

## INFORMATION MINING –AN ESSENTIAL STAGE IN THE PEDAGOGICAL RESEARCH DESIGN

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### Abstract

*The research design and conducting underpins a complex approach, which involves a series of stages, each based on specific actions. The quality of the investigation carried out also depends on solid scientific information mining, which should capitalize on different categories of sources, comply with rigorous criteria and requirements regarding selection, exploitation and citation.*

*The present paper addresses the issue of information mining - an important stage in the pedagogical research, as envisaged from the perspective of the prospective (pre-service) teachers, who are developing research skills. The sample was made up of 80 Master's students at the Faculty of Letters, University of Craiova, who are in the first year of teacher training, Level II.*

*The research methods used were the questionnaire-based survey and the focus-group interview. We administered a survey to the subjects in the sample, and we also conducted a focus-group interview with 20 Master's students.*

*The research findings confirmed the relevance of this stage for the rigorous research design.*

**Key words:** *Information mining, Pedagogical research, Research design, Bibliography, Webography.*

### 1. Introduction

The approach to pedagogical research design involves several stages, each based on specific actions, with different degrees of complexity and difficulty. The quasi-algorithmic structure makes each of the stages of particular importance, the success of the whole activity depending on the rigour and precision of the stepwise task completion.

The present paper addresses the issue of information mining, as an important step in the theoretical foundation, as well as in the general approach to pedagogical research design (Mogonea, 2016).

Information mining is considered an "active and critical approach to accessing and exploiting the means and sources of pedagogical information (...) in order to

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collect state-of-the-art topic-related data and findings, and to evaluate the stage of development of the previous research, with reference to the field and issues concerned, the scientific content of the research design” (Bocoş, coord, 2016, p. 356 – our translation).

The importance of information mining is justified and materialized by several important aspects.

First of all, it facilitates theoretical clarification, important conceptual delimitations, a detail-oriented approach to sub-topics, from the perspective of new theories, paradigms, which are relevant to the educational field.

Secondly, consulting the sources allows the researcher to investigate and list the research on the corresponding topic / issue conducted up to that moment.

In other words, the information mining stage bears consequences and implications both on the theoretical level and on the applied, experimental level of research. It allows for diagnosis regarding the level, stage of the investigation of the topic in the mainstream literature, as well as for prognosis concerning the opportunities available to the researcher to develop, continue or approach other aspects of the investigated topic.

The magnitude and duration of this stage depends on the complexity of the topic, its degree of novelty, the researcher's aims, his/her theoretical and practical experience, the resources available and many other conditions or criteria that may differ from one topic to another.

The quality of information mining is dependent on closely meeting the conditions and requirements regarding the identification, selection of the sources, their review, the references and citations, both in the content of the paper and in the general bibliography section.

All these demands may represent challenges, stumbling blocks for the researcher, even for the experienced one. The difficulty is even higher when a young researcher is involved, such as prospective (pre-service) teachers, who are developing the teaching and related research skills.

## **2. Sources of documentation and ways to use them**

The use of the sources acquires specificity also depending on the type of research, qualitative or quantitative (Friedhoff, zuVerl, Pietsch, Meyer, Vompras, Liebig, 2013).

The sources for carrying out research in the educational field can be classified into three main categories (Bocoş, 2003):

- **Bibliography;**
- **Webography;**
- **Official curriculum-related documents.**

The reading of bibliography involves consulting papers and books, which deal with the topic under investigation, either directly or indirectly, within a chapter / sub-chapter.

New communication technologies offer the possibility to consult webography (papers, conference proceedings, e-books, etc.). There are virtual libraries, open source software libraries (Stuart Geiger, Varoquau, Mazel-Cabass, Holdgraf, 2018) available.

The examination of the curriculum-related documents is required in the case of certain topics, and these documents include either the main, official ones, issued by the Ministry (Framework plan, curricula, syllabi, text books) or the auxiliary ones (curriculum auxiliaries, teacher's guides, student tutorials, educational software, etc.) or materials designed by the teacher (lesson planning, learning units plans, lesson plans).

