-ce qu'un instrument ? Les dossiers de l'Ingénierie éducative, 19, 61-65. Retrieved from http://tecfalabs.unige.ch/mitic/articles/rabardel_1995_quest-ce_quun_instrument.pdf
- Raffoul, F. (2018). The History of Responsibility. In C. Mattingly, R. Dyring, M. Louw, & T. S. Wentzer (Eds.), *Moral Engines* (1 ed., Vol. 5, pp. 230-250). Berghahn Books. <https://doi.org/10.2307/j.ctvw04jwk.15>
- Ratinaud, P., & Déjean, S. (2009). *IRaMuTeQ : implémentation de la méthode ALCESTE d'analyse de texte dans un logiciel libre* Modélisation Appliquée aux Sciences Humaines et Sociales (MASHS2009), Toulouse Le Mirail.
- Reinert, M. (1993). Les "mondes lexicaux" et leur "logique" à travers l'analyse statistique d'un corpus de récits de cauchemars. *Langage & société*, 5-39. <https://doi.org/10.3406/lsoc.1993.2632>
- Ricœur, P. (1994). Le concept de responsabilité: Essai d'analyse sémantique. *Esprit* (1940-)(206 (11)), 28-48. <http://www.jstor.org/stable/24276317>
- Sabourin, P. (2009). L'analyse de contenu. In G. B (Ed.), *Recherche sociale: de la problématique à*

la collecte des données. Presses de l'Université du Québec.

- Salone, J.-J. (2013). Analyse textuelle avec IRaMuTeQ et interprétations référentielles des programmes officiels de mathématiques en quatrième. *Sciences-Croisées*. <https://hal.science/hal-01671161>
- Salonen, A. O., Laininen, E., Hämäläinen, J., & Sterling, S. (2023). A Theory of Planetary Social Pedagogy. *Educational Theory*, 73(4), 615-637. <https://doi.org/10.1111/edth.12588>
- Sarkis-Onofre, R., Catalá-López, F., Aromataris, E., & Lockwood, C. (2021). How to properly use the PRISMA Statement. *Systematic Reviews*, 10(1), 117. <https://doi.org/10.1186/s13643-021-01671-z>
- Savin-Baden, M., & Howell Major, C. (2013). *Qualitative research. The essential guide to theory and practice*. Routledge.
- Siemens, G. (2005). Connectivism: A Learning Theory for the Digital Age. *International Journal of Instructional Technology & Distance Learning*, 2(1). http://www.itdl.org/Journal/Jan_05/article01.htm
- St. Pierre, E. A. (2006). Scientifically Based Research in Education: Epistemology and Ethics. *Adult Education Quarterly*, 56(4), 239-266. <https://doi.org/10.1177/0741713606289025>
- St. Pierre, E. A. (2019). Post Qualitative Inquiry in an Ontology of Immanence. *Qualitative Inquiry*, 25(1), 3-16. <https://doi.org/10.1177/1077800418772634>
- Sterling, S. (2007). Riding the storm: towards a connective cultural consciousness. In A. E. J. Wals (Ed.), *Social Learning Toward a More Sustainable World: Principles, Perspectives, and Praxis*. Wageningen Academic Publishers. https://www.researchgate.net/publication/258151623_Social_Learning_towards_a_Sustainable_World_full_e-book
- Sterling, S. (2021). Concern, Conception, and Consequence: Re-thinking the Paradigm of Higher Education in Dangerous Times [Original Research]. *Frontiers in Sustainability*, 2. <https://doi.org/10.3389/frsus.2021.743806>
- Tesar, M., Hytten, K., Hoskins, T. K., Rosiek, J., Jackson, A. Y., Hand, M., Roberts, P., Opiniano, G. A., Matapo, J., St. Pierre, E. A., Azada-Palacios, R., Kuby, C. R., Jones, A., Mazzei, L. A., Maruyama, Y., O'Donnell, A., Dixon-Román, E., Chengbing, W., Huang, Z., . . . Jackson, L. (2022). Philosophy of education in a new key: Future of philosophy of education. *Educational Philosophy and Theory*, 54(8), 1234-1255. <https://doi.org/10.1080/00131857.2021.1946792>
- Tight, M. (2019). Systematic reviews and meta-analyses of higher education research. *European Journal of Higher Education*, 9(2), 133-152. <https://doi.org/10.1080/21568235.2018.1541752>
- Veletsianos, G., & Kimmons, R. (2012). Assumptions and Challenges of Open Scholarship. *International Review of Research in Open and Distributed Learning*, 13(4), 166-189. <https://doi.org/https://doi.org/10.19173/irrodl.v13i4.1313>
- Vergnaud, G. (2007). Représentation et activité : deux concepts étroitement associés Recherche en éducation(4), 9-23. Retrieved from https://isfecauvergne.org/IMG/pdf/article_de_Vergnaud.pdf
- Vergnaud, G. (2011a). Au fond de l'action, la conceptualisation. In J.-M. Barbier (Ed.), *Savoirs théoriques et savoirs d'action* (pp. 275-292). Paris: Presses Universitaires de France.
- Vergnaud, G. (2011b). La pensée est un geste comment analyser la forme opératoire de la connaissance Enfance(1), 37-48. Retrieved from <https://www.cairn.info/revue-enfance2-2011-1-page-37.htm>
- Weinstein, O. (2013). *Science ouverte, science « moderne » et montée du corporate capitalisme. Work package 1 : « La montée de l'exclusivisme et ses apories »*. <https://hal.science/hal-03367030>
- Weller, M. (2011). *The digital scholar: How technology is transforming scholarly practice*. Bloomsbury Academic. <http://oro.open.ac.uk/29664/>
- Wenger, E. (2004). *Learning for a Small Planet: A Research Agenda*. <https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=1edaa7f3f9bfe94dff79c7645d5c734bfeee814e>
- Wiley, D. (No date). *Defining the "Open" in Open Content and Open Educational Resources*. <https://opencontent.org/definition/>
- Zawacki-Richter, O., & Jung, I. (Eds.). (2022). *Handbook of Open, Distance and Digital Education*

