
Information literacy in educational research

PID_00260214

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Recommended minimum time required: 4 hours



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The assignment and creation of this UOC Learning Resource have been coordinated by the lecturer: Antoni Badia (2019)

First edition: February 2019

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Av. Tibidabo, 39-43, 08035 Barcelona

Design: Manel Andreu

Publishing: Oberta UOC Publishing, SL

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Introduction

Information literacy is regarded as a basic and core skill that permeates the set of skills required in the 21ST CENTURY. It is perceived as one of the key competencies required to be a fully-fledged and responsible citizen in the current information and knowledge society. It is also regarded as necessary in order to be able to perform the typical tasks involved in the educational, professional or research settings properly.

Moreover, it is considered to be a very complex competency. The main research conducted on this topic identifies three skill sets that must be applied comprehensively to be able to solve information problems properly (Brand-Gruwel, Wopereis, Walraven, 2009). The constituent skills are the first type of skills, and include sourcing, selecting, organizing, producing and reporting information. The skills required to self-regulate decision-making in the information problem-solving process are the second type of skills, and include the planning, oversight and evaluation of the process. The base skills are the third type, including the use of specific expertise, reading skills and digital literacy.

Some recent research (Garcia, Badia, 2017) also includes a fourth type of skills, the so-named collaborative skills, related to work processes that are shared with other people. This collaborative skill requires individuals to reach agreements with others both in terms of the work to be done and in the contents that will be part of the information problem-solving process.

As the preceding explanation suggests, information literacy is indispensable in any approach to educational research. For this purpose, a major body of knowledge regarding the skills involved in information literacy must be built up. It is also imperative to learn how to apply the skills depending on the specific characteristics of each type of information problem involved in a given type of educational research (Monereo, Badia, 2012).

These didactic materials have been produced with a view to being a useful educational resource in the development of information literacy applied to the performance of educational research. The general ideas expounded may be applicable to any type of educational research, although the specific suggestions made are intended to be of use to students engaging in a research assignment within the framework of a master's degree at the end of their training process.

The module provides information about topics or subjects directly related to information literacy. This means that the module will not explain how specific computing programs and applications can be used to perform certain

processes that are required for information literacy, and nor will it provide specific and academically-established procedures that readers can find in other modules.

This module is intended to be a selection of the knowledge currently available about information literacy that may be of use to educational researchers. At this moment in time, there is a major body of knowledge about information literacy, although few works make such knowledge available to people who are training “to be researchers”.

The module also cites a minimum number of bibliographic references related to each one of the topics. We believe that this way of presenting information is more useful for a type of publication with an eminently applied nature of the module that sets out to provide readers with useful knowledge from a didactic standpoint. Nevertheless, the end of the module contains a selection of bibliographic references that anyone interested in furthering their knowledge of this topic may find useful. Some of these references are cited in the body of the text, although others are referenced with the sole purpose of being useful to readers who wish to pursue the topic further.

Further to the preceding comment, this module focuses on explaining the processes and the skills directly related to information about educational research. This means that other topics that are not strictly speaking part of this area have been excluded from this teaching material. Two examples of such topics, among others, and which readers can find in other academic contributions, are the design of educational research and academic writing.

This teaching material has not been designed to be knowledge that must be learned and reproduced in an evaluation examination. On the contrary, the different topics expounded should constitute a sufficiently transferable tool that will enable the readers to apply the knowledge creatively to the specific requirements of their educational research.

In this regard, a great deal of the knowledge provided is open-ended because it is conceived as a point of departure in the learning of information literacy. One exercise that could initially contribute to the development of this competency would be the systematic and exhaustive analysis of research results, such as articles, posters or communications at congresses. A large part of this material is comprised of aids to interpretation that could be useful in beginning to analyze these research outcomes and to learn from this process of analysis.

In summary, the module seeks to help aspiring researchers to “be aware” of what they know (and do not know) about the information problem-solving process involved in educational research. Furthermore, the module also aims

to assist these future researchers in solving possible problems and to provide them with guidance so that they will be able to take the best possible decisions regarding their specific educational research assignment.

Objectives

The purpose of this module is to provide the basic knowledge to be able to contribute to the development of the following five learning objectives:

1. Define an information problem of an educational research assignment.
2. Source and select academic documents that are useful to educational research.
3. Scan information from academic documents.
4. Elaborate information from academic documents.
5. Report and present the information from educational research.

1. Information literacy in educational research.

Initial conceptual qualifications

The application of information literacy to educational research is a complex process which, from the outset, calls for a suitable approach if the research objectives are to be attained. At the very least, addressing an information problem-solving process requires a clear definition of the sphere of activity and the field of knowledge targeted by the educational research that the researcher intends to pursue.

1.1. The sphere of activity of educational research

Why could this section be interesting?

For the application of information literacy to be addressed properly, the characteristics of the sphere of research must be clear.

Anyone who seeks to further their information literacy applied to educational research must have a clear idea of the sphere of activity they wish to address as a learner, as well as the differences between their own and other possible positionings that might coexist in their daily activity.

Table 1 summarizes the main characteristics of three spheres of activity directly related to the area of education, which we have termed the training, professional and research spheres. We have compared these three spheres of activity using seven domains: scenario, position, purpose, meaning, approach, implementation and results. The seven domains of each one of the three sphere are compared below:

Table 1. Comparison between different spheres of the educational research activity

	Domains	Training sphere	Professional sphere	Research sphere
1	Scenario	Training activity	Job	Research project
2	Position	Learner	Professional	Researcher
3	Purpose	Development of re-search competencies	Professional action and problem-solving	Provide new educational knowledge
4	Meaning	What being a learner means	What being a professional means	What being a researcher means
5	Approach	Development	Holistic	Specific
6	Implementation	Following a learning plan	Professional intervention	Implementation of re-search

Domains		Training sphere	Professional sphere	Research sphere
7	Results	High level of research competency	Competent professional action	New educational knowledge

A person engaged as a professional in a job engages in the latter with a view to taking a meticulous professional approach, overcoming any problems that may arise in the course of their professional activity. In order to do so, they must decide at all times what the most suitable knowledge and competencies are in order to carry out each one of the professional tasks that arise in their regular professional practice.

A person involved in research must fully realize that educational research is usually conducted within the framework of research projects (formal or not) with a view to contributing new knowledge to a given field of study. In order to do so, they must demonstrate a suitable mastery of the knowledge and the competencies of the researcher (for example, information literacy), they must focus on a specific area of knowledge and must adhere to the procedures laid down by the academic community for research activity. The outcome of this process must be the generation of new educational knowledge.

Any person involved in training must realize that they must act as a learner in a training activity. They must acknowledge that there are other more experienced people who can help them and must engage fully in this activity in order to extend or further their initial knowledge. Following a (more or less) structured learning plan must lead to an increase in their expertise in their field of study and their research competency.

Warning! Possible problem ahead!

When applying information literacy to research, two very common problems encountered consist of taking up the position of a professional and that of a researcher.

If the trainee researcher is also an education professional, the activity involved in the training sphere may sometimes come into conflict with certain domains of the professional sphere. Professionals from the field of education with many years of experience enjoy certain advantages when they embark upon research because they are highly conversant with the target area and also have a mastery of certain skills required to address it. Despite this, they may encounter many difficulties when they attempt to change the usual way of interpreting and understanding educational reality when they try to transition from the point of view of the professional to that of the researcher.

For example

Professionals who start an educational research activity frequently fail to grasp the purpose of the training activity. This confusion may arise when they begin to address “research questions” which in actual fact are unresolved questions from the professional sphere. Some of these questions aim to improve their professional activity or to solve problems encountered in their professional practice. It also often occurs that such education professionals believe that their existing knowledge of their profession will suffice to allow them to answer certain questions posed by the educational research and that there is therefore no need to seek further information about a given topic.

If the learner is also a member of a research team, certain domains of both spheres of activity (the training sphere and the research sphere) may also come into conflict. For example, during the implementation of a research project, a learner may be involved in a process of review of academic documentation of a given topic. This process, which would also enable this person to learn, could compromise the learning plan they initially designed as a learner.

1.2. Educational research is not about conducting studies into education

Why could this section be interesting?

Knowing how to approach educational research (and not a study about education) and knowing how to position it inside an academic discipline is a requirement for beginning to apply information literacy, for example in the search for information for the theoretical framework.

