Interdisciplinarity and Postgraduate Teaching of Knowledge Organization (KO): Elements for a Necessary Dialogue

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Abstract: Interdisciplinarity implies the previous existence of disciplinary fields and not their dissolution. As a general objective, we propose to establish an initial approach to the emphasis given to interdisciplinarity in the teaching of KO, through the teaching staff responsible for postgraduate courses focused on -or related to the KO, in Ibero-American universities. For conducting the research, the framework and distribution of a survey addressed to teachers is proposed, based on four lines of action: 1. The way teachers manage the concept of interdisciplinarity. 2. The place that teachers give to interdisciplinarity in KO. 3. Assessment of interdisciplinary content that teachers incorporate into their postgraduate courses. 4. Set of teaching strategies and resources used by teachers to include interdisciplinarity in the teaching of KO. The study analyzed 22 responses. Preliminary results show that KO teachers recognize the influence of other disciplines in concepts, theories, methods, and applications, but no consensus has been reached regarding which disciplines and authors are the ones who build interdisciplinary bridges. Among other conclusions, the study strongly suggests that environmental and social tensions are reflected in subject representation, especially

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in the construction of friendly knowledge organization systems with interdisciplinary visions, and in the expressions through which information is sought.

Introduction

1.1. Interdisciplinarity and teaching

Interdisciplinarity is a complex and polysemic term. According to the online Merriam-Webster Dictionary, interdisciplinarity "involves two or more academic, scientific, or artistic disciplines" (Merriam-Webster 2023). This definition is heir to the one established in 1926 by the coiner of the expression, the psychologist Robert Woodworth (Frank 1988). However, Klein (1990) argues that the concept of interdisciplinarity has its roots in older discourses, notably those on the synthesis and integration of knowledge.

It should not be assumed that the meaning of interdisciplinarity is apparent or that it means the same for everyone (Follari 1999). Therefore, it is a necessary task to resolve conflicts over its interpretation (Follari 2005).

The different interdisciplinarity definitions align with ideological, epistemological, or philosophical conceptions. There are definitions associated with a capacity of individual subjects (Rugarcía 1997; National Academies of Sciences, Engineering, and Medicine 2005); or a collective construction (Follari 2007; Sutz 2015). It is visualized as the co-production of knowledge based on a common language (Sutz 2015) or from a methodological perspective, such as the combination of methods (Barbero 2004), the non-repetition of them (Follari 2007) or the formulation of approaches to complex objects of study that require the integration of different disciplines (Morin 1990; Bammer 2005; García 2010; Lenoir 2013).

These divergent conceptions generate points of friction and dissension. Follari (2007) discusses the impossibility of an individual subject being interdisciplinary because interdisciplinarity is a consequence of the synthesis of a group of people. On the contrary, Rugarcía (1997) establishes that one person might be capable of integrating the same two or more disciplines. Although Follari (2007), Lenoir (2013), and Barbero (2004) conceive inter-discipline as a method to approach objects in their complexity, they differ on whether the integration produces new methodologies or if only a transfer of methods from one discipline to another is verified (Parentelli, 2019a).

Interdisciplinarity presupposes the existence of prior disciplinary fields and not their dissolution (Morin 1990, 2005; Nieto-Caraveo 1991; Sotolongo and Delgado 2006; Rugarcía 1997; Medina 2006; Rendón 2008, among others). In this respect, interdisciplinarity can only be built by projecting and communicating elements of the pre-existing disciplines. Nowadays, the process of hybridization or intersection across disciplines is continuous, and with it, the interdisciplinary perspective will not stop growing (Dogan 1996; Newell 2013).

The so-called interdisciplinarity, and consequently the need for disciplinary integration in teaching, starts with recognizing the difficulty that the fragmentation of knowledge establishes for the learning of professionals and scholars within the complex context that reality provides.

The inclusion of interdisciplinarity in higher education implies, on the one hand, the epistemological questioning of the historical construction of theoretical and methodological objects (Stolkiner 1999) and, on the other, a pedagogical innovation, if what is sought is to break with the university tradition of distributing specialist knowledge by careers.

Likewise, it is necessary to devise strategies for the achievement of interdisciplinary approaches and consider specific educational devices to achieve this. It is not a question of initiating a revolution on how university education is organized concerning its pedagogical conceptions but considering aspects that promote critical thinking through strategies and didactic resources that enable an interdisciplinary perspective.

Was possible by incorporating integrative themes that promote the linking of disciplines and the application of innovative methodologies (Malinowski 2016). Torres (2006) proposes integrating thematic nuclei focused on problems, institutions, and historical issues, addressing theoretical and methodological frameworks from different disciplines (Parentelli 2019a). These would be examples of curricular strategies inserted in pedagogical proposals without substantially changing the latter.

Badilla (2009), among other authors, argues that for interdisciplinarity to be expressed, it is necessary to start from an integrated curriculum as a pedagogical approach; for example, the organization of teaching into areas focused on research responsive to real issues. In any case, the teacher's action is crucial. Both in designing and implementing an integrated curriculum and incorporating themes, nuclei, or complex problems associated with learning processes, and curricular agreements. The design of strategies and didactic resources associated with learning objectives are needed.

In this sense, there is a pedagogical dimension in the incorporation of interdisciplinary teaching that perhaps should address the aspects indicated by Parentelli (2015): a) Make the interdisciplinary intention explicit; b) The recognition that there are disciplines involved in the theoretical, conceptual and methodological issues, as well as the teaching attitude of opening the epistemological frontiers of the area; c) Identify the areas of knowledge that can contribute; d) Identify interdisciplinarity knowledge; e) Establish where inter-discipline is going to be conceived; f) Reflect on the activity and at the completion, identify obstacles and strengths; g) Think of concrete strategies for interdisciplinary work; and h) Promote predisposition and group climate (Parentelli 2015, 121-122).

Regarding postgraduate teaching of KO, as a constitutively interdisciplinary domain, it would be interesting to speculate on how interdisciplinary teaching processes are generated, with particular attention to the unique features their pedagogical and didactic approaches must have.