Springer. <https://doi.org/10.1007/978-981-19-0351-9>.

Appendix 1: List of competence frameworks analysed

Open Education / Open Educational Resources courses

- OpenMed - Opening up Education in South-Mediterranean countries, <https://openmedproject.eu/course/>
- OpenGame - <https://opengame-project.eu/>
- Open Educator Factory- https://wikieducator.org/Research/open_educators_factory ; <http://rd.unir.net/pub/oef/login.php>
- UNESCO OER recommendations, http://portal.unesco.org/en/ev.php-URL_ID=49556&URL_DO=DO_TOPIC&URL_SECTION=201.html

Open Science

- MOOC la science ouverte - <https://www.fun-mooc.fr/fr/cours/la-science-ouverte/>
- Introduction to Open Science - <https://www.fosteropenscience.eu/node/2076> ; <https://www.fosteropenscience.eu/>
- MOOC Open Science: Sharing Your Research with the World - <https://online-learning.tudelft.nl/courses/open-science-sharing-your-research-with-the-world/>
- UNESCO Open Science recommendations, <https://unesdoc.unesco.org/ark:/48223/pf0000379949.locale=en>

Open research training

- Open Research in Practice - <https://www.surrey.ac.uk/library/open-research/open-research-training>
- MOOC Recherche reproductible : principes méthodologiques pour une science transparente - <https://www.fun-mooc.fr/fr/cours/recherche-reproductible-principes-methodologiques-pour-une-science-transparente/>

Appendix 2: Detailed method for the systematic literature review

To perform the systematic literature review, Google Scholar was chosen because it indexes the majority of peer-reviewed online journals and journals from major publishers in the scientific literature.

An initial review was carried out on the abstracts of the articles identified by the Open Scholar search query. Based on the results of the lexicometric analysis, two further literature reviews were carried out using the same procedure on two other dimensions: *open researcher* and *open educator*.

