Acta Scientiarum

http://periodicos.uem.br/ojs/acta
ISSN Online: 2178-5201
Doi: 10.4025 / actascieduc.v40i1.37198

TEACHER TRAINING

The relationship between continuing education and technological resources from the perspective of higher education professors

Alexandra Ferreira Martins Ribeiro[1*] and Alboni Marisa Dudeque Pianovski Vieira[2]

*[1]Pontifical Catholic University of Paraná, Rua Imaculada Conceição, 1155, 80215-901, Prado Velho, Curitiba, Paraná, Brazil. [2]Graduate Program in Education, Pontifical Catholic University of Paraná, Curitiba, Paraná, Brazil. *Author for correspondence. E-mail: alexandrafmribeiro@gmail.com*

RESUMO. O olhar deste estudo voltou-se às autobiografias dos professores das 'licenciaturas de matemática' das instituições de ensino superior de caráter privado em Curitiba. A pesquisa teve como objetivo geral investigar sua percepção acerca da relação entre a formação continuada e os recursos tecnológicos e desdobrou-se nos seguintes objetivos: analisar as percepções docentes acerca do uso dos recursos tecnológicos na formação continuada e examinar como os docentes compreendem sua aplicação na relação entre professor e aluno no processo de ensino e aprendizagem. A metodologia utilizada é de caráter bibliográfico com pesquisa de campo, contando com os estudos de Brito e Purificação (2011), Rasco e Recio (2013), Gimeno Sacristán (2013), Tardif (2014) e Kenski (2015). Na pesquisa de campo, utilizaram-se os procedimentos teórico-metodológicos da História Oral para a realização das sete entrevistas feitas com os docentes que atuavam nas 'licenciaturas de matemática' em Curitiba. Verificou-se que eles percebem as possibilidades e os desafios do uso dos recursos tecnológicos tanto na formação continuada, quanto na relação entre professor e aluno. Dentre as possibilidades, a formação continuada em tempos e espaços flexíveis; dentre os desafios, acompanhar a rapidez das inovações e sua aplicação em sala de aula.

Palavras-chave: percepção docente, licenciatura de matemática, autobiografias.

Relação entre a formação continuada e os recursos tecnológicos, na percepção de professores da educação superior

ABSTRACT. This study examined the autobiographies of professors of mathematics courses at private higher education institutions in Curitiba. The main objective of the research was to investigate professors' perceptions of the relationship between continuing education and technological resources and for the following specific objectives: to analyze professors' perceptions of the use of technological resources in continuing education and to examine how professors understand the use of such technologies in the relationship between professor and student in the teaching-learning process. The methodology used was a bibliographical and field research, relying on the theoretical framework studies of Brito and Purificação (2011), Rasco and Recio (2013), Gimeno Sacristán (2013), Tardif (2014), and Kenski (2015). As far as field research is concerned, the theoretical-methodological procedures of oral history were used when conducting interviews with seven professors who work in mathematics programs in Curitiba. We assessed the professors as perceiving possibilities and challenges in using technological resources in continuing education and considered the relationship between professor and student. Among the possibilities, continuing education in flexible times and spaces; among the challenges, monitoring the speed of innovations and their applications in the classroom.

Keywords: professor perception, degree in mathematics, autobiographies.

Relación entre la formación continuada y los recursos tecnológicos, en la percepción de profesores de la educación superior

RESUMEN. La perspectiva de este estudio se dirigió a las autobiografías de los profesores de las 'licenciaturas en matemáticas' de las instituciones de enseñanza superior de carácter privado en Curitiba. La investigación tuvo como objetivo general investigar su percepción acerca de la relación entre la formación continuada y los recursos tecnológicos y se dividió en los siguientes objetivos: analizar las percepciones docentes acerca del uso de los recursos tecnológicos en la formación continuada y examinar cómo los docentes comprenden su aplicación en la relación entre profesor y alumno en el proceso de enseñanza y aprendizaje. La metodología utilizada es de carácter bibliográfico con investigación de campo, contando con los estudios de Brito y Purificação (2011), Rasco y Recio (2013), Gimeno Sacristán (2013), Tardif (2014) y

Kenski (2015). En la investigación de campo, fueron utilizados los procedimientos teórico-metodológicos de la Historia Oral para la realización de las siete entrevistas hechas con los docentes que actuaban en las 'licenciaturas en matemáticas' en Curitiba. Se verificó que ellos perciben las posibilidades y los desafíos del uso de los recursos tecnológicos tanto en la formación continuada, como en la relación entre profesor y alumno. Entre las posibilidades, la formación continuada en tiempos y espacios flexibles; entre los desafíos, acompañar la rapidez de las innovaciones y su aplicación en clase.