1.2. Interdisciplinarity and KO

From the subtitle of the Knowledge Organization (KO), a continuation of International Classification, it was recognized that the thematic scope of the new field of studies included "Conceptology, Classification, Indexing, and Knowledge Representation, including the relevant Linguistic Problems and Terminology" (Dahlberg 1993, 1). In the Classification System for Knowledge Organization Literature (CSKOL), also created by Dahlberg to classify the documents of the area, notations for subject areas are included, such as 13 Mathematics in KO, 14 Systems Theory, 15 Psychology, and KO, 711 Linguistics, and KO or 96 Policy and Legal Questions.

Other authors have enriched the range of links between KO and other disciplines. Thus, the concepts, techniques, and procedures provided by Artificial Intelligence, Natural Language Processing, and Cognitive Sciences are three contributions McIlwaine (2003) identified from which KO builds better theoretical and methodological tools.

In the preface to issue 2/3 of 2008 of the KO, a special issue dedicated to answering the question "What is KO?" its guest editors declare from the first sentence the field's interdisciplinary nature. In his contribution to the dossier, Hjørland (2008) also considers the fields mentioned in the KOJ subtitle "Concept Theory, Classification, Indexing, and Knowledge Representation" as an example and states that each of these fields may be studied from different disciplinary perspectives.

Thus, "concepts, for example, may be studied by Psychology, Linguistics, Philosophy, Sociology, and Artificial Intelligence.

Each of these fields tends to emphasize different aspects of concepts. At the same time, however, each of those fields struggles with the same fundamental problems regarding the nature of concepts" (Hjørland 2008, 98).

Next, Hjørland (2008) points out the benefits that these areas and others share standard epistemological bases with KO because this allows for the construction of better-grounded and more solid theories. In this line, Mai (2000) had already incorporated the idea of appealing to canonical thinkers of the Social and Human Sciences (such as Barthes, Morin, Foucault, Bourdieu, or Eco mentioned above) by using Peirce's thought to support the processes.

However, Hjørland also mentions significant obstacles in interdisciplinary intersection studies: "To understand the relationship between Linguistics and LIS [Library and Information Science], it is, therefore, important to understand that both fields are influenced by changing epistemological views and interdisciplinary trends. Epistemology is simply a deeper way to understand both fields. This situation, unfortunately, makes it more difficult for all parties, including KO" (Hjørland 2008, 99).

While KO is acknowledged as a specific area of knowledge, there are continuous references to different levels of dialogue and exchange with knowledge from other disciplines (García Marco 1995; McIlwaine 2003; Hjørland 2008; Szostak, Gnoli, and Lopez-Huertas 2016; Guimarães 2017; Salaba 2020; Barité 2022).

There seem to be two powerful intersections, due to their antiquity, stability, and depth, which are verified both in academic production and in professional practice: with LIS or Information Science (IS) and with Information Retrieval (IR) studies (Smiraglia 2014). In the latter case, it flows smoothly towards the links with the disciplines that are behind the historical paradigms of IR: Information Technologies and Natural Language Processing, the contributions of Cognitive Sciences, and those of Social Sciences, which correspond to the physicalist, cognitive and social paradigms respectively (Cruz Gil 2015).

We should add the cultural dimension of KO because "cultures represent strongly bounded communities, in such a way that even neighboring or overlapping cultures experience subtle shifts of meaning between them" (Smiraglia 2012, 15). To the extent that appeals to the cultural dimension of knowledge within KO, theories and methods find their place taken from Anthropology, Social History, and Cultural Studies and also begin to be valued.

Perhaps the interdisciplinary vocation of the KO is a consequence of the fact that "knowledge organization is of great importance in a global information landscape and affects all economic, political, social, and educational sectors" (Salaba 2020, 384).

The interdisciplinary composition of the field is also perceived in the terminology commonly used in KO literature,

which naturally includes many expressions specific to the area (automatic indexing, corporate thesaurus, literary warrant, subject heading, top term, preferred term, non-descriptor), but also others that come from the most varied disciplines.

In the latter case, expressions that are borrowed coexist without modifying either their linguistic expression or their concept (boolean operator, cluster, conceptual map, cross reference, fiction, mutual exclusion), with others that are modified or specified in their scope, so that their concepts can become operational in KO (domain analysis, category, personality, bias, syntax, paradigmatic relation).

1.3. Teaching KO as an interdisciplinary field

The contribution of many disciplines to the area as evidence, that the university teaching of the KO should meet three objectives, the third of which is "to train the student in the vocabulary and basic models of the interdisciplinary sciences connected with it" (García Marco 1995, 220).

Research conducted on undergraduate comparative curricula (Morgan and Baden 2006; Pattuelli 2010; Alajmi and Rehman 2016; Chaudhry 2016, 2018; Salaba 2020) establish a well-founded analysis of professional tensions and challenges in a growing digital environment and reaffirm the idea of a curriculum organized around the classic concepts that give profile to the profession.

In the first Congresses of LIS Schools of the Mercosur, a series of papers (Barité, 2000a and 2000b; Guimarães, 2000, 2001a and 2001b) identified the bodies and theoretical approaches present in degree programs in the subject area in that region (integrated by Argentina, Brazil, Paraguay, and Uruguay). A critical and not merely enumerative vocation was presented: to avoid reducing training to "a hybrid set of notions and applications that students cannot interpret or use according to their epistemological contexts" (Barité 1999, 126).

Morgan and Badwen (2006) studied KO teaching within formal education courses in LIS. Specifically, they examined the perceptions of the 'providers' (university educators), 'consumers' (employers), and LIS professional associations concerning seven classic KO cores: abstracting, indexing, cataloging, classifying, Internet resource description, metadata, and thesauri.

Pattuelli (2010) examined the subject content of approximately 2000 course readings of introductory-level KO courses from thirty-four (34) schools in the USA and Canada, taught in ALA [American Library Association]-accredited LIS programs. Results indicated that traditional bibliographic methods and practices remain at the core of KO courses and that metadata is a nuclear element of course content.