Lexicometric analysis offers the possibility of managing large volumes of texts, analysing their vocabulary, categorising words based on their frequency, distribution and grammatical categories (Labbé & Labbé, 2013). Textual analyses were carried out for each dimension, in particular similarity analyses (co-occurrence analyses of words in the text corpus from the abstracts of the listed articles). Similarity analysis is a co-occurrence analysis presented in the form of word association graphs and is based on the connectivity properties of the corpus. The tree-like graphical representation shows nodes representing word forms and edges (links) describing co-occurrences between nodes. The larger the size of the words, the more frequently they occur in the corpus, and the thicker the edges, the stronger the co-occurrence. This algorithm aims to strengthen the neighbourhood relationships between word forms (Salone, 2013). The analyses were carried out using the open-source software IRaMuTeQ (Interface of R for Multidimensional

Text and Questionnaire Analysis), which is widely used for exploring textual data, including text analysis using text mining and content analysis methods (Ratinaud & Déjean, 2009; Reinert, 1993). The reporting of these systematic reviews was guided by the standards of the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) statement (Sarkis-Onofre et al., 2021).

The aim of the PRISMA statement is to help authors improve the reporting of systematic reviews and meta-analyses (Moher et al., 2009). It offers a number of significant advantages in conducting systematic reviews and ensuring transparent reporting.

This model can be valuable for reporting the entire bibliographic process in publications (Albero & Las Vergnas, 2022), including details about the specific queries formulated, the number of documents discovered, and the criteria used for selecting documents subject to in-depth analysis.

In order to select relevant references, we established inclusion and exclusion criteria.

- Step 1: All articles written in languages other than English, duplicates and articles not related to the research topic were excluded.
- Step 2: All references with missing abstracts, invalid or broken URLs were excluded.

The initial literature search using the query "open scholar" yielded 592 articles, excluding citations and patents. 287 articles were excluded because they were duplicates or not related to the research topic, and 62 were written in a language other than English.

A further 32 references were excluded because they had incomplete abstracts, their URL addresses were invalid or the requested URL could not be found. A total of 211 studies were included in this review (Figure 3).