Each of the three categories of sources presents benefits, but also costs and risks. A comparative analysis of the three categories of sources, from the perspective of the two mentioned aspects, is provided below:

**Table no. 1. A comparative analysis of the three categories of sources, based on static costs and benefits**

| <b>Category</b>                     | <b>Advantages, opportunities</b>  | <b>Limitations, risks</b>   |
|-------------------------------------|---|---|
| <b>Bibliography</b>                 | <ul style="list-style-type: none"> <li>- consulting verified sources</li> <li>- access to reliable sources</li> <li>- access to programmatic studies of well-known scholars</li> </ul>  | <ul style="list-style-type: none"> <li>- access to some sources may be limited</li> <li>- the difficulty of identifying previous research on the topic</li> <li>- consulting the sources can cause inconvenience due to space and time limitations (reading room, the library office hours)</li> </ul>  |
| <b>Webography</b>                   | <ul style="list-style-type: none"> <li>- fast and convenient access to different sources</li> <li>- possibility to access certain materials free of charge</li> <li>- consulting updated sources</li> <li>- multiple possibilities to access the sources (phone, tablet, laptop)</li> </ul> | <ul style="list-style-type: none"> <li>- a more rigorous selection of sources</li> <li>- a more rigorous review of the materials</li> <li>- risk of consulting irrelevant or scientifically inaccurate sources</li> <li>- limited free access for certain papers, books</li> <li>- the access conditioned by a certain period of time</li> <li>- conditioned by access to the Internet</li> </ul> |
| <b>Curriculum-related documents</b> | <ul style="list-style-type: none"> <li>- access to official documents</li> <li>- fast access of documents on the official websites of the Ministry</li> </ul>   | <ul style="list-style-type: none"> <li>- reference to documents in force</li> <li>- difficulty of identifying/selecting relevant official documents</li> </ul>  |

Some authors (notably, Mogonea, 2011) insists on the review of the sources as a pre-requisite of the quality of information mining, and at the same time, of ensuring the originality of the approach.

Citing sources is an important aspect of research ethics, mentioned by several authors (Frăsineanu, 2014). This must be done rigorously, in compliance with the citation rules in force. Citation refers both to the indication of the sources consulted throughout the paper and in the general bibliography section at the end of the paper.

As far as Education sciences are concerned, currently the APA (American Psychologists Association) citation rules are used.

According to principle of extensive information mining, numerous guides can be used online (Backhaus, Tuor, Flitter, 2018) or in printed format (Rădulescu, 2011; Mogonea, Mogonea, Popescu, Ștefan, 2012, 2013; Neacșu, Manasia, Chiciooreanu, 2016), for the design / conduct of a research, as well as for the information mining itself.

### 3. Conditions for accurate information mining

The purpose of information mining, regardless of the type of sources (Mogonea, Mogonea, Popescu, Ștefan, 2012) is indicated by:

- clarification and definition of the basic, key concepts;
- clarification of the main theoretical aspects of the topic;
- knowledge of the research carried out on the topic, in order to avoid repetition;
- compilation of the thematic bibliography, by categories of sources;
- established and intuition-driven solutions for unresolved issues;
- drawing up a preliminary plan for improving research.

*The requirements* of the accurate and efficient / quality information mining are mainly the following (Bocoș, 2003, in Ștefan, 2013, p. 57) – the research should:

- be selective, in the sense of using reference works, relevant and valuable, as important contributions to the development of educational theory and practice: encyclopedias, treatises, doctoral theses, monographs, books, papers, etc. (printed or in electronic form); theoretical works, which refer to the scientific - psychological, pedagogical and methodical foundation of educational processes, as well as works based on research and experimental investigations in different areas of understanding will be considered.

- be based, as far as possible, on first-hand, primary, authentic sources to ensure the correct understanding of the terms and meanings (for example, reference to a work based on reading a review of that work, in which the text could be distorted by infiltrating the reviewer's subjectivity, opinion, attitude, etc.

- be carried out in an active way, encourage participatory research, and the active and interactive attitude of the researcher towards the text and information: knowledge thirst, desire to know and discover by exploiting his/her own potential, engaging in information mining, adopting an active and interactive behaviour in search of the new, problem solving, imagination, creativity, etc.