In conceptual terms, research activity into educational topics should be embodied in three areas:

- First of all, a distinction must be made between **Research in the sphere of education** and **educational research**.
- Secondly, a distinction must be made between a **study about education** and **educational research**.
- And thirdly, the **reference academic discipline** that provides the theoretical framework and the questions (or hypothesis) for the research must be identified.

Research in the sphere of education includes the set of activities, projects and research tasks that focus on the study of an aspect or a phenomenon directly related to the educational dimension of any human activity. This category may include research projects such as the evolution of public expenditure in the operation of schools, the study of a country’s educational policies during a given period or the application of the learning methodology for research into science. This may be approached from multiple perspectives and fields of study and not necessarily from the educational sciences disciplines.

Educational research is a more restrictive concept. Although it also straddles all the research activities that focus on the study of a certain educational aspect, in this contribution, the notion of educational research is implemented taking an academic discipline as its reference point and it must be possible to apply the knowledge generated to this reference educational discipline.

For example

Research into “the evolution of public expenditure in the operation of schools” may be classified as educational research if it is based on paradigms specific to the economics of education and, moreover, if the knowledge generated may be added to the existing knowledge of this discipline.

Warning! Possible problem ahead!

An educational professional who intends to carry out educational research can begin by focusing information literacy in an over-holistic fashion, without reflecting upon and deciding the discipline on which they wish to focus their research.

A **study about education** seeks to obtain information and evidence about the current condition of a topic in a given social group or in a defined geographical area. Parents’ opinions about school meals in a country and teachers’ perception of an educational reform in a state are two examples of studies about a specific educational aspect. The ultimate goal is to obtain in-depth and detailed knowledge about the aspects studied, which can often be very useful in assisting decision-making in order to change educational conditions or situations that need to be optimized. Studies about education are not educational research because they do not have a reference conceptual framework and do not purport to furnish new information about this reference conceptual framework.

Educational research seeks to further or to expand the knowledge of a given object of study. The relationship between teachers’ conceptions about technology and the use made of the latter in the classroom is an example of educational research. The research may be contextualized, although its immediate purpose is to provide original knowledge about a topic or subject, and if this occurs to be able to transfer this knowledge in order to optimize aspects related to educational research, both in the context in which the data were mined and often in other educational contexts.

Finally, **educational research** involves identifying a reference knowledge area and of using it to guide the entire information literacy application process. The psychology of education, the didactics or sociology of education, to name but some disciplines, may be identified as areas of reference knowledge. Usually, research has a reference knowledge area that provides it with a set of theoretical frameworks and typical research designs. Research may have more than

one reference knowledge area, although it is by no means easy to find truly interdisciplinary educational research that has the capacity to fuse approaches from more than one academic discipline.

Warning! Possible problem ahead!

One of the usual problems facing aspiring researchers is that people from the professional sphere begin to address educational research more as a study than as actual research. This problem is rendered clearly apparent in the initial wording of the title, the bibliography they begin to select or the questions or hypotheses addressed in the initial educational research proposal.

2. Information literacy: definition and characteristics

This section will define information literacy, will describe two classifications about types of information problem-solving and will identify and explain the phases involved in solving an information problem.

Why could this section be interesting?

Knowing the definition and the main characteristics of information literacy, as well as the skills involved in information problem-solving, may help the learner to understand the need to learn this content, to be aware of the content they have to learn and subsequently plan the process in order to learn these skills applied to educational research.

2.1. Definition and type of information problems

“Information literacy is a person’s capacity to solve information problems in specific spheres of human activity and in contexts and in situations with well-defined conditions that have an impact on the solving process. Generally speaking, an information problem may be defined as a specific type of problem whose purpose is to obtain, produce and convey certain information that solves the information problem. In other words, solving an information problem means solving the discrepancy that arises between the information required to answer a question and the information initially available.” (Walraven et al., 2008)

Establishing classification criteria is usually a good tool for exploring our knowledge of a concept in greater depth. Two types of information problem classifications are presented below:

- The first classification is general, and criteria pertaining to the type of task will be used.
- The second classification will use criteria directly related to the types of information problems pertaining to educational research.

1) In the first type of distinction that we make, four types of information problems may be identified in accordance with two classification criteria: the degree of complexity of the information problem and the level of structuring of the solving process.

a) The first criterion is **the problem’s degree of complexity**, which ranges from one pole of the continuum that indicates minimum complexity to the other pole of the continuum that denotes maximum complexity. A problem’s complexity is determined by its nature.

For example

Knowing Leo Messi's date of birth is a very simple information problem if we have an Internet connection available. On the other hand, extracting the ten most relevant publications about a specific educational topic or subject may be an extremely complex problem.

b) The second criterion is **the level of structuring of the information** problem-solving process, which ranges from one pole of the continuum where the maximum level of structuring is located to the other pole of the continuum where the minimum level of structuring is to be found. Citing a set of academic references properly is a highly-structured process, because there is a style book that defines a clear and precise process for generating each citation. On the other hand, producing a theoretical framework for research is usually a minimally-structured process, although certain initial guidelines may sometimes be available for this purpose.

The following table presents a graphic representation of the intersection of both criteria and may be useful in classifying the set of information problems that can be identified when educational research is conducted.

Table 2. Classification of information problems according to their degree of complexity and the structuring of the solving process

Degree of complexity Calculating a multiple regression	Maximum Writing a theoretical framework Minimum
Maximum Citing a bibliographic reference Minimum	Degree of structuring Choosing the keywords

Warning! Possible problem ahead!

By necessity, all specific educational research means having to address different types of information problems. The failure to identify the nature of these problems could seriously compromise the progress of the research. Beginning to identify the types of information problems we have to contend with could be a good way to start to overcome this difficulty.

2) The second type of classification that we present is related to the types of information problems that must be solved in educational research. If we take the definition of information problem into account, the existing information problems and the types of information required in an educational research project will be the same.

Trying to identify all the possible information problems that may be derived from any educational research exhaustively is an insurmountable task. One need merely think, for example, of the needs arising from an educational re-

Definition of information problem

An information problem is defined as the discrepancy arising between the information required to answer a question and the information initially available.

search project, with problems (information-related or not) such as drafting a scientific proposal, setting up and coordinating a task force, designing a plan of work with a proper time-line, producing a list of the expected impact of the results or preparing a budget for the research project.

If we focus on information problems linked solely to the writing of an academic article, it will be possible to identify the prototypical information problems that generally speaking usually need to be solved in order to successfully address this kind of task. The following table proposes a classification of these information problems.

Table 3. Information problems related to the writing of a research article

Sections of an article	Information problems
1 Summarize the research	1.1 Choose the title
	1.2 Draft an abstract
	1.3 Choose the keywords
2 Contextualize the research	2.1 Contextualize the problem to be solved
	2.2 Rationalize the research
3 Provide a theoretical framework for the research	3.1 Expound the theoretical framework chosen
	3.2 Evaluate the theoretical inputs
	3.3. Identify the theoretical aspect to be developed
	3.4 State the questions (or hypotheses)
4 Design the research	4.1 Contextualize the geographic setting/the type of educational institution/the educational situation
	4.2 Select and describe the participants
	4.3 Prepare the data collection tools
	4.4 Define the data collection procedure
5 Provide an empirical framework for the research	5.1 Analyze the data obtained and obtain results
	5.2 Discuss the results
6 Prepare the conclusions	6.1 Draw conclusions from the results
	6.2 Identify the research's limitations
	6.3 Extract the practical limitations of the results
7 Prepare the bibliography	7.1 Cite references correctly
8 Justify the ethics of the research	8.1 Explain the ethical requirements applied throughout the research process

Three relevant considerations related to this list of prototypical information problems involved in the writing of an academic article must be taken into account, and which here we will call “interrelation between information problems”, “types of information problem” and “strategic position in solving an information problem”.

All information problems are interrelated. Each one of the information problems listed in table 3 are part of a common line of research activity and therefore cannot be solved independently. This means, for example, that any decision taken, say, on the basis of the information problem that we called “3.1 Expound the theoretical framework chosen”, will impact many other information problems.

One initial step in understanding an information problem may be to try to define and classify it taking the proposal submitted in table 2 into account. By doing this, any trainee researcher may realize what information problems they believe they know best and the ones that they do not, and which information problems may be easier or more difficult to solve. There may be major differences between the knowledge the future researchers believe they have and the knowledge they actually have about this type of information problems.