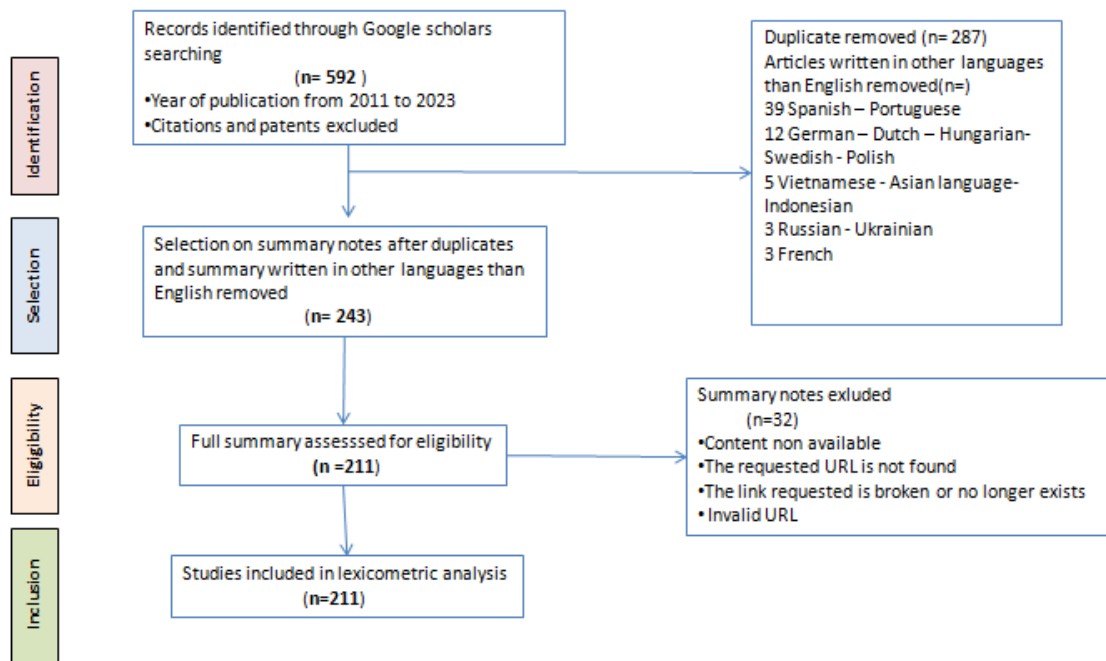


Figure 12: PRISMA diagram: Systematic documentary research on the theme of “open scholar”

The second literature review using the search term "open researcher" returned 740 articles, excluding citations and patents. 65 references were excluded because they were duplicates or not relevant to the research topic, 141 were written in a language other than English, and a further 89 references were excluded because of incomplete abstracts, invalid URLs or unfindable requested URLs. In total, 445 studies were included in this review (Figure 4).

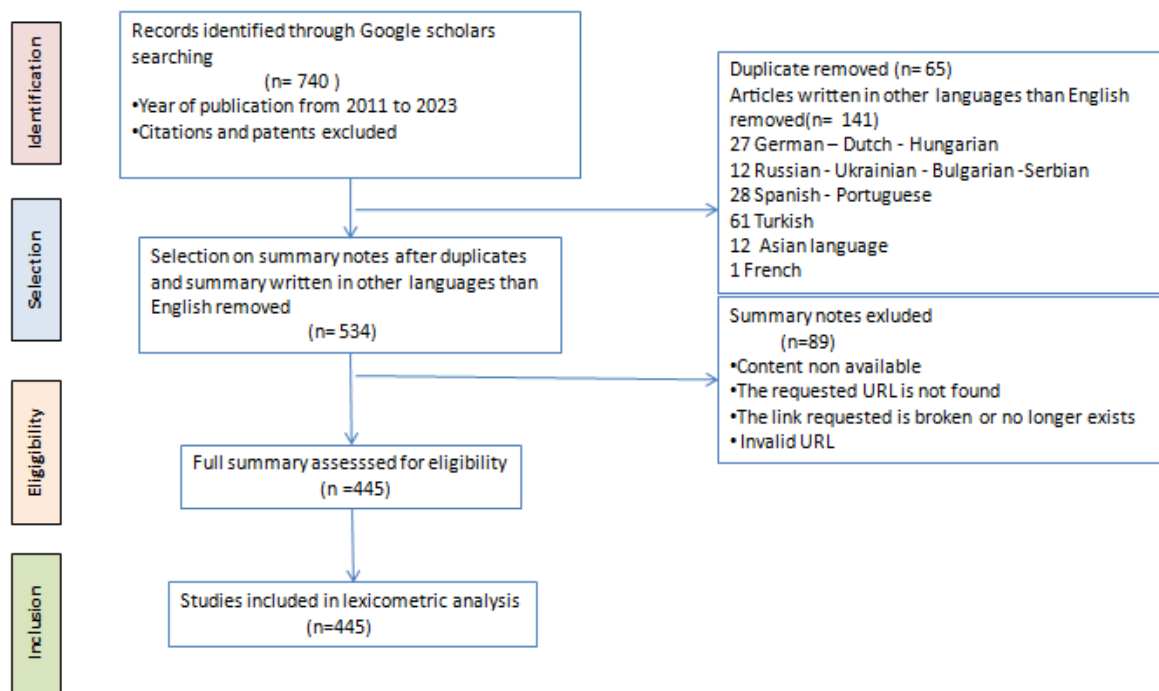


Figure 13: PRISMA diagram: Systematic documentary research on the theme of “open researcher”

The third literature review, focusing on the search query 'open educator', yielded 208 articles, excluding citations and patents. Of these, 10 and 7 references respectively were removed due to duplication, non-English language or lack of relevance to the research topic. A further 36 references were excluded due to incomplete abstracts, invalid URL addresses or unfindable requested URLs. In the end, a total of 155 studies were included in this review (Figure 5).