- encourage a reflective approach, self-reflection, the researcher's inquisitive attitude, his/her mental alertness in relation to the data that s/he collects through information mining: interest in the topic addressed, permanent (self-) reflective attitude regarding the new ideas and experiences, internal dialogue, self-questioning, practicing one's reflective thinking, thanks to filtering everything during the information mining process, etc.

- foster the adoption of a critical attitude by the researcher when reading the material, showing critical thinking, filtering, not accepting an opinion without

reflecting on it and without asking himself/herself about its value, putting into good use initiative and reasoning.

- make the researcher adopt an impersonal and objective attitude, not show bias or prejudice, cultivate the respect for scientific data, and for the scientific - theoretical and methodological foundation of innovative approaches, etc.

- use the results driven by information mining in as many directions as possible: restatement of the topic, clarification of some aspects and content, emergence of new ideas and suggestions, arguing for ideas and experiences, remedial work, completions, outlining new openings and developments, etc.

- be based on constant information mining, to represent a systematic approach throughout the research design, organization, development, completion and exploitation, in order for the researcher to be updated with the advances in the field, as well as with the new provisions laid down in the curriculum-related documents and be able to list the issues that have been solved and those that have not been satisfactorily solved yet.

We consider that the value of information mining is secured not only by rigour, careful use of the sources, faithfulness in their citation, but also by the ability to detach from them, through a critical and creative approach.

#### 4. Research methodology

The empirical research that we carried out aimed to establish the importance and the requirements of information mining, as a stage of research preparation and design by pre-service teachers.

The **objectives** of the research were:

1. Identification of the students' opinion regarding the specificity of information mining in the research carried out in the educational field;
2. Identification of their preferences regarding the sources, based on review, from the perspective of the advantages and disadvantages of each category;
3. Awareness of the difficulties that the students face in information mining.

The whole process underpinned the identification of the truth value of two hypotheses:

1. *The application of rigorous selection criteria for sources, regardless of their type, is essential for the information mining quality.*
2. *Performing the review of the sources underlies original research.*

We used two **research methods** in order to achieve the above mentioned objectives and validate the two hypotheses. These were the questionnaire-based survey and the focus-group interview, the appropriate instruments being the survey and the interview guide.

##### *Tool overview*

The opinion questionnaire aimed to investigate the opinion of the subjects on the essential aspects of information mining, addressed in the broader context of research preparation and designing in the educational field.

In terms of structure, it included, in addition to the factual data, 10 items, which fall in both the category of closed questions, but also semi-open or open ones. Students were asked to choose a variant, considered to be the closest to their opinion, but they also had multiple choice items. Also, some items allowed the students to express their opinion freely, wording their answer.

From the point of view of the content, the items of the questionnaire were concerned mainly with aspects related to the preferences of the students for certain categories of sources, the application of the selection criteria, the difficulties encountered in this case, the necessity of undertaking the review of the sources or of their citation. in accordance with the rules in force.

The interview guide included 7 questions oriented, in particular, to the ethical issue of selecting and indicating the sources, and to the obligation of not copying certain ideas, concepts instead of analysing and filtering them, based on the student's reasoning and subjectivity.

The sample consisted of 80 Master's students in the first year at the Faculty of Letters, University of Craiova, who filled in the opinion questionnaire. Out of the 80 students, 20 also participated in the interview.

## **5. Results and discussions**

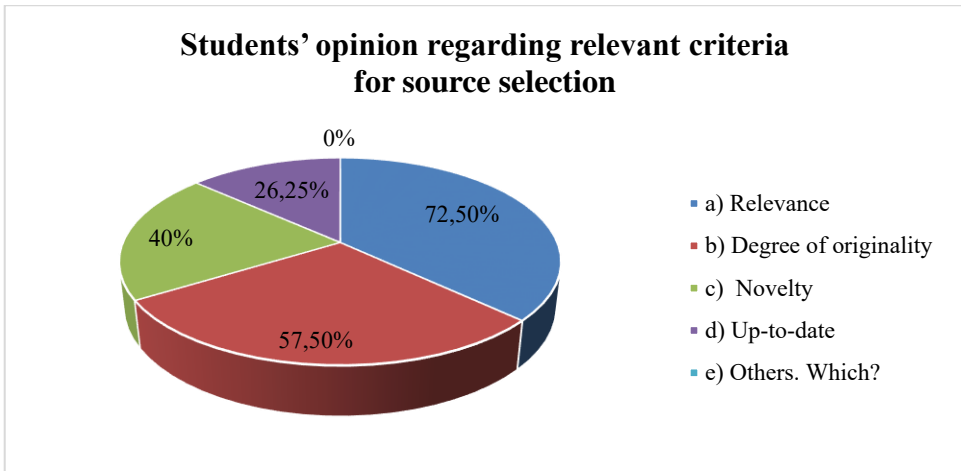
The research methods and tools were fully exploited in our investigation to ensure the achievement of the purpose and objectives and establish the truth value of the hypotheses.