Finally, a strategic position should be taken when it comes to solving an information problem. Taking up this position means learning to take decisions with a full understanding of what the objective of the solving process is, what skills need to be applied at all times and in which order, and how to channel the solving process in order to eventually accomplish the objective.

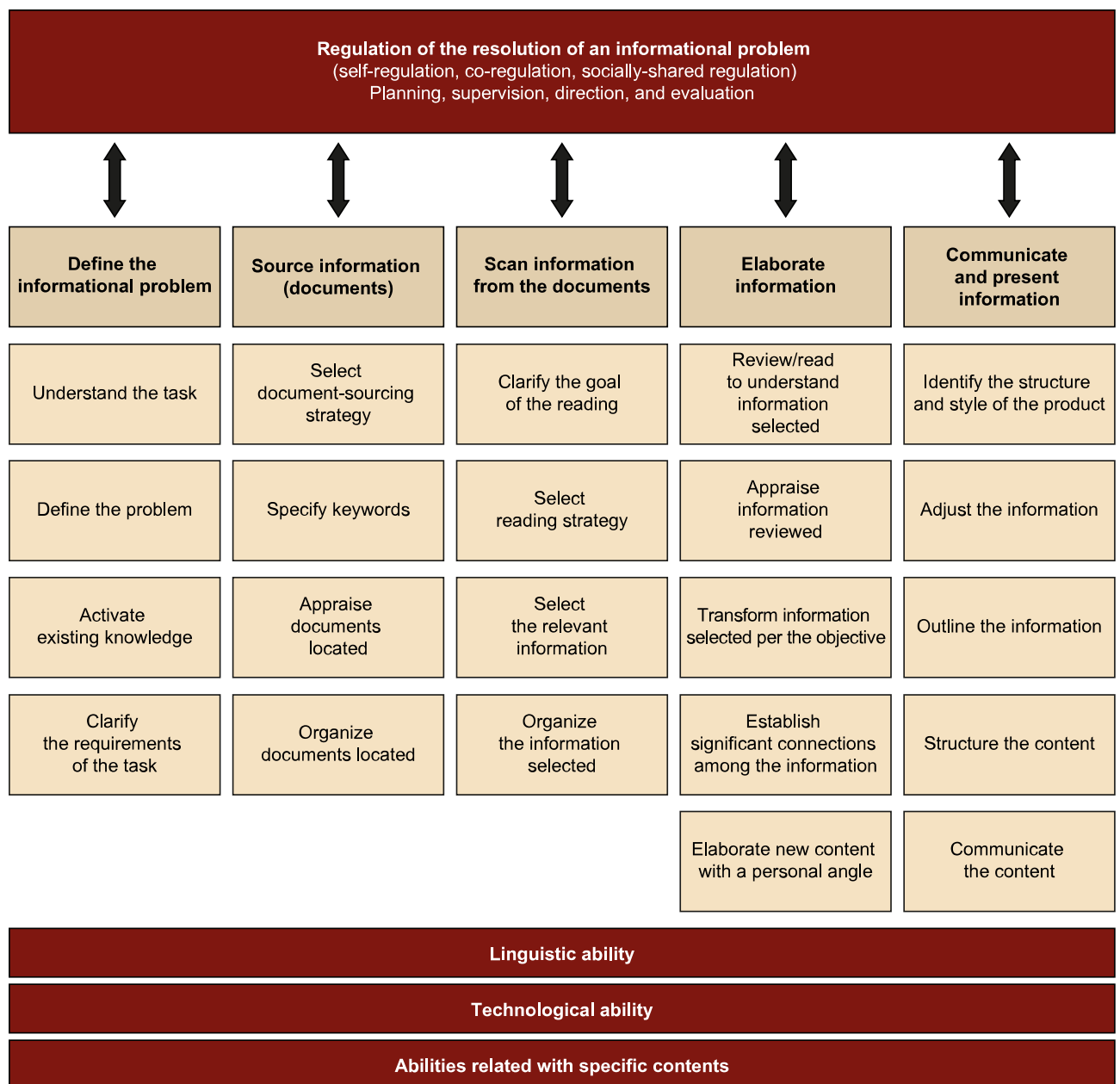
2.2. The structure and components of the information problem-solving (IPS) process.

Put simply, solving an information problem in educational research consists of defining the information problem properly, sourcing and selecting the documentation properly, scanning the information in the documents, preparing the available content (summarizing, interrelating ideas or making deductions, among others) and reporting the information in an academic document or article.

Moreover, the researcher needs to know how to apply the skill of self-regulation in order to follow the process through to the accomplishment of the objective and also how to apply certain basic skills, namely those related to understanding written texts, digital skills (the use of computing tools) and skills related directly to the specific area of knowledge involved in the problem.

Table 4 depicts the set of interrelated skills that are part of information literacy, as well as the three support skills and the self-regulation skill.

Table 4. Skills that are part of information literacy applied to academic writing



Information literacy applied to educational research is a very complex type of competency because it straddles an extensive set of interrelated skills. This complexity is made clear through the way the future researcher acts when they address specific activities in the performance of educational research.

3. Constituent skills applied to educational research

As was shown in table 4, there are five types of constituent skills in information literacy, which we have termed as follows: define the information problem, source information, scan the information from the documents, elaborate information and report and present information (Walraven, Brand-Gruwel, Boshuizen, 2008).

In some earlier approaches, this set of skills used to be presented as phases, or stages, meaning that the person who was to apply this competency or literacy did so in consecutive steps, i.e., beginning with the first skill (defining the information problem) and concluding with the last one (reporting and presenting the information). Recent research (Garcia and Badia, 2017) indicates that this process is also recursive, i.e., in practice the five skills are applied throughout the entire information problem-solving process.

3.1. Defining the information problem

Defining the information problem, applying it to the academic writing of educational research articles, is ultimately intended to design an action plan that must be followed throughout the entire information problem-solving process. It is probably the most complex ability of all five and at the same time is the one that often merits least attention from aspiring researchers. Each one of the tasks involved in this skill are defined below and should ultimately yield the specific action plan to solve a specific information problem:

1) **Understand the task** means being able to understand what the activity consists of, and in most cases, of identifying the final product that will be obtained at the end of an information problem-solving process. Learning to ask the right questions about the information problem and learning how to put a precise name to each information problem may be a good way of understanding it.

For example

Any educational research needs to be based theoretically on a well-defined set of relevant publications on the topic in question, and these publications must be sourced and selected. In this case, one “right question” would be: What are the most relevant publications in the education topic on which I intend to focus my research?

2) **Define the information problem clearly** means identifying different alternative actions in order to answer the question being asked and to assess which action plan (and the possible variants in the action strategy) would have a greater likelihood of answering the question. The purpose of this task is

not to have a highly detailed plan and to apply it rigidly. It is rather a question of having an initial plan and of gradually adapting it as the resolution process unfolds, always striving to avoid applying the principle of trial and error.

For example

Continuing with the above example, defining the information problem would involve establishing a general plan on how to apply the remaining four constituent skills. For example, one possible definition (although there may be many) would be to source ten classic articles about the topic (which in academic terms would be reference articles), using, for this purpose, the Google Academic search engine and the university library, print the articles, review their content, draft a summary of each article and produce a table establishing relationships between the articles.

3) **Activate existing knowledge** is highly contingent upon each person's available knowledge about information literacy applied to educational research and to the educational topic which is the object of the research. The existing knowledge that must be activated will depend on the ultimate intention. More specifically, any existing knowledge that is truly insufficient to initiate the information problem-solving process must be identified and be taken into account throughout the process in order to acquire the necessary knowledge.

Warning! Possible problem ahead!

There are two situations that often lead the aspiring researcher to run the risk of overestimating their existing knowledge. The first situation arises when a professional wants to research an educational topic that is a regular part of their professional practice and wrongly believes that they have sufficient knowledge to undertake research in this area. The other situation may affect people who regularly use digital tools in their day-to-day work (for example, finding information on the Internet) and believe that they can seamlessly transfer this informal information-sourcing skill to the systematic and precise search for academic documentation on the Internet.

4) The fourth task consists of **elucidating the requirements of the** information problem-solving process. The viability or feasibility of the different action plans considered must be assessed, as should whether the resources available are sufficient and whether the plan of action chosen can actually be implemented without any difficulty.

For example

Any intention to locate truly relevant academic publications about an educational topic will place two demands on the future researcher. On the one hand, they must have sufficient proficiency in reading English and must also have access to databases that include reference educational journals and in turn know which ones are the most suitable.