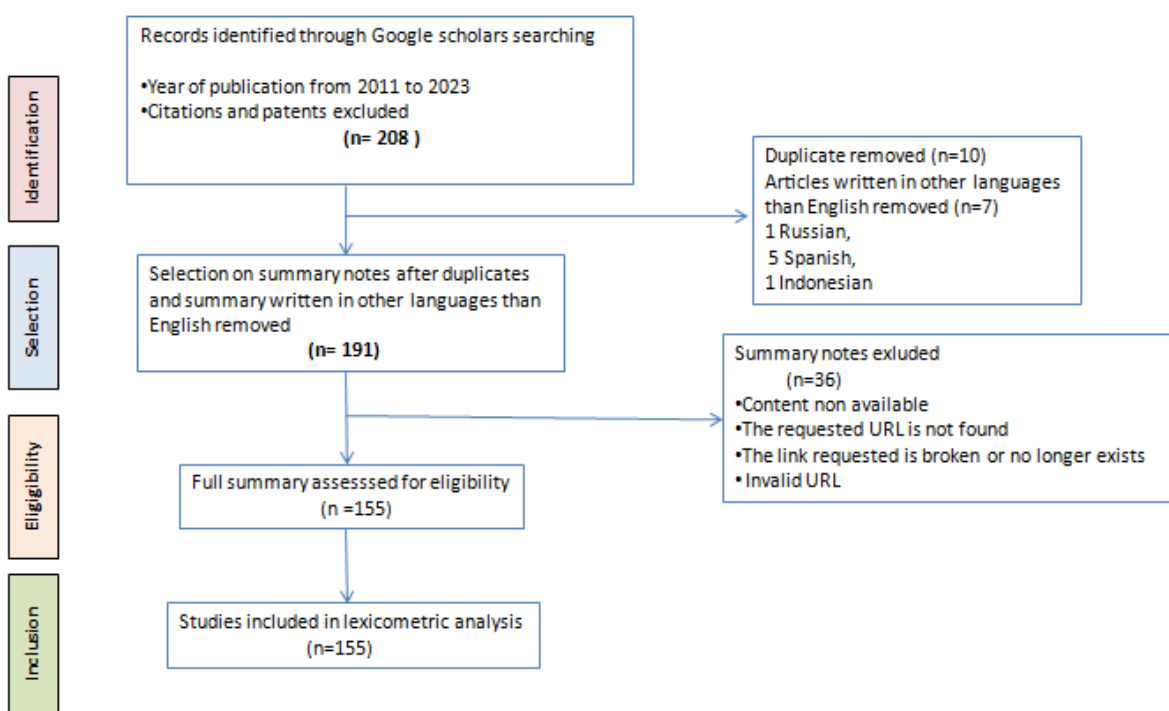


Figure 14: PRISMA diagram: Systematic documentary research on the theme of “open educator”

Appendix 3: Matrix components and their explanations

Activity schemes	Operative invariants		Inferences and strategies	Rules of action	Anticipations	Artefacts
	What the subject holds for true	What the subject holds for relevant				
Schemes listed below are part of a competence that is already existing or that needs to be developed.	Operative invariants indicate what the subject (rightly or wrongly, depending on his level of expertise) considers to be true and relevant, and what the key concepts are that are referred to when he is faced with a given task in a given context. It includes everything he needs to identify the elements and their relationships that are involved in the implementation of the scheme.		This expresses the adaptation of the scheme to the specific characteristics of the situation and the task. What is noted are the parameters that determine the choice of rules of actions (not the calculations <i>per se</i>).	They represent the part of the scheme that responds to the stimulus received. They allow the scheme's implementation by producing effects on the task and situation.	Considering the overall aim pursued, anticipations refer to the subject's expectations in terms of the effects he wants to achieve through the implementation of the rules of action.	Artefacts noted here are those mentioned that translate the actual implementation of the scheme.