

VOL V

# Educação:

*Saberes em  
Movimento,  
Saberes que  
Movimentam*

*Teresa Margarida Loureiro Cardoso*  
(organizadora)

 EDITORA  
ARTEMIS  
2023

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## APRESENTAÇÃO

Neste volume V da *Educação: Saberes em Movimento, Saberes que Movimentam*, o convite à leitura é feito por meio de uma proposta de viagem com paragens, ou, no mínimo com passagens, por locais mais estreitos, ou, pelo contrário, mais alargados. Dito de outro modo, já não em sentido figurado, lanço o desafio de percorrer temas quer de âmbito circunscrito, por exemplo, em torno de áreas científicas, como a matemática, quer, pelo contrário, o desafio de percorrer temas de âmbito mais amplo, conforme ilustra, desde logo, entre outras, a reflexão sobre problemas e tendências na educação contemporânea, precisamente por onde se inicia este livro.

Tomando-o como sugestão de partida para o seu movimento de leitura, por entre *Educação* e *Saberes*, irá (re)encontrar preocupações e princípios comuns aos anteriores volumes, e a outras obras de referência, incluindo recomendações da UNESCO, nomeadamente a qualidade e a inovação, essenciais ao desenvolvimento integral do ser humano, numa era, que alguns designam de pós-digital, na qual outras inteligências têm vindo a adquirir mais tempos e mais espaços.

E porque desejo que “Venham Mais Cinco”<sup>1</sup> volumes da *Educação: Saberes em Movimento, Saberes que Movimentam*, endereço o repto “Traz Outro Amigo Também”<sup>1</sup> para esta e as próximas viagens-leituras!

25 de julho de 2023

Teresa Cardoso

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<sup>1</sup> Nota: alusão direta a duas músicas de José Afonso, responsável por uma rara rutura de “inovação e genialidade” em Portugal. Cf. por exemplo <https://altamont.pt/jose-afonso-venham-mais-cinco/> e <https://altamont.pt/jose-afonso-traz-outro-amigo-tambem-1970/>. Acesso em: 25 jul. 2023.

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# CAPÍTULO 6

## THE USE OF THE INTERNET BY PRESERVICE MATHEMATICS TEACHERS

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**ABSTRACT:** The objective of this study is to examine how pre-service mathematics teachers utilize the Internet when preparing teaching sequences. Using the documentational approach to didactics, this research aims to identify the factors that shape the selection of Internet resources by preservice mathematics teachers during the preparation phase of teaching sequences. The study reveals that various external and internal factors play a role in influencing their choices. It highlights the importance of incorporating a training module on the Internet usage for teaching sequence preparation within the teacher education curriculum.

**KEYWORDS:** Internet. Preservice mathematics teachers. Resources.

## USO DA INTERNET POR CANDIDATOS A PROFESSOR DE MATEMÁTICA

**RESUMO:** O objetivo deste estudo é examinar como os professores de matemática em formação utilizam a Internet ao preparar sequências de ensino. Utilizando a abordagem documentacional para a didática, esta pesquisa busca identificar os fatores que moldam a seleção de recursos da Internet pelos futuros professores de matemática durante a fase de preparação das sequências de ensino. O estudo revela que diversos fatores externos e internos desempenham um papel na influência de suas escolhas. Destaca-se a importância de incorporar um módulo de treinamento sobre o uso da Internet para a preparação de sequências de ensino no currículo de formação de professores.

**PALAVRAS-CHAVE:** Internet. Professores de matemática em formação. Recursos.

### 1 INTRODUCTION

“We are incomplete without the Internet!”. Although this sentence may seem an exaggeration at first glance, let's imagine a situation where our connection to the Internet is either temporarily or permanently severed. For instance, when writing an article, we won't be able to copy and paste the parts we like from the numerous windows we open while

sitting in our chairs; instead, we would have to go to a library, like in the pre-internet era, and settle for photocopying a few pages from the limited resources available. We would need to call our mother to ask for guidance on how to cook a dish we can't remember how to make. And if we wanted to learn about a topic that we're unfamiliar with, we would have to do with the encyclopaedic volumes in our bookshelf. We wouldn't be able to send emails, listen to any music we desire instantly, or engage in online shopping, and so on. Whether we are aware of it or not, the Internet has become an integral part of our personal and professional lives today.