Applying this information skill in practice involves three considerations:

- a) The first idea is that the four tasks mentioned above must evidently be regarded as interrelated, since any decision taken in one of them will affect how each one of the other three tasks are defined.
- b) The second idea is that in order to define an information problem properly we need to have sufficient knowledge of the skill set involved in information literacy because the practical application of these skills must be part of the action plan.
- c) Finally, the third idea underlines the need to complete this first task properly, although it must also be remembered that the right decisions must be taken efficiently without getting bogged down in doubts that may initially seem insurmountable.

3.2. Sourcing information (documents)

Sourcing information (documents) is a key skill that underpins the entire information problem-solving process. As we have already shown in table 4, it includes four types of tasks, which we named as follows: selecting the document sourcing strategy, specifying keywords, appraising the documents located and organizing the documents located. Let us examine them in detail.

1) **Selecting a suitable document-sourcing strategy** is usually regarded as a relatively easy task, particularly if the assistance and guidance of a more experienced researcher is available. Being conversant with the sources of information usually consulted by researchers in this field of study is usually sufficient to establish the strategy. Such knowledge involves, at the very least, the search engines and databases that need to be used, as well as any academic journals and articles that should be used as reference.

Nevertheless, it should be remembered that choosing the right document-sourcing strategy is heavily influenced by the research objective, which is directly related to the type of information problem that is to be solved. We should not select the same research strategy to find the ten most relevant classic articles about a topic that we would use to search for three articles that have used the same analysis categories of the data that we intend to use in our research.

For example

According to some experts in the topic, the five reference journals in the field of specific language impairment (SLI) are:

- Journal of Communication Disorders
- International Journal of Language & Communication Disorders

- Journal of Speech, Language, and Hearing Research
- Clinical Linguistics & Phonetics
- Topics in Language Disorders

Knowing this may prove to be a very important factor in locating the best articles about SLI published in the last five years.

Warning! Possible problem ahead!

Selecting a research strategy is highly influenced by the objective of the search and therefore, and depending on the objective, the purpose of the search could be specific information rather than documents strictly speaking, information which could be contained in the actual document that we are writing. For example, a possible specific information problem of this type could be: which 5-7 publications referred to in the theoretical framework should be chosen in the project conclusions in order to demonstrate that we are comparing the results obtained in our work to the results of existing research on the topic?

2) **The specification of keywords** is the second task involved in the information sourcing skill, and consists of placing the research project in a given area of knowledge and area of research. In order to specify the project's keywords, we must be aware of the keywords available in the theory of education. One of the best ways of doing so may be to refer to the Thesauri available in the field of knowledge of education. Some possible examples of Thesauri are:

- Data base/ ERIC Thesaurus
- Data base/ UNESCO Thesaurus
- Thesaurus of the State University of New York

Precision in the specification of keywords is an indispensable requirement that may help to avert major confusion throughout the process of sourcing relevant documentation.

For example

When we use some of these expressions *learning assessment*, *assessment of learning* and *assessment for learning*, we are referring to three different concepts with different meanings.

The assistance of a more experienced researcher in the field of study may be very important in avoiding wasting many hours trying to locate the most suitable keywords for the research project. Expert help may also be necessary in order to locate the most relevant publications about the subject in databases and specialized Internet-based search engines, such as Google Scholar.

Warning! Possible problem ahead!

There are two possible problems involved in doing this.

1) The first problem is lack of proficiency in English, which may lead to the failure to use keywords in this language or that it may be difficult to translate the keywords that you decide to use into English.

2) The second problem is related to the “translation” of the keywords used in the sphere of everyday life or in the professional sphere into the educational research sphere. For example, when referring to a learning activity in educational research, the word *assignment* or *learning assignment* is normally used in English. Therefore, assignments focusing on having pupils produce some type of text or document are normally called *Writing assignments* in English. Calling it a *learning activity* may be regarded as imprecise.

3) **Appraising the academic documents located** is the third task involved in this skill. As in the previous processes, each document must be appraised depending on the objective of the information problem being addressed.

a) The first criterion to be applied when selecting a document is to make sure that the topic of the document matches the topic of our project. More often than not, it will suffice to check the title and the content of the abstract. In the case of an empirical article, the keywords, the theoretical framework applied, the research questions, the results and the conclusions also often need to be reviewed.

Applying an in-depth review and understanding of the article's content to this skill is not an objective. In order to appraise the documents located, it will suffice to find sufficient textual signs in the document's content that show that this document will be useful in certain aspects of the ongoing research.

Some highly relevant criteria that may be used are:

- b) Consider the quality of the journal.
- c) Check the date of publication.
- d) Examine the relevance of the authors and their affiliation.
- e) Locate the number of times a document has been cited.

A decision must be taken on how to combine these four criteria in each situation in which a specific document has to be selected.

For example

If the information problem consists of locating certain classic publications within which the research may be framed, the criteria of being an acknowledged author and the number of citations could be the most adequate ones. On the other hand, if it is a matter of selecting the most relevant empirical articles about a specific topic, the quality of the journal may be decisive in deciding whether a document is relevant to the ongoing research project.

4) Organizing the documents located is the last task involved in the information-sourcing skill. There is a broad variety of computing applications that can help to systematically organize the academic publications located. These programs or applications may be useful in managing the set of bibliographic references that may be used in educational research.

From our point of view, the following three programs are highly recommendable:

- Mendeley
- Papers
- Refworks

These types of programs for organizing and classifying academic documentation use the descriptive fields that are typical of any document, namely title, year of publication, authors or keywords.

The organization of the documentation located, when the objective is much more defined and specific, such as producing simple research and writing an academic article, may require the use of more specific criteria linked to the needs of each particular educational research.

For example

The documents located may also be classified taking the table of contents of the academic publication into account. Thus, and by way of example, different folders or directories may be opened where the documents can be classified according to a table of contents of the documents, which could include, among other items:

- 1) Documents for the introduction.
- 2) Documents for the theoretical topic A.
- 3) Documents for the theoretical topic B.
- 4) Documents to justify the design.
- 5) Documents to explain the data collection tools.

The organization and classification of the documentation may often be accompanied by a graphic chart indicating two information items of these documents:

- a) The document's basic contents.
- b) The interrelation between the documents.

Two examples of ways of representing this knowledge may be the use of a double-input table and the use of a concept map.

Below, as an example of displaying documents, is a fragment of a table that summarizes some of the key characteristics of a meta-analysis of articles related to writing interventions with students with learning difficulties.

Table 5. Key characteristics of a meta-analysis of articles.

TABLE 1

Descriptions of Individual Writing Comparisons

<i>Study</i>	<i>Type of publication</i>	<i>Design</i>	<i>Grade level</i>	<i>Writing genre</i>	<i>Treatment and comparison conditions</i>	<i>N</i>	<i>Hedge's g ES</i>	<i>Quality score^a</i>
Writing treatments that included four or more effect sizes								
Strategy instruction								
Bryson & Scardamalia (1996)	J	E	10	P	Inquiry strategies vs. genre elements	15	1.22	57%
Curcic (2009)	D	E	7-8	EX	Big 6 Skills strategy vs. BAU	20	0.80	71%
Curry (1997)	D	Q	4	N	Plan/write strategies vs. writing skills	48	0.57	50%
De La Paz & Graham (1997)	J	E	5-7	P	Plan/write strategies vs. genre elements	42	0.91	100%
Eissa (2009)	J	E	9	P	Planning strategy vs. BAU	67	3.50 ^b	43%
Englert, Raphael, Anderson, Anthony, & Stevens (1991)	J	Q	4-5	EX	Plan/write/revise strategies vs. BAU	55	0.55	64%
Garcia & de Caso (2004)	J	E	5-6	MG	Plan/write strategies vs. BAU	127	0.96	57%
Garcia & de Caso-Fuertes (2007)	J	Q	5-6	MG	Plan/write strategies vs. BAU	100	0.71	50%
Garcia-Sanchez & Fidalgo-Redondo (2006)	J	E	5-6	EX	Plan/write/revise strategies vs. writing skills	121	2.21	71%
MacArthur, Schwartz, & Graham (1991)	J	Q	4-6	N	Revise/edit strategies vs. BAU	29	1.42	64%
Reynolds, Hill, Swassing, & Ward (1988)	J	Q	6-8	CD	Revising strategies vs. BAU	53	0.15	50%
Sawyer, Graham, & Harris (1992)	J	E	5-6	N	Plan/write strategies vs. BAU	21	1.14	86%
Therrien, Hughes, Kapelski, & Mokhtari (2009)	J	E	7-8	EX	Writing prompt strategies vs. BAU	40	0.32	71%

Source: Gillespie, A.; Graham, S. (2014). A meta-analysis of writing interventions for students with learning disabilities. *Exceptional Children*, 80(4), 454-473.