The teaching of new topics like Information Architecture, markup languages, and semantic web at the introductory level of the KO courses was also identified. In the conclusions, she established that KO education "faces challenges similar to those of LIS education programs. In general: redefining its role and restructuring the curriculum to respond to a changing profession" (Pattuelli 2010, 821).

More recently, Salaba (2020) reported preliminary results on KO requirements and offerings of 64 ALA-accredited programs housed in sixty academic institutions, focusing on competencies for professional practice. In the conclusions, she perceived KO's critical role in today's information landscape, and not only in libraries. The author wonders, "How can LIS programs benefit from an international effort to adequately define Information Organization and KO competencies to prepare their graduates for careers in this field?" (Salaba 2020, 392).

It is worth noting that none of these investigations on the situation of undergraduate courses in the area mention the interdisciplinary characteristic of KO. Only in Salaba (2020), in a table about the scope of the competence sets, five related domains are mentioned (Cognitive et al.) without further comment.

The concern for the contributions and influences between KO and other disciplines may be expressed only in postgraduate education.

Any teaching weakness in managing theories or methods is necessarily replicated in the education of their postgraduate students. Moreover, "if interdisciplinary researchers have trouble finding what they need, students in interdisciplinary courses will also face serious difficulties" (Szostak, Gnoli, and López-Huertas 2016, 20).

Several requirements must be met to incorporate the interdisciplinary issue into a postgraduate level solidly. First, teachers must thoroughly understand their epistemological, conceptual, and methodological problems. They know they will have to update and deepen their knowledge, with an openness towards other logics and interpretations of reality that may be very distant from their own (Augsburg and Henry 2009; Aytac et al. 2012). Integrating knowledge from disciplines with different objects of study or that visualize the same objects of study for different purposes requires collaboration between teachers and specialists, implying mutual acceptance and mutual learning (Lattuca 2001). The interdisciplinary content knowledge intended to integrate into the courses must be related to the new skills and tools students should incorporate for proper performance in research, teaching, and professional practice.

On the other hand, the contents of postgraduate courses can differ significantly in their orientations from one continent to another, from one country to another, and even from one university to another, likely to happen particularly in periods of rapid evolution and hybridization of knowl-

edge, such as the one that has been taking place since the development of the semantic web and the generalization of interdisciplinary approaches in producing new knowledge (Palmer 1999, 2001).

The KO field does not escape these difficulties. A relevant background to formulate this hypothesis is a doctoral thesis (Almeida 2019) that seeks to establish the epistemic loci of the discourses on theories, methods, and techniques in KO literature in Brazil in the 21st century. The thesis assumes that KO is, in this century, a space of knowledge rooted in all LIS, and its function of excellence in our discipline is to create bridges with other areas of knowledge through its theories, processes, and products. As a general objective, it is proposed to interpret the universe of KO in the Brazilian science of the 21st century based on university teaching and research. Among other specific objectives, it seeks to identify KO themes in the course syllabi of 13 Brazilian Postgraduate Programs. A significant element is that in almost all the course syllabi, there are explicit references to interdisciplinarity as an aspiration, an orientation, or a form of theoretical or methodological approach.

The present study is intended to specify further the level of attention that Ibero-American teachers (that is, in Spain, Portugal, and Latin American countries) have paid to the issue of interdisciplinarity in their KO courses. The terms' iberoamerica/n' used in Spanish refers to American territories and nationalities colonized by Portugal and Spain in the Iberian Peninsula (Portugal, Spain, Brazil, and all Spanish-speaking countries in America).

The results and analysis of a first advance (22 responses to a survey) are presented herein, allowing us to approach preliminary conclusions. In future works with higher response rates, the survey data will be related to those arising from the analysis of the postgraduate course programs.

2. Objectives

Following the theoretical introduction made, the fulfillment of the following general objective is proposed: to establish an initial approach to the emphasis given to interdisciplinarity in the teaching of KO, by teachers responsible for postgraduate courses focused on - or related to the KO, in Ibero-American universities.

The following specific objectives are also established:

Create a directory of Ibero-American postgraduate courses with KO content, with a metadata architecture that allows periodic data updating and analysis based on stable indicators.

Provide helpful information to postgraduate professors to improve their didactic strategies and teaching practices.

Contribute to the evaluation processes in terms of the quality of university education in the field of KO.

3. Methodology

To conduct the research, the questions associated with the objectives mentioned above are: How explicit are the teachers in their courses concerning the interdisciplinary elements of the KO? What areas related to KO do they privilege in postgraduate teaching? What support is used to identify and select interdisciplinary content? Where is the emphasis placed? On theories, methodologies, or authors from other areas? What is the real contribution teachers hope to make by including content from other domains? What pedagogical and didactic strategies do Ibero-American teachers use to promote the learning of interdisciplinary content, and what are the cognitive processes involved?

While not the intention to give a definitive response to these questions, we seek to increase an empirical knowledge base that will guide future research on the subject.

i) Creation of a directory of postgraduate courses focused on -or related to KO in Ibero-American universities, based on the information available on the Internet. As an inclusion criterion, it is established that the course is focused on KO when all of its contents correspond to topics that are specific to the area. For its part, it is considered that the course is related to the KO when the contents of the course are shared between the KO and another subject area.

   This directory presents the following fields of information: country, university, postgraduate program, course name, accreditation at master's or doctorate degrees, responsible professor, teaching team, emails, program or syllabi, bibliography, years of teaching, and comments.

ii) a survey design aimed at the teaching staff responsible for postgraduate courses, based on four lines of action:
   1. The conception of interdisciplinarity among teachers.
   2. The place teachers give to interdisciplinarity in KO and the identification of the contributions that KO receives from other domains. 3. The assessment of interdisciplinary content teachers incorporate into their postgraduate courses. 4. The set of teaching strategies and resources teachers use to incorporate interdisciplinarity in teaching KO.

iii) Distribution of the survey among the teachers responsible for courses included in the directory. In March 2023, eighty-eight (88) invitations were sent to complete an online survey. At the end of that month, twenty-two (22) responses had already been received. The quantitative and qualitative analysis of the results was carried out in this universe, constituting a random

sample of twenty-five percent (25%) of the invitations sent, given that responses will continue to arrive in the following months.