Thus, for the first of the hypotheses already mentioned (*The application of rigorous selection criteria for sources, regardless of their type, is essential for the information mining quality*), we used the data collected from the answers to some of the items of the administered opinion questionnaire (respectively items 1, 2, 3, 4, 5, 10), and for the second hypothesis (*Performing the review of the sources underlies original research*) - the answers recorded for the other items of the questionnaire (6, 7, 8, 9), as well as those recorded during the focus group interview.

We present, for a start, the results that allowed the validation of the first hypothesis.

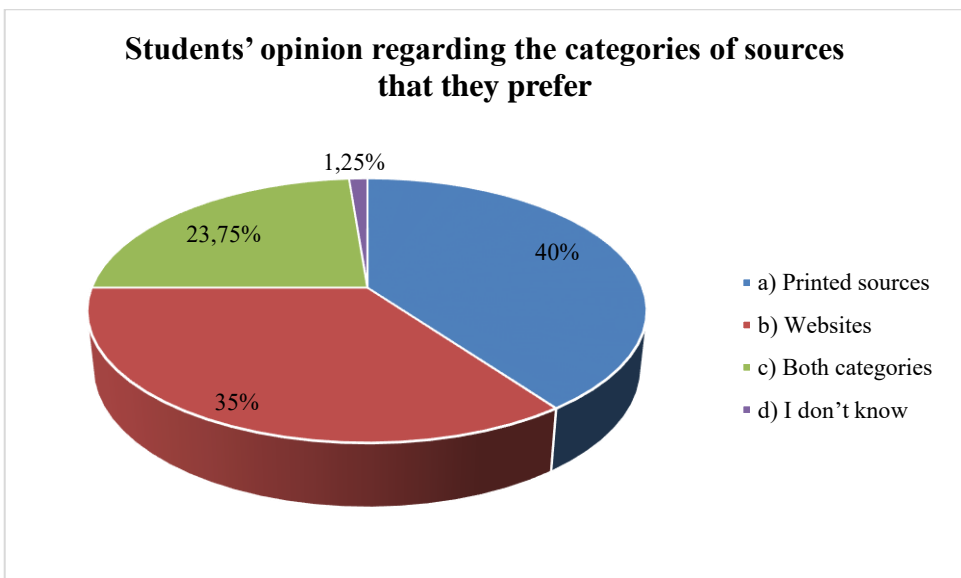
Thus, regarding the students' opinion on the importance of information, in the general context of designing pedagogical research (item 1), they unanimously considered that this is very important.

Chart 1 shows the results recorded in item 2 of the questionnaire (with multiple choice), regarding the criteria that students consider important in selecting the sources.



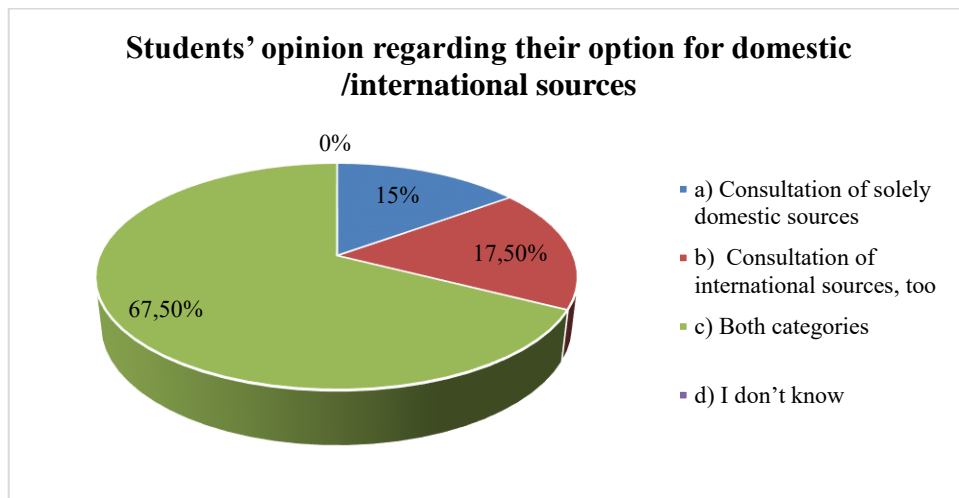
**Figure no. 1. Students' opinion regarding relevant criteria for source selection**