3.3. Scan the information from the documents

Once we have an initial selection of academic documents, we can go on to read them. Scanning information from the documents is the third constituent skill of information literacy. It includes four tasks, which we have termed as follows: elucidating the objective of the reading, selecting the reading strategy, selecting the relevant information and organizing the relevant information.

1) **Elucidating the objective of the reading** means ascertaining the usefulness of the information we are looking for in the document, and this knowledge will be closely related to the reasons that have led us to select this specific document. There may be numerous types of reading objectives, some of them general, such as learning more about a topic, and other more specific ones, such as knowing which categories have been used to classify the data collected.

Warning! Possible problem ahead!

Scanning documents is an activity that may take up too much of the student's time, in many cases because there is no clear idea of what the actual reading objective is in each selected document. Knowing why reading a specific document may be useful is the best way of selecting the most suitable reading strategy.

2) **Selecting the reading strategy** is the second task involved in the document information-scanning skill. Only on very specific occasions will it be necessary to read an entire document from start to finish. Such occasions may be, for example, when the purpose of the reading is to acquire new knowledge or when the researcher seeks to further their understanding of a hitherto somewhat unknown topic.

Reading strategies

Five of the most common strategies for reading a publication depending on the objective of the reading may be:

- Sourcing the information-abstract.
- Sourcing specific conceptual information.
- Sourcing specific data.
- Sourcing the main conclusions.
- Sourcing the associated bibliography.

When a researcher sources the information-abstract of a publication, they are seeking to obtain a very brief synthesis of the contents that characterize the publication. Therefore, reading must be focused, going straight to finding the information being sought. This information may be useful when we wish to

cite the most relevant information from the publication in the theoretical framework of the research. For example, if the idea is to summarize the content of an empirical article in a single paragraph, at least the author or the authors, the year of publication, the objective of the research, certain data from the sample and the main results and/or conclusions must be cited.

The selection of the reading strategy to source specific conceptual information may be useful, for example, when the reading is intended to locate different definitions for the same concept. One variant of this reading strategy may be used to locate specific data, for example, in the results of empirical research, or also to locate the article's main conclusions in the section where these conclusions are presented.

Finally, mention should also be made here of one final reading strategy which is a variant on information sourcing (documents) and consists of searching for and selecting potentially relevant bibliographic references from among the citations used in a publication that we have selected for review.

For example

Reading an article may help us to identify which relevant bibliographic citations are contained in the article's theoretical framework. The identification of these references is a document-reading strategy which in actual fact contributes to identifying and subsequently sourcing new documents that are useful for our educational research.

3) Choosing the best reading strategy must make it possible to **select the most relevant information** that is being sought depending on the reading objectives. When the reading objective is very general and the reading strategy is diffuse, the most important data in an academic publication are usually ultimately selected in summary format. In the case of an article, these data usually comprise the title, the author or authors, the year of publication, the journal, the abstract and the keywords.

The process of selecting relevant information is more complex the more specific and focused the reading objective is. The following table interrelates several reading objectives from an academic article to the type of relevant information that should be selected.

Table 6. Three examples of interrelations between a reading objective and the type of relevant information that must be selected

	Reading objective	Selection of the relevant information Example
1	Describe the existing knowledge about a topic	Select a sentence that reflects the conclusion of the study.

	Reading objective	Selection of the relevant information Example
		“For example, some reading time data suggests that the processing time of a verb is not a function of its argument structure or semantic complexity, (e.g., [30–32]), whereas other reading data seem to implicate that lexical semantic complexity influences reading times (e.g., [33–34])” (p. 2) (1)
2	Build a theoretical framework	Select concept categories. “For example, Ainley, Banks, and Fleming (2002) identified the educational uses of the computer: an ‘information resource’ tool that enables access to content to complete a task; a ‘creation’ tool that allows the creation of products or virtual objects; and a ‘knowledge construction’ tool, referring to technology as a resource for the support of processes of collaboration that stimulate the development of superior cognitive abilities” (P. 103) (2).
3	Describe the results of research	Select the description-abstract of the results of research. “The developmental pathway of simultaneous gesture–speech combinations was studied in Esteve-Gibert and Prieto (2014). The study showed that at 11 months infants already produced simultaneous gesture–speech combinations, but pointing without speech still occurred more frequently. In their longitudinal sample they also found a significant increase in gesture–speech productions by 15 months of age. These multimodal productions mostly involved pointing and reaching gestures with a declarative communicative purpose, and when combined with speech, the two modalities were temporally coordinated in an adult-like way” (p. 43) (3).

Bibliography listed in the table

(1) Sanz-Torrent, M.; Andreu, L.; Ferreiro, J. R.; Coll-Florit, M.; Trueswell, J. C. (2017). Auditory word recognition of verbs: Effects of verb argument structure on referent identification. *PLoS one*, 12(12), e0188728.

(2) Arancibia, M.; Badia, A.; Soto Caro, C. P.; Sigerson, A. L. (2018). The impact of secondary history teachers’ teaching conceptions on the classroom use of computers. *Technology, Pedagogy and Education*, 27(1), 101-114.

(3) Igualada, A.; Bosch, L.; Prieto, P. (2015). Language development at 18 months is related to multimodal communicative strategies at 12 months. *Infant Behavior and Development*, 39, 42-52.

In this task it may be possible to make a literal selection of information from the source document with a view to maintaining the exact meaning attributed by the author or the authors to a concept, to an idea, to a conceptual categorization or to the results of the research. Of course, the literal selection of information at this point does not mean that the information may be used subsequently just as it has been selected, because this would be dishonest and could be regarded as a blatant case of plagiarism. It may also be possible to take personal, albeit not literal, notes from the documents consulted, but in this case we must make sure that we maintain the original spirit attributed to it by the authors.

4) The following task is to **organize the information selected**.is normally used in English. This is an initial phase of organization of the information as the final product of this document-scanning skill. Therefore, it will suffice to classify the information obtained in order to access it subsequently without any difficulty.

The product of scanning a set of documents could involve a single document for personal use containing literal information or information summarized personally culled from the set of documents. Drafting specific documents for each “reading objective” could be a good documentary management strategy.

For example

The reading objective of an aspiring researcher is to “define the concept of learning difficulty”. In order to do so, they review ten articles that define this concept, select the definitions drawn from the articles literally and include them in a single document. Besides each literal citation, they also select complementary information from each article that helps to understand each definition better. Evidently, the document describes the bibliographic reference the information was taken from with precision.

Summarizing, the document information-scanning skill is a halfway-house between having the documents selected and being able to organize and elaborate the information contained in these documents. After scanning the documents, the aspiring researcher must know, precisely and in detail, without having to enter the documents, the information contained in each document that may be interesting for the educational research being conducted.

3.4. Elaborate the information

The task of elaborating information consists of transforming this information into personal knowledge so that it can subsequently be used to report and present an educational research product. The initial information may be any source of information that can be used for the research, and more specifically the documents that were produced in previous information-sourcing (documents) and the document-information scanning tasks.

The result of this information elaboration process may be very diverse, although in all cases this “document” must be the outcome of a personal (or group) information elaboration process. It must be an original product in the sense that it contributes new knowledge to an area of research.

Subsequently, and applying the communication skill, it must be relatively easy to transform into a specific research product, which may take different forms, such as a poster, a document present findings at a symposium or congress, a research report, a degree or master dissertation or an article in a scientific journal.

The way in which each specific situation can transform and personalize the information will depend on certain conditions of the educational research setting, including, among others, the objectives of the research and the candidate’s aspiration to becoming a researcher in every action that they perform within the framework of the research.

Some categorizations regarding different cognitive demands according to the learning task may help us to explore this topic further. For example, considering the contributions made by Becerril and Badia (2015), there are five highly-complex information elaboration processes which are summarized in the following table.