In today's world, the Internet is also considered an essential component of education and instruction (Safarova, 2023). The utilization of digital Internet technologies and electronic educational resources in the educational process has been proven to have beneficial outcomes, as evidenced by the experience gained from the digitalization of education and pedagogical research. These tools enhance the efficiency of learning, streamline the search for information, foster motivation and interest in the subject, facilitate independent work, serve as an optimal method for reaching a large audience, and effectively clarify new information (Kryvorot & Pryhodii, 2022). Indeed, it is crucial for educators to possess the capability to arrange cognitive tasks by leveraging contemporary digital Internet technologies and consistently enhance their digital skills. This proficiency enables them to utilize electronic educational resources proficiently, conduct efficient searches, make logical selections, systematize educational materials, and effectively administer a high-quality educational process (Kartashova, Plish, & Bakhmat, 2018).

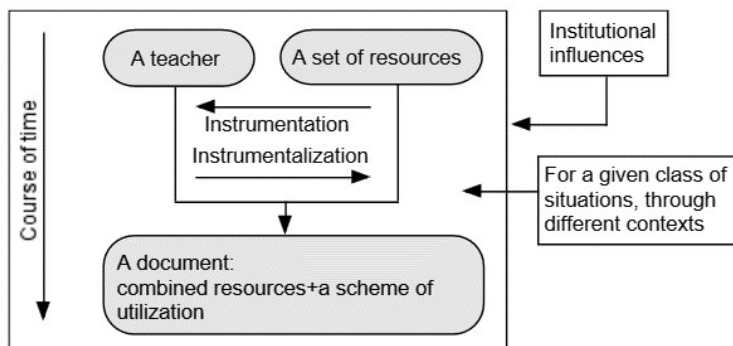
In the realm of mathematics education, the instructor plays a pivotal part as a facilitator. They assume the responsibility of structuring the learning environment and guiding students in their knowledge construction. In pursuit of this objective, the teacher arranges and employs various resources. These resources encompass curricular aids such as books, software, and websites, as well as interactions with colleagues and students, as highlighted by Gueudet & Trouche (2010). These interactions serve as fundamental assets for the teacher's instructional endeavours. In many contexts, each subject at every educational level possesses a shared resource, which is the curriculum. In addition to this, there exists a didactic collection comprising student textbooks, teacher guides or instructional materials, as well as various media like CDs, posters, and objects. Recent research and investigations primarily concentrate on the analysis of textbooks and the instructional practices of teachers. However, it is crucial to acknowledge that a teacher who designs a teaching module does not solely rely on textbooks. They also incorporate other written or digital resources, their own representations, their instructional experiences, their social attributes, and their approaches to classroom or time management.

In light of this viewpoint, it becomes significant to consider the documentational approach put forth by Gueudet and Trouche (2008) as a means to examine the coordination and relationship among the various resources employed by a teacher when designing a teaching sequence. The documentational approach serves as a fundamental aspect of teacher research, as it offers insights into understanding how a teacher structures, implements, modifies, and adapts their teaching practices.

The documentational approach is centred around examining the primary work of teachers, which is their documentation work. This encompasses all the activities in which teachers engage with resources, such as conducting research, making connections, designing materials, sharing their work, and revising their materials. Through these interactions, teachers create “documents” that bring together a combination of resources and utilization schemes, infused with their experience and professional knowledge. Therefore, according to Gueudet and Trouche (2011), a document comprises of recombined resources and utilization schemes.

The process of creating documents, referred to as documentational genesis, involves the integration of tools and instruments, and is sensitive to the specific context and modes of activity (Figure 1).

Figure 1. Schematic representation of a documentational genesis (Gueudet & Trouche, 2010).



Within the context of documentational genesis, there are two simultaneous processes: instrumentation and instrumentalization. The instrumentalization process involves the teacher’s appropriation and adaptation of resources, guided by their own knowledge. The way in which the resources are modified and combined is determined by the teacher’s expertise. On the other hand, the instrumentation process refers to how the resources influence and shape the teacher’s activity.

This research focuses specifically on the resources related to the use of the Internet among the various resources available to teachers, such as textbooks and

materials. Gueudet (2012) states that there is a wide range of digital resources available to teachers, and this availability brings about significant changes in their work and professional development. The Internet, being both omnipresent and a mediator of knowledge, plays a crucial role in the documentation process (Gueudet & Trouche, 2011). Therefore, it is essential to examine the use of the Internet by pre-service mathematics teachers for didactic purposes. It is worth noting that the Internet is complex and heterogeneous, with varying quality of contents. Its richness and complexity stem from the fact that it encompasses both resources and tools and is an ever-evolving collaborative platform, with teachers contributing to its enrichment.