As far as the categories of sources are concerned, the answers of the students show that the balance inclines towards the printed sources, although a significant percentage was recorded for the variants regarding the electronic sources or both categories (see Chart 2).



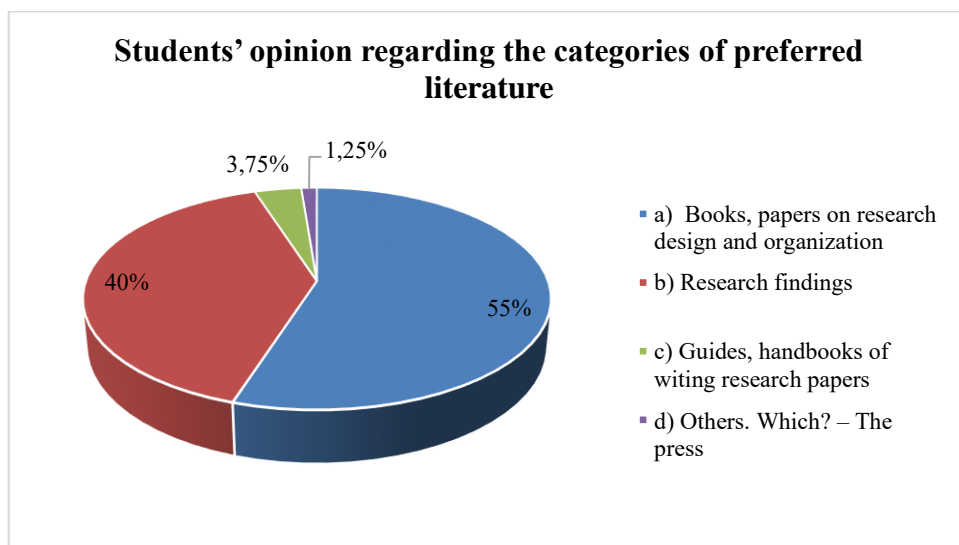
**Figure no. 2. Students' opinion regarding the categories of sources that they prefer**

The majority of the students believe that both domestic and international sources should be consulted in order to design and conduct research (see Chart 3).



**Figure no. 3. Students' opinion regarding their option for domestic /international sources**

Furthermore, in relation to the types of sources that students consider important in the information mining process, they preferred the variant regarding books, theoretical studies regarding the design and organization of a research, although close percentages also recorded for the other answer variants (see Chart 4).



**Figure no. 4. Students' opinion regarding the categories of preferred literature**



In order to establish the truth value of the second hypothesis, we validated, as mentioned above, the answers of items 6, 7, 8, 9, as well as those given in the group interview.

Items 6 and 7 were with open answers, aiming to spot the difficulties and advantages of using the sources.