4. Discussion

The directory of Ibero-American postgraduate courses focused on or related to KO currently includes information on eighty-eight (88) courses corresponding to thirteen (13) Latin American countries and two (2) European countries. As mentioned before, the preliminary results below correspond to the twenty-two (22) responses received from the online survey completed by the professors responsible for the courses.

These preliminary data extract the entire content due to the impossibility of transferring all the information in this article. The following is, therefore, a synthesis that follows the original sequence of the four thematic lines of action into which the survey was divided.

4.1. The conception of Interdisciplinarity among professors

At this point, a common denominator is visualized that refers to the implicit acceptance of the existence of the disciplines so that there must be an interdisciplinary approach. Thus, numerous expressions associated with actions between disciplines appear in the responses: the relationship between disciplines, the combination of disciplines, the confluence of disciplines, the interconnection of disciplines, the intersection of disciplines, the dialogue of disciplines, the integration of disciplines, the exchange of knowledge, the connection of disciplines and the cooperation across disciplines. It could be cautiously affirmed that these interrelationships presuppose different levels of relationship. It would seem, for example, that 'interconnection,' 'intersection,' and 'integration' presuppose a greater link depth. At the same time, expressions such as 'relationship,' 'confluence,' 'cooperation,' and 'exchange' refer to generic traffic across disciplines. The expressions' combination,' 'dialogue,' and 'connection' could be placed at a medium level.

This classification into three intensity levels across disciplines (high, medium, and low intensity) could represent the spectrum of positions. These positions go from those who believe it is more appropriate to seek multidisciplinary connections, which do not require further disciplinary integration, to those who seek to build interdisciplinary experiences, which need a vital intersection.

In several answers, the association of Interdisciplinarity with complex thought appears implicitly:

– "It is a way of integrating different disciplines in an approach that seeks to overcome the limitations of unique disciplinary perspectives and achieve complementarity across the various areas of knowledge involved. In short, its objective is to build a more complete and integrated knowledge."
– "Interdisciplinarity is any intersection space between two or more fields of knowledge that have different objects of study, theories, and methods, but that requires approximation and overlap to some extent, due to the needs of scientific, technological, social or cultural reality."

Another aspect to highlight refers to the relationship between the object of study and the problem to be addressed when teachers define Interdisciplinarity. It is inferred that there is an underlying theoretical conception that refers to Interdisciplinarity as an approach to the object:

– "Proposal for solving problems or developing activities that are achieved from assimilation or remodeling through cooperation and the exchange of knowledge, practices, and infrastructures originally located in other or various disciplines."
– "It is a way of the intersection of contents across disciplines that allows a more comprehensive understanding of the phenomenon or object and its problematization."

Finally, other conceptions of Interdisciplinarity associated with the relationship between disciplinary theories and methodology are identified:

– "A discipline that incorporates theoretical aspects, concepts, or methodologies from other disciplines."
– "Formal and informal connections affecting objects, objectives, problems, and theoretical and methodological perspectives between two or more fields of knowledge."

Upon asking teachers if they consider it necessary to incorporate interdisciplinary aspects or approaches in their postgraduate course contents, 21 of the 22 respondents answered in the affirmative After analyzing the reasons for this widespread conviction, the responses could be categorized into three dimensions:

– Epistemological dimension: Disciplines, disciplinary boundaries, the object of study, theories, methodologies (16 answers).
– Pedagogical dimension: Didactic strategies, learning, learning objectives (6 answers).
– Ideological Dimension: Need, complexity, reality, fragmentation of knowledge (6 answers).

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Some responses are highlighted in which the role of the KO appears concerning these dimensions.

– "Interdisciplinarity guarantees the generation of new knowledge, which is the basis of innovation. It is also the way to solve the artificial fragmentation of knowledge that the teaching of a discipline imposes, and that does not contribute to the sustainable solution of the scientific problems that KO must consider as an area of knowledge".
– "To understand the ethical bases of knowledge organization systems, content from various disciplines is needed to make them effective. For example, Linguistics, Logic".

4.2. The place professors give to Interdisciplinarity in KO and identify the contributions that KO receives from other domains.

In this section of the survey, three questions were asked that were answered with one of these five options: Disagree (D), Partially disagree (PD), Partially agree (PA), Agree (A), and totaly agree (TA). Below are the questions and the respective graphs.

The first question is: In your opinion, is KO an area of interdisciplinary nature? (Fig. 1)
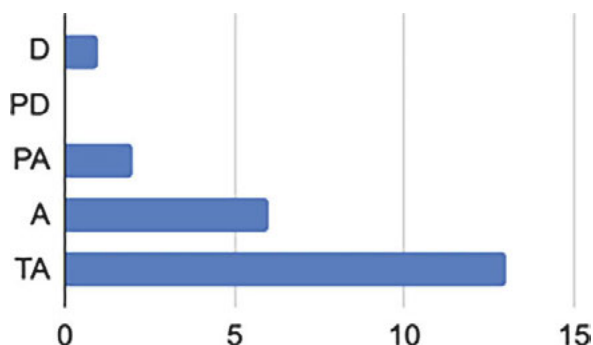

Figure 1. Is KO a field of an interdisciplinary nature?

The broad consensus among those surveyed regarding KO as an interdisciplinary field stands out in this table. In the survey, a space was opened for teachers to give answers not included in the previous options on the place of interdisciplinary in KO. Their answers:

– Interdisciplinarity depends on the focus and profile of the program.
– Interdisciplinarity is a structuring part of KO, such as the contributions of semiotics, linguistics, semantics, and terminology, which is in its essential foundations.
– LIS is part of the Social Sciences, and the KO integrates LIS; for this reason, it is interdisciplinary because it has familiar elements and cannot have an autonomous approach.

These answers reinforce the previous inference regarding the consideration of KO as an area of interdisciplinary nature.