Considering the Internet as a resource within the documentational approach, we recognize that future teachers need to possess the ability to develop sophisticated utilization strategies to ensure its effective and tailored usage aligned with learning objectives and the target audience. In line with this perspective, our research aims to investigate the utilization of the Internet by pre-service mathematics teachers during the preparation phase of teaching sequences.

## 2 METHODOLOGY

This qualitative research was designed as a case study. Case studies are a method in which one or more events, environments, programs, social groups, and interconnected systems are examined in detail (Yin, 2014). The research was carried out with 50 preservice mathematics teachers studying at the education faculty of a public university in western Turkey. The participants in the research were selected by convenience sampling method based on the voluntary to participate. Participants were asked to create a teaching sequence for a specific subject. The data collection process involved conducting semi-structured interviews with all 50 participants. These interviews comprised eight questions that required “yes” or “no” responses, along with justifications. The interviews were recorded and subsequently transcribed into a written format. The collected data were analysed using the descriptive analysis method.

## 3 FINDINGS AND RESULTS

In this section, the findings and results obtained from the semi-structured interviews are presented according to the objective of the research which was to examine the factors that impact the selection of internet resources when preparing a teaching sequence.

The analyses of pre-service teachers' responses to the interview questions concerning the place of Internet in their teaching sequences development process is given in Table 1.

Table 1: Answers of the pre-service teachers to the interview questions.

To develop the teaching sequence,	Yes (%)	No (%)
Did you use the internet?	94	6
The following percentages are based on the 94% of preservice teachers using the Internet: n = 47		
Did you consult a forum or a discussion group?	63,8	36,2
Did you post on a forum or a discussion group?	0	100
Did you visit a web hosting website (YouTube, Daily motion etc.)?	55,3	44,7
Did you use a search engine (Google, Yandex etc.)?	100	0
Did you use the site of a publisher?	2,1	97,9
Did you use a resource pooling site (smart exchange, cabri exchange etc.)?	95,7	4,3
Did you use the e-mail services?	2,1	97,9

According to the findings presented in Table 1, a significant majority (94%) of preservice teachers utilised the Internet when preparing their teaching sequence, primarily relying on resource pooling sites. It was observed that many of them consulted online forums or discussion groups, although none of them actively participated by posting. Around half of the preservice teachers made use of video hosting websites, while very few preservice teachers utilized email communication tools or publisher sites. To gain deeper insights into the preservice teachers' responses, the justifications provided by them were analysed. The analysis of the preservice teachers' statements revealed that the Internet is considered an essential resource by nearly all of them during the preparation of their teaching sequence. The expression of PST34 is given as an example for the consideration of Internet as an essential resource:

*"PST34: I did not have a lot of books in my hands ... In addition, I thought that I could find everything on the internet ... Is not that the case ..."*

However, it is worth noting that three preservice teachers who did not use the internet expressed a preference for using traditional paper-based resources. This phenomenon can be interpreted as a form of instrumentalization, where the trainee

teacher selectively rejects certain resources that do not align with their accustomed habits and established schemes.

E-mail usage was significantly limited among the preservice teachers. This could be attributed to the asynchronous nature of this communication method, suggesting that teachers either expected immediate feedback or lacked the expertise to seek assistance via e-mail. This observation indicates a reluctance to utilise e-mail as a resource, stemming from external factors such as the availability of more suitable recipients and internal factors related to a preference for synchronous communication channels like the telephone, which offer more immediate responses.

It is noteworthy that all the preservice teachers made use of a search engine, which was an anticipated finding considering that most web browsers have a search engine as their default homepage and the browser address bar can also function as a search engine. The justification provided by the preservice teacher PST7 regarding this aspect is given as an example as follows:

*“PST7: Why I used Google ... why ... how can I look for something on the internet otherwise?”*

It can be inferred that there is a recurring scheme, as indicated by the following operational invariant: Whenever there is a need to search for information on the internet, the use of a search engine becomes necessary.