Palabras-clave: percepción docente, licenciatura en matemáticas, autobiografias.

Introduction

Although human beings are in constant contact with technology and have accumulated knowledge on how to act and interact with the resources available to achieve their goals, the beginning of the twenty-first century was marked by the introduction of several tools, materials, objects, and devices that have changed the way people interact with each other, learn, work, and live. Professors in turn use the knowledge acquired in their initial and continuing education to achieve specific educational goals. Several changes in their relationship with the environment have also impacted teaching practices. Purificação and Pessoa (2015) demonstrated that training courses cannot always keep pace with technological innovations and that the use of digital technologies by students has created dilemmas in daily teaching. Fombona, Vázquez-Cano, and Reis-Jorge (2016) in turn demonstrated that problems involving technological resources at universities impact teaching practices. Nóvoa (1992) and Goodson (1992), analyzing autobiographies of professors, found that not all professionals experience career dilemmas in the same way; thus, when faced with challenges and possibilities arising from technological resources, while some professionals are more resistant to innovations, others seek to diversify their practices in the classroom.

Thus, the main objective of this study was to investigate the perception of professors of the relationship between continuing education and technological resources by listening to their life stories. Specific objectives of the study include the following: To analyze professors' perceptions of the use of technological resources in continuing education, and identify how they perceive the use of technologies in the relationship between professor and student in the teaching-learning process.

We used literature review and field research methodologies within the theoretical framework of Brito and Purificação (2011), Rasco and Recio (2013), Gimeno Sacristán (2013), Tardif (2014), and Kenski (2015). For data collection, this study followed the theoretical and methodological procedures of oral history when conducting seven interviews with professors of 'licentiate degree courses in mathematics' at private higher education institutions in Curitiba.

Listening to life histories of professors is important, since "[...] the narratives of the subjects that are part of the history studied enrich the investigative process, allowing us to understand the policies, ideologies, and practices of the past and present" (Vieira, 2013, p. 72). According to Coelho, Morales, and Vogt (2016), learning the perceptions of professors on topics related to technology and science is relevant, as they play an important role in opinion formation and aid in the emergence of critical citizens. Thus, by listening to and analyzing the life histories of the professors, it was possible to identify these perceptions and relate them to the theoretical framework.

Methodology

The narratives obtained using the oral history methodology show us that in the memories expressed in the reports of the professors who experienced educational issues, it is possible to find information that no other document can provide. In this section the details of the methodology, such as selection of participants, development of the script of questions, application of the technique, conduct of interviews, and processing and analysis of the data, are briefly described.

Common features provide some homogeneity to the sample and imply more reliable results (Goodson, 1992). Thus, the following sampling criteria were established to homogenize the participants: being a professor of undergraduate mathematics courses at a private higher education institution in the city of Curitiba and having a teaching credential or bachelor's degree in Mathematics. Our research focused only private institutions since the main project already considers public ones.

The MEC website was used to search for participants. We looked for private higher education institutions (Ipes) in the city of Curitiba that offered licentiate degree courses in mathematics in 2015. This search found three institutions. Subsequently, professors' names were searched on the website of

each institution. Once we collected their names, we used the Lattes Platform (CNPq) to select those who met our criteria. Of the 13 eligible professors invited, seven agreed to be interviewed. Given the qualitative nature of this study, the number of participants, which exceeds 50% of all those eligible, was satisfactory for the intended purpose. The confidentiality of the professors was maintained by replacing their names with the letter M and a unique number for each.

Following the recommendations of Alberti (2004) and taking the participation of the interviewees in the selected theme as a priority, the interviews were thematic and semi-structured. To this end, a flexible script of questions was developed to guide the interviews according to the professional trajectory expressed in the *Curriculum Lattes* of the professors. After the professor agreed to participate and signed the Informed Consent Form, the "[...] document necessary for the onset of the interview in which the interviewee grants interview rights to the program" (Alberti, 2004, p. 88), the interviews were digitally recorded in a quiet environment, their workspace, to ensure good sound quality and with the expectation that the room could trigger professors' memories.

When analyzing the reports, it was observed that the terms 'technology,' 'technological resources,' and 'challenge' constantly appear in the professors' narratives, showing the need to investigate the relationship between these factors and the continuing education of the professors. The interviews were analyzed using the content analysis technique proposed by Bardin (2011), which prioritizes the practical, systemic, and quantitative presentation of the data, providing a better understanding of the results. For the quantitative interpretation of the narratives, they were divided into two categories: continuing education and its relation to technological resources in education, and technological resources and the relationship between professor and students. These categories are further explained in the article.