Secondly, it was asked if an interdisciplinary relationship exists between LIS and KO, as we can see below (Fig. 2).
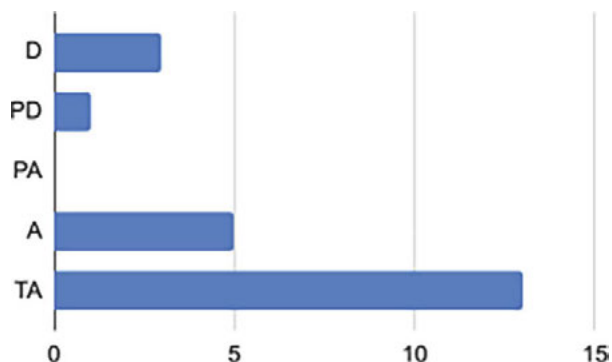

Figure 2. Is the relationship between LIS and KO of an interdisciplinary nature?

A clear tendency to agree that the relationship between LIS and KO is interdisciplinary can be seen in these responses. Among the fundamentals that the respondents noted, it is found that:

a) Inter-discipline is a constitutive feature of both LIS and KO.
b) The inclusive bond of KO as part of LIS leads them to share the field and the objects of study.

Third and last, it was asked whether there is an interdisciplinary relationship between information retrieval (IR) and KO. These were the answers (Fig. 3).
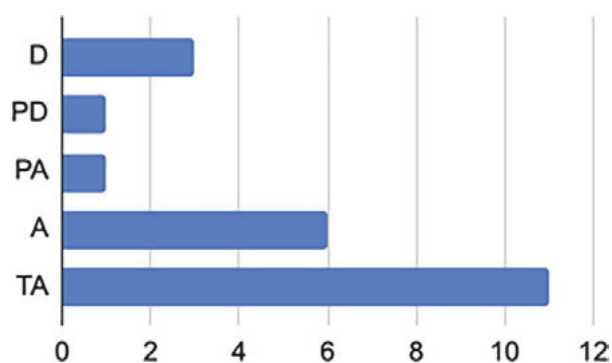

Figure 3. Is the relationship between IR and KO of an interdisciplinary nature?

Also, in this case, the supremacy of positive opinions regarding the interdisciplinary link between IR and KO is noteworthy.

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When we asked, "What are the disciplines or fields of knowledge that, in your opinion, interact interdisciplinary with KO?" the answers opened up a wide range of disciplines that teachers recognize a priori as associated or contributors to the common fund of KO. It is essential to mention that professors responded freely; they were not provided with a list of disciplines they had to choose. The teachers identified no less than forty-eight (48) disciplinary links with KO. To better visualize this dispersion, we grouped these links into macro-areas according to the following detail:

– Information Science (includes Library Science, Documentation, Information Literacy, Information Organization, Information Retrieval, Information Search and Retrieval, Knowledge Modeling and Representation, and Data Analysis).
– Philosophy (includes Epistemology, Logic, and Philosophy of Science).
– Linguistics (includes Terminology, Philology, Semiotics, and Semantics).
– Social and Human Sciences (includes Sociology, Sociology of Knowledge, Law, Business Administration and Management, Communication Science, History, Cultural Studies, Cognitive Sciences, Psychology, and UX or User Experience)
– Technologies (includes Information & Communication Technologies, Informatics, Computer Science, Artificial Intelligence, Cybernetics, Programming, Digitization, Knowledge Base, and Spatial Analysis).
– Mathematical Logic (includes Statistics, Metric Studies, and Set Theory).

In the frequency count, the fields that teachers visualize with more significant interdisciplinary interaction with KO are those included in Language Sciences (21.2%), Information Science (18.8%), Social and Human Sciences (also 18.8%), and Technologies (17.6%). Most of the respondents identified the relationship of KO with other disciplines in its theoretical (86.4%), methodological (77.3%), and about its object of study (63.6%) dimensions.

4.3. The assessment of interdisciplinary content teachers incorporate into their postgraduate courses.

When asked if they had incorporated interdisciplinarity in their postgraduate courses, twenty (20) of the twenty-two (22) respondents answered in the affirmative. Of the remaining two, one regrets not including it, and another focuses on disciplinary specificity. Regarding the disciplines that have some presence in their courses, the professors surveyed mentioned at least fifty-two (52). Grouped by macro areas, they were distributed as follows:

– Information Science (includes Data Science, Documentation, Access to scientific information, Document Management, Archival Digitization, Linked Open Data, Information Visualization, Graph Theory, and Information Retrieval).
– Philosophy (includes Epistemology, Information Philosophy, Open Science, and Science Communication).
– Linguistics (includes Philology, Semantics, Semiotics, Terminology, Socio-terminology, and Speech Analysis).
– Social and Human Sciences (includes Sociology, Anthropology, Sociology of knowledge, Cultural studies, Literature, Visual Arts, Music, Theology, Administration, Marketing, Ethics, Psychology, Cognitive sciences, Socio-cognitive paradigm, and Communication).
– Technologies (includes Engineering, Computer Science; Ontological model; Semantic Web, Spatial Analysis, Territorial Planning, Human-Computer Interaction, and Cybernetics).
– Mathematics (includes Statistics, Logic, and Systems theory).
– Others (includes Research training).

When carrying out a comparative analysis between the disciplines that, at the discretion of the teachers, interact with the KO and the disciplines that are present in their courses, the following order of predominance changes is observed (Table 1).

Although the same macro-areas of knowledge are repeated, the percentages are different and modify the order of influences. This does not necessarily lead to establishing a divergence between the conception of interdisciplinarity that teachers have and the one that they incorporate into their courses. Indeed, a teacher may have an opinion on the interdisciplinary links of KO (for example, he/she considers that Terminology is related to KO), but the orientation of his/her courses may lead her/him to consider only some of these links (continuing with the example, in the courses taught by the teacher cannot incorporate the relationship between Terminology and KO in their contents).

In any case, it is interesting to note the wide range of interdisciplinary links that teachers identify and express in their courses, and the consistency that occurs in the disciplines.

It is also interesting to highlight the increase in the percentages of content related to Information Science and the Social and Human Sciences in the courses, while a decrease in the content related to epistemological, philosophical, and technological aspects is observed.