Furthermore, despite the fact that all the preservice teachers utilised the Google search engine, the issue of “wandering” during the research process was frequently mentioned. An example of statements composed by the preservice teacher PST35 that illustrates this phenomenon is:

*“PST35: .... indeed, you said that it must be constructivist, there is not really any constructivist example on the internet ... anyway I could not find but yet I searched for a week ... I tried to do with what I could.”*

In PST35’s statement, two factors are observed. Firstly, the influence of the institution, represented by the professor who assigned the task of preparing teaching sequence. It is crucial for the task to meet the professor’s expectations, specifically in terms of adopting a constructivist approach. Secondly, internal factors come into play, indicating that the preservice teacher lacks the necessary skills to conduct effective keyword research and organize information effectively. Other preservice teachers have also expressed difficulties in finding online video resources that are both professional and align with the constructivist approach.

The preservice teachers provided various justifications for their non-participation in forums or discussion groups, with a unanimous consensus that their lack

of motivation was primarily due to the cumbersome registration process. Additionally, they expressed concerns about being judged or evaluated by others. Based on their statements, it appears that many of them perceive discussion groups as exclusive spaces for experienced teachers. The following excerpt from a conversation serves as an illustration of this phenomenon.

*“PST6: Ah yes... the page of teachers of mathematics in Facebook... I feel like there are only teachers who write, I thought it would have been stupid... indeed I do not know... once I had read on a page, a student had written a post... the teachers on the page had answered him by saying why you do not do your homework yourself, you wait for the answer from us without doing any research, things like that... since that... indeed it is, they would have written same for me also, not? ...*

*Researcher: Do you think they are right?*

*PST6: Yes, indeed they may be right... in the end this homework is given to us to do research ourselves.”*

In these instances, there is a clear rejection of an internet resource due to internal factors, particularly related to motivation and preconceived fears influenced by personal experiences.

Several preservice teachers raised concerns about the high data consumption of YouTube videos, even when viewed in low quality, particularly when using a mobile network. In this case, it is important to highlight the presence of an external economic factor that impacts their resource selection.

## 4 CONCLUSION

One of the significant findings from this study pertains to the limited effectiveness of search engine resources in the context of preparing teaching sequences by pre-service teachers. This observation can be attributed to their lack of proficiency in conducting keyword-based research and appropriately organizing the gathered information. The knowledge and deficiencies of future teachers play a significant role in shaping the instrumentalization process.

Additionally, it is worth noting the influential role of the institutional context in shaping the usage schemes of the Internet for teaching sequence preparation. As future teachers simultaneously hold the status of students in a faculty of education with a strong emphasis on technological training, the demands and expectations of the institution and professors strongly influence the characteristics of their teaching preparations, including the integration of ICTs and constructivist approaches.



Another noteworthy conclusion is that the acceptance or rejection of a resource during the documentational genesis process by trainee teachers is influenced by both external and internal factors. Developing appropriate utilization schemes for the diverse resources available on the Internet is not a straightforward task. Therefore, teacher training programs need to prioritize the development of competencies in this area.

This research emphasizes the need to address the limited effectiveness of search engine resources, the influence of institutional context, and the importance of teacher training in utilizing Internet resources effectively for teaching sequence preparation. These insights highlight the complexities and challenges associated with the integration of digital resources in educational contexts.

## REFERENCES

Gueudet, G., & Trouche, L. (2010). Des ressources aux documents, travail du professeur et genèses documentaires, In G. Gueudet, & L. Trouche (dir.), *Ressources vives. Le travail documentaire des professeurs en mathématiques* (pp. 57-74). Presses Universitaires de Rennes et INRP.

Gueudet, G., & Trouche, L. (2011). Développement de l'Internet dans l'enseignement : vers un essor du collectif ? In C. Develotte, & F. Poyet, *L'éducation à l'heure du numérique, état des lieux, enjeux et perspectives* (pp. 145-165). Lyon: INRP-ENSL.

Gueudet, G. (2012) Ressources et documents dans l'enseignement: le cas des mathématiques, *Séminaire GRCDI (Groupe de Recherche sur la Culture et la Didactique de l'Information)*, Rennes.

Kartashova, L., Bakhmat, N. & Plish, I. (2018). Development of teacher's digital competency in terms of information and educational environment of a secondary education establishment. *Informational technologies and learning tools*, 68(6), 193–205. <https://doi.org/10.33407/itlt.v68i6.2543>.

Kryvorot, T., & Pryhodii, M. (2022). Training of pedagogical workers for the use of digital internet technologies in the educational process. *Professional Pedagogics*, (1), 33-41.

Safarova, F. I. (2023). Efficiency of internet technologies in English classes. *Educational Research in Universal Sciences*, 2(1), 48-53.

Yin, R. K. (2014). *Case study research: Design and methods* (5th ed.). Sage.

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