Table 7. Five types of information elaboration

Level	Information elaboration process
1	Isolated use of information without transforming the content, or transforming the information slightly
2	Connect concepts and ideas from more than one source of information in a simple way
3	Think about the concepts and develop new conceptual frameworks
4	Evaluate and critically review information
5	Develop new knowledge and transfer it to new contexts

1) The first process of information transformation consists of selecting a literal citation from a specific part of the original content. We may decide to make a literal citation when the content is highly important to the educational research being conducted and we wish to maintain the original meaning of the concept employing the author’s exact words. Of course, academic requirements must be followed in order to demonstrate that we are using a literal citation so that it cannot be regarded as “plagiarism”.

This initial and simple information transformation process may also include all the forms of paraphrasing the information that can be used. Paraphrasing information consists of explaining an author’s original concept or idea in a

different way while maintaining the original meaning. The extent to which the specific words used in the original are maintained indicates the different levels of paraphrasing that may be used.

Warning! Possible problem ahead!

Sometimes it can be very difficult to maintain the balance between using “our own words” when explaining an idea that we wish to include in the text and maintaining the original meaning attached to the concept or idea in the original text exactly and precisely. In all cases, it must be made clear whether the idea comes from a given origin and was expressed by specific authors or it is an original proposal made by the aspiring researcher.

2) The second information elaboration process involves connecting concepts and/or ideas drawn from more than one original source of information. Naturally, we are not referring to selecting and explaining information from authors when these connections have already been made. Beyond this, this level of elaboration means that the author of the connections must be the aspiring researcher. Making a new connection of this nature may be regarded as an original contribution by the future researcher.

It could be possible to establish a very exhaustive classification of different ways of establishing connections between concepts and/or ideas taken from different sources, although any such classification would depend heavily on the field of study that is the focus of the educational research. We provide examples and explain the nature of some of these types of connections below.

Table 8. Examples of connections between concepts and/or ideas culled from different sources.

Type of connection		Example
1.	Exemplification of conceptual categories	“Argument structure is a construct within linguistic theory that specifies the relationship between the semantics of a lexical item and its syntactic expression, and, as such, serves as an important interface between lexis, syntax and semantics (e.g., Levin and Rappaport Hovav, 1996; Jackendoff, 2002; Grimshaw, 2005). Carnie (2013) showed that the argument structure of a verb includes the number of arguments (one, two, or three) that a verb requires in a particular predicate (intransitive, transitive, or ditransitive)” (p. 2; Andreu, Sanz-Torrent, Rodríguez-Ferreiro, 2016).
2.	Indicate that the same topic has been addressed in different research works	“The experiments below used the visual world paradigm (Cooper, 1974; Tanenhaus, Spivey-Knowlton Eberhard, & Sedivy, 1995) to study this issue” (p. 3; Sanz-Torrent, Andreu, Rodríguez, Coll-Florit, Trueswell, 2017).
3.	Indicate previous research that provided the inspiration for our own	“Regarding the redefinition of certain IPS processes, there are some relevant precedents in collaborative learning that the group has used as a unit of analysis. Lazonder (2005) analysed the information search processes and results in student pairs. Murphy (2010) examined another one of the processes, the collaborative reading of texts on the computer screen, and focused on analysing educational interaction based on exploratory talk aimed at adequately selecting information. Kumpulainen, Salovaara, and Mutanen (2001) studied how various groups of students who are learning collaboratively can more superficially or more deeply process information. Some previous studies also considered the regulation of a task to be a social and shared process (Hadwin, Järvelä, Miller, 2011), focused on the procurement of a common objective through the collective regulation and adaptation of the collaboration process” (p. 4; Badia & Beceril, 2015).

Type of connection		Example
4.	Contributing results to support previous findings	"Findings are consistent with available literature about this topic in the sense that thanks to mobile technology, children have the opportunity to explore what they are learning from a variety of different perspectives (Boticki et al., 2015; Furio et al. 2015; Jahnke & Kumar, 2014; Murphy, 2011). Consequently, this facilitates access to details about a large amount of topics and supporting the emergence of relevant thoughts or ideas to contribute in class (Churchill & Wang, 2014; Furi_o et al. 2015; Jahnke & Kumar, 2014; Yang et al., 2015). Moreover, mobile technology is linked with the improvement of students' engagement to learning (Churchill & Wang, 2014; Gerger, 2014; Lu et al., 2014)". (p. 25; Gómez & Badia, 2016).

Bibliography listed in the table

1. Sanz-Torrent M.; Andreu L.; Rodríguez Ferreiro J.; Coll-Florit M.; Trueswell J. C. (2017). Auditory word recognition of verbs: Effects of verb argument structure on referent identification. *PLoS ONE*, 12(12): e0188728. <<https://doi.org/10.1371/journal.pone.0188728>>.
2. Andreu, L.; Sanz-Torrent, M.; Rodríguez-Ferreiro, J. (2016). Do children with SLI use verbs to predict arguments and adjuncts: evidence from eye movements during listening. *Frontiers in psychology*, 6, page 1917.
3. Badia, A.; Becerril, L. (2015). Collaborative solving of information problems and group learning outcomes in secondary education. *Infancia y aprendizaje*, 38(1), 67-101.
4. Gómez, M.; Badia, A. (2016). Exploring the use of educational technology in primary education: Teachers' perception of mobile technology learning impacts and applications' use in the classroom. *Computers in Human Behavior*, 56, 21-28.

3) The third process of information elaboration consists of thinking about the concepts and developing new conceptual frameworks. The aforementioned process of connecting concepts and ideas from different sources is acceptable because there is existing evidence in the content contributed by each source of information that justifies the making of this connection. The previous table shows this assertion clearly. On the other hand, elaborating information thinking about the concepts and developing new conceptual frameworks means that it is the aspiring researcher who decides to make the connections between concepts and ideas and has to justify them depending on the theoretical framework applied. Two examples of this level of information elaboration that we shall address presently are provided below.

Table 9. Examples of development of new mental frameworks

Types of elaboration		Examples
1.	Thinking about the concepts	"Narrative research has become an important means for understanding teachers' culture; that is, teachers as knowers of themselves, of their situations, of children, of subject matter, of teaching, and of learning (Clandinin & Connelly, 1998). If we are to understand emotion and teacher identity, then narrative research is a powerful tool to document the way discursive environments provide the construction of teacher identity. Taken together, social, cultural, and institutional discourses set the 'conditions of possibility' (Foucault, 1979) for who and what a teacher might be» (p. 214-215, Zembylas, 2003).

Types of elaboration		Examples
2.	Developing new conceptual frameworks	"In collaborative learning research, regulatory processes have been usually considered from a cognitive perspective and, thus, the definition has been linked to cognitive processes involved in or instrumental for knowledge co-construction (Hmelo-Silver and Barrows 2008), socio-cognitive dynamics of knowledge building (Zhang et al. 2007), knowledge convergence (Weinberger et al. 2007), or task- and team-related aspects (Fransen et al. 2013). What is important and different in the shared regulation of learning is that self-regulated learning theory extends conceptions of learning beyond cognitive processes and outcomes, acknowledging the interactive roles of motivation, emotion, metacognition, and strategic behavior in successful learning (Zimmerman and Schunk 2011). SSRL refers to processes by which group members regulate their collective activity. This type of regulation involves interdependent or collectively shared regulatory processes, beliefs, and knowledge (e.g., strategies, monitoring, evaluation, goal setting, motivation, and metacognitive decision making) orchestrated in the service of a co-constructed or shared outcome" (Hadwin et al. 2011). (p. 128; Järvelä et al., 2015).

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1. Zembylas, M. (2003). Emotions and teacher identity: A poststructural perspective. *Teachers and Teaching*, 9(3), 213-238.

2. Järvelä, S.; Kirschner, P. A.; Panadero, E.; Malmberg, J.; Phielix, C.; Jaspers, J.; Järvenoja, H. (2015). Enhancing socially shared regulation in collaborative learning groups: designing for CSCL regulation tools. *Educational Technology Research and Development*, 63(1), 125-142.

In the first example, Zembylas (2003) develops the conceptual relationship between three notions, *narrative research*, *emotion*, and *teacher identity* is normally used in English. The conceptual relationship between these three theoretical constructs will become one of the theoretical foundations of the post-structural perspective that this author will develop in the course of this article and will continue to develop in subsequent published articles.