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Campos de conocimiento interdisciplinarios que interactúan con KO		Incorporación de otras disciplinas en los posgrados de KO	
Lingüística	21,2 %	Lingüística	19,3 %
Ciencias de la Información	18,8 %	Ciencias de la Información	28,1 %
Ciencias Humanas y Sociales	18,8 %	Ciencias Humanas y Sociales	29,8 %
Tecnologías	17,6 %	Tecnologías	8,8 %
Filosofía	16,5 %	Filosofía	8,8 %
Lógica matemática	7,1 %	Lógica matemática	3,5 %
		Otros	1,8 %

Table 1. Comparison between the fields of knowledge that interact with KO and the disciplines that the respondents include in their postgraduate courses on KO
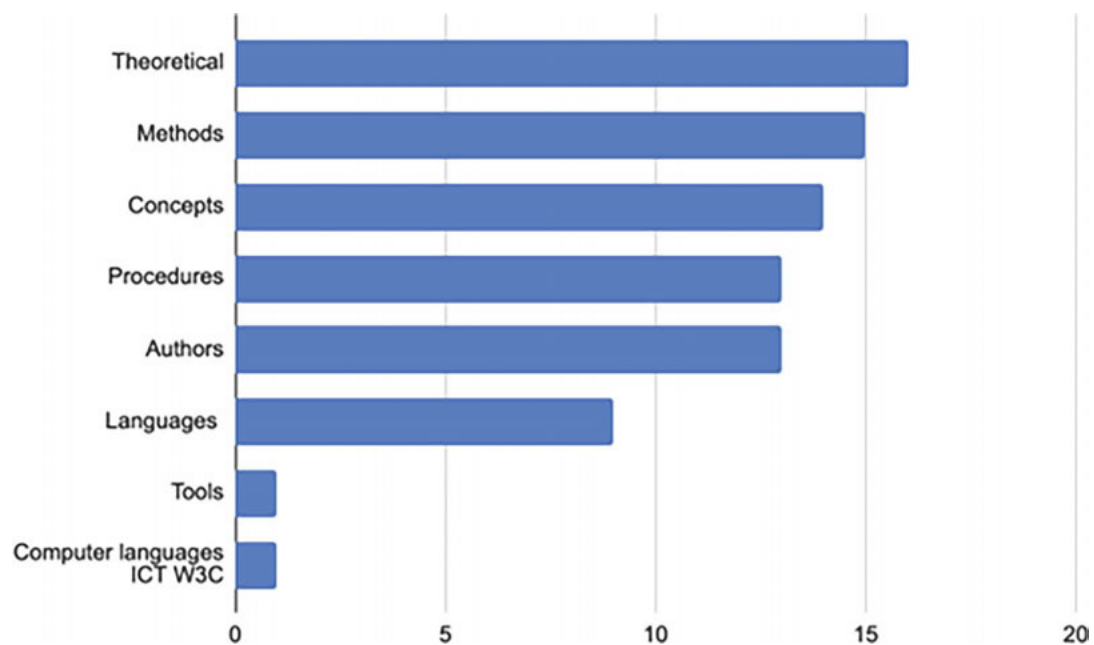

Figure 4. Content of interdisciplinary bridges in courses.

4.4. The set of teaching strategies and resources used by teachers to incorporate interdisciplinarity in the teaching of KO.

In this line of action, teachers were asked through which components or modalities (previously offered to us) they established the link between KO and other disciplines (different from IS and IR) in their courses.

As can be seen in Fig. 4, there are approaches to insert interdisciplinary aspects or contents in the courses, which are widely used (theories, methods, and concepts with 16, 15, and 14 responses, followed by authors and procedures (13 responses each).

When asking respondents for a brief rationale for the selection they made, some responses were particularly illustrative:

– From a concept we proceed to establish the theoretical framework and from there its methods and application procedures are explained.

– The content of knowledge from the areas of interdisciplinary contribution, refers to theoretical aspects, main authors, and structuring concepts.
– In general, I include the contributions that other disciplines make to KO and, although to a lesser extent, I try to establish the influences that KO theories, methods, and authors may have on other domains, especially Lexicography and Terminology.

The answers to the questions "Which are the non-KO, non-IS, and non-IR authors that appear in the bibliographies of your courses?" and "In which disciplines of origin do you place these authors?" were expressive of the variety of interests and orientations that exist in the casuistry of the courses. The authors referred to were: Aristotle (Philosophy), Kant (Philosophy), Charles S. Peirce (Philosophy), Mario Bunge (Epistemology and Philosophy), Michel Foucault (Philosophy, History, Sociology, Psychology), Thomas Kuhn (Physics, Philosophy of Science and History), Umberto Eco (Semiology and Philosophy), Olga Pombo (Philosophy and Epistemology), Barry Smith (Philosophy), Francis Bacon (Philosophy), Ludwig von Bertalanffy (General Systems Theory), Teun van Dijk (Linguistics), Lúcia Santaella (Semiotics), Eugen Wüster (Terminology), Jean-Claude Boulanger (Terminology), María Teresa Cabré (Terminology), Brenda Dervin (Communication), Óscar Mealha (Information and Communication on Digital Platforms), Pierre Levy (Ethics applied to Information Technologies), Peter Senge (Engineering, Social Systems Modeling Management), Tim Berners Lee (Computer Science), Nicola Guarino (Computer Science), Peter Burke (History, Cultural History) and Susana Finquelievich (Urban Sociology).

4.5. The set of teaching strategies and resources used by teachers to incorporate interdisciplinarity in the teaching of KO.

In this line of action, teachers were asked about the didactic strategies they use to promote disciplinary integration in their courses. The results were the following (Fig. 5).

The responses show that the three teaching strategies suggested in this multiple-choice question have been used by approximately half of the teachers surveyed.

A set of options was also offered to gather responses on the learning objectives sought in the aforementioned strategies (Fig. 6).

The commitment to the understanding of concepts, the application of knowledge, and the analysis of situations clearly stand out as the learning objectives most sought after by teachers in their courses. Evaluation and creation also have high response rates, in line with the usual objectives of graduate programs.