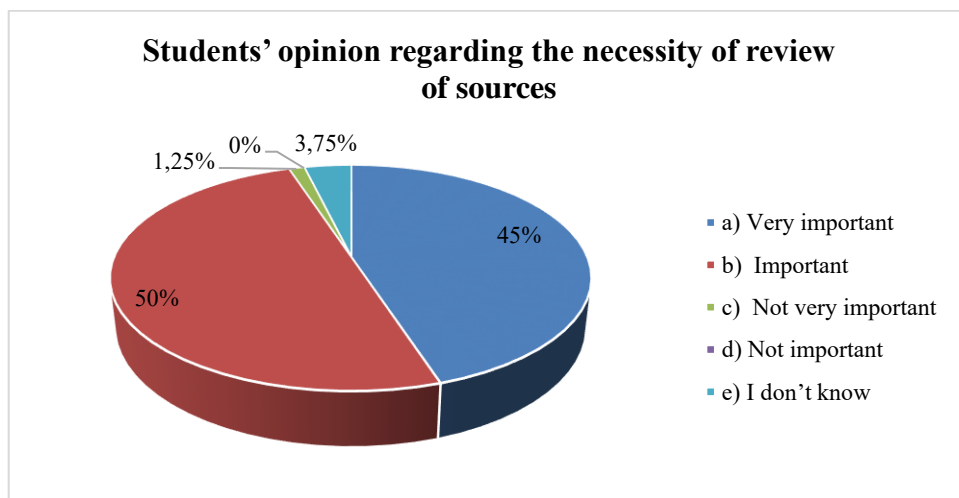
Among the difficulties identified by the students, we mention:

- Shortage of sources on certain topics of interest;
- Checking the reliability of the sources;
- The amount of time required for consultation;
- The inconvenience of consulting some sources in printed format;
- Limited access to certain electronic sources (requiring passwords or paying access fees);
- Viability, sometimes short-term, of electronic sources;
- The need for Internet access in the case of electronic sources.

The Master's students also mentioned the advantages of rigorous information mining:

- The correct design of the research;
- The multitude of perspectives for interpreting the accessed information;
- Research rigour;
- Research consistency;
- The accuracy of the knowledge used;
- Opens up new horizons;
- The originality of research.

Regarding the need for the review of the sources (item 8), the students' opinions were divided on the first two answer variants, as it can be seen in Chart 5.



**Figure no. 5. Students' opinion regarding the necessity of review of sources**

Also, most of the students surveyed consider that citing the sources is very important.

The focus-group interview was also oriented towards gathering information about the students' opinion regarding the specificity of information mining, the principles, criteria, conditions of its performance, and the ethics of research to be complied with.

The answers given by the 20 participants in the interview, generally validated the conclusions drawn by administering the questionnaire, and pointed out to highly specific aspects regarding this essential stage of pedagogical research.

We were particularly interested in the opinions related to adapting the criteria for the selection of sources to the specific field / specialization to which the students from the target group belong, as well as their use and citation.

Above all, as it turned out from the questionnaire, students prefer printed sources, as opposed to electronic ones, although they recognize the convenience of accessing electronic materials.

Also, differences in the way of citing the sources appear, students applying in a less rigorous way the criterion of correspondence between the sources cited in the paper and those mentioned in the bibliography section.

Last but not least, the students mentioned the need to approach the topic in an original way, not only in terms of content, but also with reference to the structure and layout of educational research design and carrying out. All these aspects can be explained by the specific training of students (in the fields of philology, music, acting).

## **6. Conclusions**

The results of our investigation validate the working hypotheses regarding the importance of information mining in the general context of pedagogical research design. The Master's students are familiar with the criteria of selection and accurate use of the sources, being able to identify, at the same time, the advantages and the limitations of each category. The tools applied showed a slight preference for the printed sources, which can be explained by the specificity of the field and the specializations of the students included in the sample.

To our mind, the difficulties that the students encounter in carrying out rigorous information mining, are due, in particular, to the lack of experience in the field of theoretical and applied educational research. The empirical, simplistic approach, sometimes, the difficulty in achieving generalizations, of going beyond concrete situations and particular cases, but also of substantiating, exemplifying ideas, theories with a high degree of generalization and abstraction can be possible causes of the barriers that the Master's students experience when thinking critically and anticipating.

With strict reference to the information mining activity, we noticed, in particular, the students' fears regarding the relevance of the selection criteria for the sources, which must be applied for accurate and rigorous information mining, as well as the difficulty (in some cases, even the impossibility) of the review of the sources,

of carrying out analyses that would allow them to identify successful and less successful aspects of approaching the topic, insufficiently clarified, explained, developed issues that could be the starting point of their own scientific investigation.

Despite these reported difficulties, we believe that exposure to research and concrete situations of research projects design can contribute to the development of the specific competences of the prospective (pre-service) teachers so as to achieve solid, relevant, rigorous information mining.

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