In the second example, Järvelä et al (2015) explain, in detail, a new conceptual framework for understanding, analyzing and interpreting a new concept using the acronym SSRL (*Socially Shared Regulation of Learning*). In order to explain the meaning of this new concept, they take an original concept (*individual regulatory processes*) as their point of departure, define it and expound the meaning of a new concept (SSRL), placing particular emphasis on the differences with the original concept, as well as the core aspect of the meaning of the new concept.

4) The fourth type of information elaboration consists of evaluating and criticizing information already mentioned or reviewed. It is quite common to find these types of information elaboration in the form of paragraphs at the end of a theoretical section. Two examples of this information evaluation and critique consists of summarizing and identifying the key aspects of previous contributions and comparing and assessing them, reaching an integrating synthesis. Examples of these two kinds of forms of evaluating and criticizing information are provided below.

Table 10. Examples of evaluation and critique of information already mentioned.

Types of evaluation and critique		Examples
1.	Summarizing and identifying key aspects	"While analyzing the overall effectiveness of using mobile devices in education, the review research described above has two major limitations. First, all of the reviews adopted a qualitative approach, which may be able to describe and summarize how related studies were conducted and the problems encountered during their execution, but this makes it difficult to evaluate the effects actually produced by the mobile devices in general and the specific moderator variables. Second, much of the previous review research has focused on the usage of laptop computers as the subject of their investigation (e.g., Penuel, 2006), and most of the research participants in those reviewed articles were in primary and secondary schools. However, the many new developments in mobile hardware have meant that diverse age groups now use different devices. Therefore, many different moderators need to be accounted for when attempting to determine whether or not intervening variables have an effect" (p. 254; Sung, Chang, & Liu, 2016).
2.	Compare, appraise and summarize	"In summary, the abovementioned studies indicate six different kinds of teachers' approaches to online teaching (see Table 1), both in fully online and blended environments: (1) managing learning tasks; (2) promoting self-learning; (3) facilitating content acquisition; (4) supporting knowledge-building; (5) supporting collaborative learning; and (6) creating community and networked learning" (p. 1195; Badia, García, & Meneses, 2017).

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1. Sung, Y. T.; Chang, K. E.; Liu, T. C. (2016). The effects of integrating mobile devices with teaching and learning on students' learning performance: A meta-analysis and research synthesis. *Computers & Education*, 94, 252-275.

2. Badia, A.; Garcia, C.; Meneses, J. (2017). Approaches to teaching online: Exploring factors influencing teachers in a fully online university. *British Journal of Educational Technology*, 48(6), 1193-1207.

5) The fifth type of information elaboration consists of developing new knowledge and transferring it to new contexts and is directly related to the possibility of going beyond existing knowledge. We can identify at least two ways of making this type of information elaboration possible, which consist of proposing didactic implications on the basis of the results and the conclusions of a piece of research, and producing new theoretical and methodological approaches based on existing knowledge.

a) In the first case, these types of information elaboration may be found, for example, in paragraphs at the end of an article, in the Conclusions section. Journals with an approach clearly orientated towards the transformation of educational practice commonly ask submitting authors to address the implications for educational practice of the results and the conclusions obtained in the research submitted in the article.

b) The second case refers to a much more complex situation that is difficult to accomplish, namely that an author or groups of authors present a theoretical or methodological proposal with a high degree of novelty and innovation with regard to the existing knowledge. Many of the examples that we could use of this level of information elaboration would be theoretical review or theoretical trial-proposal articles that eventually lead to a change of approach in the way that a given field of study is investigated.

They are usually theoretical proposals firmly grounded in previous studies, they provide original contributions to a field of study and point towards future research challenges. They often become highly-cited reference publications in their field of study. It is important to be able to identify these types of conclusions because, while they may be “a novelty” when they are published, they are the publications that can give us the keys to attaining a better understanding of the research lines that are developed after the reference publication.

3.5. Reporting the information

The reporting of academic information will be defined as the process of taking decisions as to which, how, where and when the content of the elaboration processes conducted is reported when the preceding skill is applied. Reporting information is often equivalent to writing it, representing it graphically, explaining information about the educational research orally or a combination of the three.

The first aspect to be addressed is the identification of the structure and the style of the product that is to be generated. Certain prototypical research products may be identified, such as an academic article, a research report, a poster at a congress or a communication at an academic meeting. At this moment in time, and in the digital setting, there may be other formats that can be used to report information about academic research, such as tools like Instagram, Twitter or YouTube.

All research products must adjust the available information generated in the educational research and delimit, structure and report the contents according to the product's specific characteristics. The option used here is to describe the decisions that need to be taken in the case of the prototype of the products par excellence, to wit the academic article.

3.5.1. Reporting the information about the title, the abstract, the keywords and the introduction

From the standpoint of information literacy, two criteria must be taken into account in order to word the title of an article properly. First of all, the specific keywords must appear in the title and they must be combined in such a way that the final text conveys the content of the article properly. Secondly, the title must state the purpose of the educational research. By way of example, the use of expressions such as “teachers' perceptions about”, “factors that affect...” or the “relationship between...” clearly convey this purpose.

One initial aspect that must be taken into account when drafting an abstract is the maximum length (the word limit) that can be used in this section in a given journal. An abstract must specify the purpose of the article and the theoretical approach taken, the main data pertaining to the method, the re-

sults and the conclusions. Moreover, specific keywords must be inserted that will help readers to place the article within the more general framework of the research about this area of knowledge.

Finally, and while the content of an article's introduction may be highly variable, depending on the nature of the publication and the type of article, this section is useful for contextualizing the topic in the social or professional setting in order to underscore the importance of conducting research in this field and to justify the relevance of the research topic and the methodology applied.

3.5.2. Conveying information about the conceptual framework

Providing information about the content of the theoretical framework may help to fulfil three functions:

- Frame the article's topic.
- Describe the current state-of-the-art in research into this topic.
- State what is known about the topic and more particularly what is not and should be known.

Different decisions and some recommendations that should be considered so as to address certain potential difficulties are outlined below:

1) First of all, the topic chosen must be the right one. This means taking the best possible decisions about references and commenting on the bibliography which is clearly the focus of the topic, making sure that our approach to the topic is not too general. For example, the researcher, now in the role of the writer, must avoid the tendency to include a great deal of the knowledge that they have amassed in the course of the educational research (particularly that which is not the focus of the article) or to use a limited bibliography section (without having considered sourcing articles in English).

The characteristics of the target must also be clearly known. The main targets of research articles are usually other researchers and experts with an interest in the topic or professionals who may also be interested in it. Being able to identify the basic knowledge of the potential readers is a requirement for deciding what is actually explained (and what does not need to be explained) about a given topic.

Warning! Possible problem ahead!

One very common error consists of using an extensive introduction addressing general aspects of the article's topic which do not fall within the specific topic of the article. Failure to be conversant with the bibliography about a highly-focused topic may lead the writer to be over-general in their exposition. For example, if the topic is about learning difficulties linked to the understanding of written texts that are part of the expression of mathematical problems in school education, then the specific bibliography must be located and the theoretical framework related to this topic must be covered.

2) Secondly, the author of an academic article may make the mistake of not clearly sticking to their topic. This may occur, for example, when the author's semantic field of meanings (names given to concepts, meanings and their possible interrelations) differs ostensibly from the semantic field used by the reference academic community.

This difficulty is not attributable solely to a specific author. For example, it would be possible to find a very different development between the semantic field which the academic community in one language has constructed about the topic (for example in Spanish) and the semantic field developed in another language (for example in English). When confronted with this problem, the author may decide to attempt to combine both semantic fields, although if this is not possible they will have to choose one of them, foregoing the academic inputs of the other semantic field.

For example

The topic of **learning strategies** has received a great deal of attention from the academic community over the last thirty years. Two language-specific semantic fields have developed over a very long time because they correspond to contributions made from the Spanish-speaking academic community or from the English-speaking academic community. It is quite difficult to use and combine the basic bibliography of both communities because the meanings of the key concepts may be substantially different.

The analysis of the titles included in an academic publication can afford many pointers as to how to take decisions about reporting the contents of a conceptual framework. We will now proceed to analyze some titles of publications in order to show how the authors have successfully defined the general topic of their article in specific sub-topics.