When carrying out a cross-analysis between the didactic strategies and the learning objectives, a coherence of design is visualized, since the analysis and the application as learning objectives (which include understanding) are fundamental for the strategies associated with problem-based learning and in projects.

Regarding the didactic activities developed in the courses to promote disciplinary integration, of the (closed) options in the survey, the most frequently selected options were group work, case studies, seminars, practical work, and problem-solving. exercises, as seen in the graph below (Fig. 7).

Concerning the previous responses, the respondents made summaries about the didactic strategy into which the selected activities were incorporated. When analyzing them, a strong emphasis is observed on strategies associated with the approach, resolution, and studies of problems and/or cases, and group work. The theoretical exposition also appears, and to a lesser extent but repetitively the invitation to
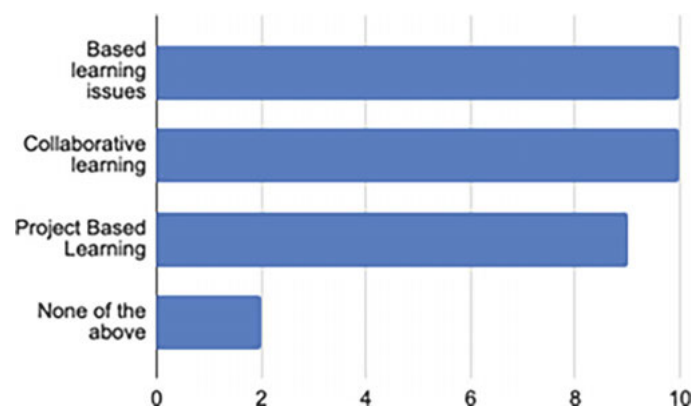

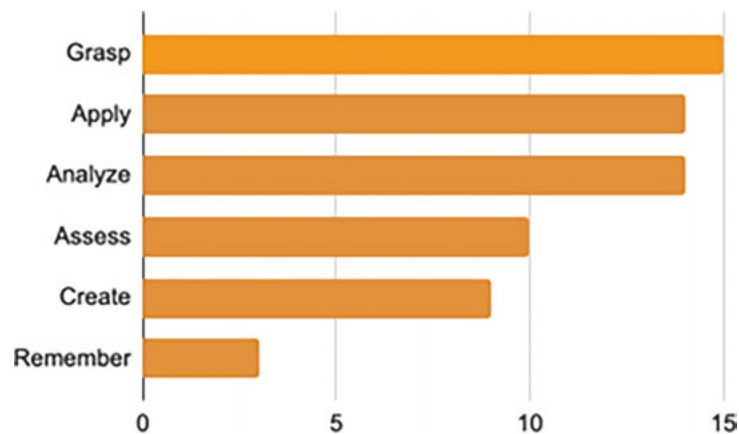*Figure 5.* Didactic strategies for disciplinary integration.

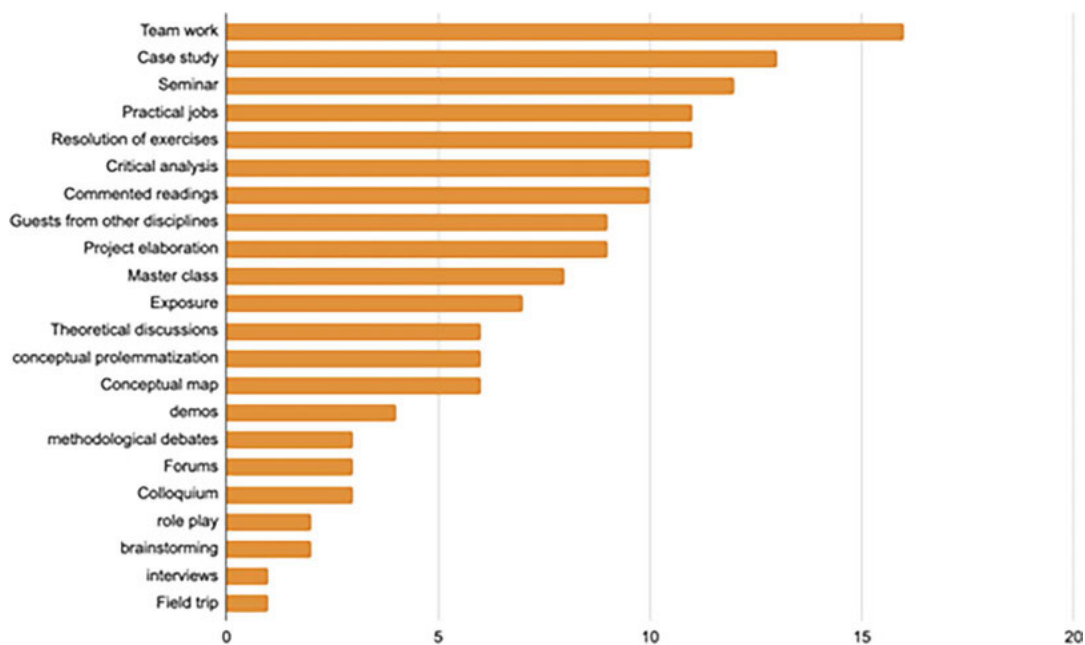*Figure 6.* Learning objectives sought by teachers.

Figure 7. Didactic activities developed for disciplinary integration.

other specialists and the debate. Associated with the above, analysis as a learning objective appears transversally. This is echoed in the examples shared by respondents.

When the teachers were asked about the aspects, elements, and/or conditions that must be present to promote an interdisciplinary approach in training, the answers can be systematized in the following aspects:

a) The specificity and disciplinary domain | Epistemological dimension.
b) Complexity | Ideological dimension.
c) Theoretical and methodological approach | Epistemological dimension.
d) Specific teaching strategies | Pedagogical dimension.

e) Teaching resources | Pedagogical dimension.
f) Multidisciplinary teaching team | Pedagogical dimension.
g) Openness to integration | Ideological dimension.
h) Approach to the problem /object of study | Epistemological dimension.

From the set of responses received, the conditions may not emerge from which it can be considered that an interdisciplinary process in university education has been fulfilled. In any case, they provide a significant amount of data that is useful in itself, and that can be crossed for further use.