Table 11. Example of the definition of a general topic into sub-topics

	Key topics		
1	A descriptive model of	information problem solving while	using internet
2	Portfolios for learning,	assessment	and professional development in higher education

	Key topics		
3	Specifying computer-supported	collaboration	scripts
4	Teacher emotions in the classroom: associations with	students' engagement,	classroom discipline, and the interpersonal teacher-student relationship
5	Learning in science:	A comparison of deep and	surface approaches
6	Achievement goals in the classroom:	Students' learning strategies and	motivation processes

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Analyzing the titles of reference publications may prove to be useful to us as writers of academic texts in order to focus the search for bibliography, organize the documentation obtained, guide the processes of scanning information in each document, elaborating information and ultimately structuring the entire content of the theoretical framework section clearly.

For example

Let us analyze the organization of the content of the theoretical framework of the following article:

Brand-Gruwel, S.; Wopereis, I.; Walraven, A. (2009). A descriptive model of information problem solving while using internet. *Computers & Education*, 53(4), 1207-1217.

Once this has been done, we can see how the structure of the content is consistent with the purpose of the article (A descriptive model of [...]):

1. Introduction
2. The IPS-I-model

2.1. The five constituent skills

2.2. Regulation activities

2.3. Conditional skills

IPS-I (Information Problem Solving - Internet)

3) Thirdly, the information that we wish to convey must be organized with a suitable definition of the line of argument of each section. To achieve this, an explicit line of argument must be followed, avoiding discontinuities and addressing all the key topics.

Organizing the information following a line of argument means going beyond merely listing, one after the other, the abstracts of the articles reviewed, with no organizational criterion and no nexus that rationalizes this organization. Taking a decision on the line of argument is not merely an aspect related to academic writing competency. The purpose of the article and research topics must be reflected in the organization of the content into sub-sections, the textual nexuses used between paragraphs and the content of each paragraph.

3.5.3. Conveying information about the design

The content and the wording used to state the research objectives, questions or hypotheses must be inferred directly from the purpose of the academic publication. The way in which each aspect should be worded or written can be learned by analyzing these sections in existing publications.

For example

In accordance with the purpose of the article:

Brand-Gruwel, S.; Wopereis, I.; Walraven, A. (2009). A descriptive model of information problem solving while using internet. *Computers & Education*, 53(4), 1207-1217.

The research questions outlined on page 1,210 were written in the following way:

"This paper focuses on the IPS-process and the skills and regulation activities involved. The aim is to build a descriptive model depicting the process of information problem solving when using the internet (especially the WWW) to search information. In order to verify the model, the following questions are addressed: 'Do students perform all the constituent skills and regulation activities as described in the model when they solve information-based problems using internet to search and find information?' An additional question is: 'How do different kinds of students go through the process and how do they differ in the performance of the constituent skills, regulation skills, and the condition skills 'reading' and 'evaluating?' This question is important because it can give input to the design of IPS-instruction for different kinds of students".

Participants' data may be reported differently in the case of quantitative or qualitative research. If the article is submitting quantitative results, any information provided about the participants is usually very brief, consisting of data about the number of participants, age, gender and certain individual char-

acteristics. On the other hand, in case studies or analyses involving a small number of participants, a great deal of information should be provided about the participants and detailed information about each case or participant.

Data should also be furnished about the “object of analysis” of the educational research. The meaning of “object of analysis” refers to information about the part of the reality that we have set out to analyze. In the social sciences in general, and more particularly in education, the correspondence between data and reality must be described precisely. The object of analysis must come from the concepts defined in the theoretical framework and must have an operative dimension, a way of measuring reality, that will make it possible to establish this correspondence.

For example, educational research may collect data about what the participants say (answers by the participants to surveys or questionnaires or oral answers in the form of sentences and statements in interviews, to mention some possibilities) or about what they do (by means of observational methodologies). The object of analysis is a “theoretical construct” that renders it possible to interpret the data and it must be explained by the researcher. The same data can be analyzed in different ways and may yield different results depending on the object of analysis.

Information should also be provided about the procedure used to collect the information. The communication of this procedure is intended to demonstrate that due consideration was given to all the reference methodological and ethical criteria with regard to the institution hosting the research and in the way that the participants were handled. The researcher must also provide information about the information collection instruments. Each type of instrument calls for a specific explanation. All too often, the aspiring researcher fails to pay sufficient attention to this aspect and in many cases it is not fully explained.

For example

If a questionnaire is to be described, information should be provided about:

- 1) The questionnaire's title, what the reference theoretical constructs convey.
- 2) How many blocks (or, as the case may be, scales) are included, and the name of each set of items.
- 3) What methodological precedent underpins each block of items? Was an existing and validated questionnaire applied or was one constructed specifically for this research? In the first case, the set of bibliographic quotations from previous studies that have used the questionnaire must be provided.
- 4) What are the characteristics of each block of items? The aim is to detail the number of items and the measurement scale.

If another type of instrument is used to collect qualitative data, this instrument must be fully explained.

For example

If an interview has been used, the type (structured, semi-structured or open-ended) is usually explained and, in the first and second cases, the structure of the interview, the number of blocks contained in it and the criterion used to classify the questions.

The reporting of the content of the data analysis will be highly variable depending on the data collection instrument used and more particularly on the nature of the data. Often, analyzing data compiled through a questionnaire item by item is unsuitable. On the contrary, these data are usually clustered into indicators that “measure” the answers given by the participants for each indicator. Correct data clustering is performed by means of data reduction techniques, such as factor analysis.

In the case of qualitative data, which often take the form of oral or written text, the information to be conveyed will often consist of describing how the data were coded and segmented, the categories used, how categories were associated with data segments, and how the reliability of the coding process was guaranteed.

3.5.4. Reporting information about the results

Results can be reported in many different formats, making it difficult to provide useful general guidelines. Consequently, we shall now expound two reference criteria that can be taken into account in a broad variety of situations:

1) The first criterion consists of considering the existence of different forms of ordering the way that the results are presented. Generally speaking, it may be very useful to present the results ordered by research objectives or by working hypotheses. Often times, when quantitative data are submitted, descriptive data are provided before the results of more complex statistical calculations are presented.

With regard to data culled from educational observation, it is common practice to present the data pertaining to the more “macro” levels of analysis first, followed by the data from the more “micro” levels.

For example

If we need to present data from a set of class sessions and we have used two levels of analysis, class session (more macro level) and educational interaction patterns (more micro levels), we will present the data from the sessions before the data from the educational interaction patterns. In the above case, it may sometimes be necessary to present these data related directly to each class session.

2) The second criterion involves considering that in any empirical research the function of the data submitted in the results is to provide reliable and valid proof about reality. Consequently, the results must be submitted in a clear, ordered and structured fashion, following a general pattern and consistently with the typical academic styles used to submit results. Each type of data must be reported in a specific way.

It is also common to add comments discussing the evidence produced together with the results submitted. One frequent error is that the discussion of the results consists of “translating” information that has already been presented using a different format (for example in a table) into a written text. The data discussion section should reflect which aspects of the data relate most evidently to the questions, objectives or hypotheses addressed.

3.5.5. Reporting the information of the conclusions

The main function of conclusions is to restate the contribution made to the field of study and more particularly to compare the new knowledge to the existing body of knowledge. Some prototypic conclusions usually include at least the following sections:

- 1) Recap on the researcher’s proposed objectives and assess the extent to which they have been accomplished.
- 2) Compare the main findings to the data from existing research about the “same object of study”.
- 3) Mention any theoretical or methodological aspects that have been not been properly resolved or, and perhaps even better, that could be optimized in future studies.
- 4) Explain possible implications for the professional field to which the result obtained could be applied.
- 5) Identify future research possibilities that could answer new question marks yielded by the research.

3.5.6. Reporting the information about the bibliography

As a rule, most journals in our setting require the use of a specific style of bibliographic citation, such as the APA (*American Psychological Association*). If this is not the case, the journals’ websites usually specify the type of bibliographic citation format that must be followed.

If you intend to publish in a journal, it is a very good idea to refer to two or three articles recently published in the journal in question. Checking how the information is presented, and more specifically the way in which bibliographic references are cited, can go a long way to helping us to understand how to present quotations in our academic publication.

Summary

In summary, and besides the preceding recommendations, it is important to remember that findings obtained in educational research can be reported by organizing the information in many different ways. There is no denying that there is a substantial variability of forms, styles, patterns and ways of reporting educational research.

Our suggestion would be to continue analyzing the formal aspects of new research articles that are published, because this will enable you to discover new and creative forms of theoretical development and of presenting data that will help you to hone your educational research information reporting skills even further.

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