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5. Conclusions

Interdisciplinarity gives a new dynamic to traditional disciplines, opening them to a space for shared exploration with specialists from other areas. It is not about exploring for the sake of exploring: the complexity of environmental (water, crop quality, desertification, pollution, climate change) and social (migratory movements, drastic changes in the worlds of work and education, inequalities and discrimination) problems, as well as the revitalization of the space race and the deepening of the technological revolution forces us to seek solutions, alternatives or guidelines that no longer depend on the unilateral views of a single discipline.

All these tensions are reflected in documentation, information, and its subject representation, both in the processes by which contents are classified and indexed, in the construction of friendly and hospitable knowledge organization systems with multidisciplinary and interdisciplinary visions, and in the expressions by which people seek information.

To this, the impact that the intelligent web continues to generate in how information is produced, recorded, organized, related, and retrieved should be added, placing KO practitioners at different crossroads. Indeed, the ways of selecting and using the knowledge that reaches the KO after crossing an interdisciplinary bridge to promote their practices impact the training of university professors and researchers, on the contents, on the ways of teaching, and also on the students' ways of learning.

For these reasons, the teaching of KO is strongly challenged since it must establish fruitful and lasting consensus by identifying, integrating, theorizing, or applying knowledge of an interdisciplinary nature.

Within the limitations of the universe studied the research allows us to verify a consensus among Ibero-American teachers that KO is a constitutively interdisciplinary field closely related to LIS and IR. However, there is an extreme dispersion in mentioning the disciplines teachers understand to interact interdisciplinary with KO. It can be appreciated when they are asked about it and when they are asked to indicate the disciplines with which they work interdisciplinary with KO in their postgraduate courses. This verification is also reinforced by the variety of authors from other disciplines they use and their courses' bibliographies.

Teacher responses clearly show concern for including interdisciplinary-based content, theories, methodological approaches, concepts, and applications from other fields of knowledge. Theoretical interdisciplinary conceptions coexist, with approaches focused on the object of study or methodological issues.

The most widely used teaching strategies are problem-based learning and collaborative learning. Corresponding coherently with the proposed didactic activities (group work, case studies, seminars, practical work, and solving exercises) and the learning objectives sought concerning understanding, application, and a critical and creative attitude for promoting research.

An issue that deserves to be analyzed in greater detail is whether the inclusion of interdisciplinarity in the discursive dimension (that is, in formal texts and the usual scientific language) is then expressed in the classroom in appropriate pedagogical and didactic approaches, or remains only in discourse, a risk that Parentelli already mentioned in a recent text (2019b).

Another critical point refers to the different intensities of interrelation between KO and other disciplines (deep, medium, low), which teachers say they accept, leading to a vast spectrum of interdisciplinarity levels, from the simple sum of elements of different disciplines to an effective and stable integration of knowledge.

The analysis parameters established in the survey manage to favor comparative studies, as well as the possibility of crossing data to obtain more refined outcomes and establish forms of evaluation of postgraduate courses.

As it is an ongoing investigation, which is expected to reach at least fifty percent (50%) of responses on the invitations sent, the findings obtained are partial. Considering the above, in this first advance, answers have been obtained to almost all the questions that guide the investigation. These results will be substantially enriched in the coming months and will be available to teachers in the KO area in Latin America and other latitudes.

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Appendix

The questions that were taken into account are shared below, in each of the dimensions of the survey. It should be noted that the survey is broader, covering other questions that were not taken into account for the composition of this article.

1- Conceptions of interdisciplinary

What do you understand by interdisciplinary?

Do you consider it necessary to incorporate interdisciplinary aspects or approaches to the contents of the postgraduate courses you teach? Because?

2- Place of Interdiscipline in KO

In your opinion, KO is an area of interdisciplinary nature? Indicate your level of agreement.

Is the relationship between Information Science (IS) and KO interdisciplinary in nature? Indicate your level of agreement.

Is the relationship between Information Retrieval (IR) and KO interdisciplinary in nature. Indicate your level of agreement.

What are the disciplines or fields of knowledge that, in your opinion, interact interdisciplinary with KO?

In relation to what you answered in the previous question, indicate the interdisciplinary relationship according to (you can select more than one option): method, theory, object of study, instrumental, common language, subject.

3- Place of interdisciplinary in your postgraduate courses

Do you consider that interdisciplinary is present in your postgraduate courses focused on, or related to KO?

What disciplines or fields of knowledge (other than IS and IR) are present in your courses?

The link with these disciplines or fields of knowledge in the program has been established through: (you can select more than one option): authors, theories, concepts, methods, procedures, languages. Develop synthetically

Have you explicitly incorporated interdisciplinary aspects or approaches into your graduate courses for specific purposes?

If you have incorporated it:

What strategies or procedures have you followed to carry out this incorporation?

What contents, aspects or interdisciplinary approaches did you seek to prioritize in your courses? Please justify your answer.

What are the authors outside the KO, IS and IR in your courses?

In which disciplines of origin do you place these authors?

You have not incorporated it: Please justify your answer

4- Didactic strategies for interdisciplinary

Indicate if you have developed any of the following teaching strategies to promote disciplinary integration: Problem-based learning; Project-based learning; Collaborative learning, none of the above.

Which of the learning objectives (knowledge, aptitudes or behaviors), as a consequence of the didactic strategy, were sought in your course? Remember, Understand, Apply, Analyze, Evaluate, Create, Other.

Indicate the didactic activities developed to promote disciplinary integration (you can select more than one option): Case study, Exercise resolution, Master class, Seminar, Group work, Invitation of experts from other disciplines, Practical work, demonstrations, Critical analysis, Elaboration of projects, Theoretical debates, Methodological debates, Conceptual problematization, Concept map, Role play, Forum, Exhibition, Brainstorming, Commented readings, Interviews, Colloquium, Field trip.

In relation to your previous answers, briefly share the didactic strategy in which the selected activities were incorporated.

Synthetically share an example related to your course that incorporates the strategies and didactic materials selected in the previous items.

In your opinion, what are the aspects, elements and/or conditions that must be present to promote an interdisciplinary approach in training?