Considerations on educational technologies

Although the term 'technology' is widely used in everyday life, there is little concern paid to its historical and sociological framework, which leads to erroneous or incomplete definitions of the term. In its common sense, the term is associated with computer science or robotics; in general, to "[...] activities related to the production of material goods considered to be cutting-edge and highly developed [...]" (Silva & Silva, 2014, p. 386); and the possibilities provided by these materialized products. In this sense, the meaning is also associated with the range of resources available in the network. The understanding of the term, therefore, is restricted to the idea of product or inorganic matter. Another misconception is the erroneous attribution of the same meanings to the terms 'technology, technique', and 'science', disregarding the fact that each of these names a different epistemological concept.

Since the 1940s, the term 'technology' has been interpreted in the scientific community as the way in which people undertake activities, and is now defined as "[...] a set of specific pieces of knowledge accumulated throughout history on the several ways of using physical environments and their material resources for the benefit of human beings" (Silva & Silva, 2014, p. 386). Concerning the terms 'science' and 'technology', Silva and Silva (2014) stated that while science is associated with theoretical and abstract knowledge aimed at achieving a specific goal, technique consists of the practices and efforts to manipulate and benefit from the available means by habits and instruments that allow the attainment of an expected goal. In this sense, technology is the accumulated knowledge of how to do something or interact with the environment; technique is how this knowledge is put into practice and adapted; and science is the set of theories developed from the knowledge arising from technique and technology. Despite having different referents, the three concepts are interconnected, as they relate to man's knowledge of how to act and interact with the environment.

It is worth highlighting the definitions attributed to the terms 'knowledge' and 'information' by Gimeno Sacristán (2013), according to whom 'knowledge' and 'to know' refer to "[...] processes or internal activities of elaboration or transformation of data, information or knowledge." The term 'knowledge' is also understood as "[...] an elaborated and systematized *corpus* expressed and depersonalized in a written work [...]"; 'information' in turn is "[...] something almost material, a content generated and spread across several means and forms of communication—which is transmitted; it is the codified meaning possessing more information" (Gimeno Sacristán, 2013, p. 164). The author distinguishes between the two terms thus: Information relates mostly to objectified knowledge outside the subjects; it is more fragmented and not necessarily systematized or organized; it can be addressed by machines; some people have more than others; and its existence is independent of the knowing subjects. Knowledge, in turn, relates mostly to internal processes of elaboration of the

subjects and their objectified products; it is related to a specific type and some level of organization, even if only from the point of view of the subject; its elaboration and organization are genuinely human processes, its existence implying the exercise of intellectual actions; some people can undertake this internal activity in a more complex manner than others, considering more or less data, information, and previous knowledge; and without the participation of the subjects, information does not become knowledge for them (Gimeno Sacristán, 2013). Thus, we acknowledge the importance and usefulness of the considerations of this author in conducting our research.

While interacting with the environment and its resources, human beings produce and systematize knowledge, as well as modifying and changing what is considered necessary (Brito & Purificação, 2011). Piva Junior (2013) adds that human beings mostly use their accumulated knowledge to achieve greater efficiency with the aid of tools and machines. In this way, by profiting from experiences and knowledge produced and transmitted over time, man's actions in interaction with the environment cease to be biologically determined.

One way of transmitting and assimilating this knowledge is education. According to Piva Junior (2013), educational technologies are applications of scientific knowledge to solve daily difficulties. Brito and Purificação (2011) add that all technological resources interacting with the school environment and focused on the teaching-learning process are considered educational technology. In this way, educational technologies can be understood both as the means by which knowledge is transmitted and used for the benefit of everyday life, and as the tools used in the mediating process between man and the use of information in order to take advantage of the knowledge produced by humankind.

More broadly, 'pedagogy' is here understood according to the definition proposed by Tardif (2014): "[...] pedagogy is the technology used by professors to deal with the focus of their work, [students] on a daily basis, achieving specific outcomes [socialization and education]." This technology goes beyond tools: "[...] videos, movies, computers, [...]" and specific techniques, "[...] lectures, directed study, socializing teaching-learning procedures, etc." The technology of teaching encompasses "[...] management of the class, students' motivation, professor and student relationships, etc." (Tardif, 2014, pp. 117–119). Pedagogy, or technology, corresponds to the professor's work, since it is how he manages all the factors and uses all means available to interact with his students and achieve the goals of education.

In short, educational technology encompasses how the professor manages material and immaterial means considered relevant to the teaching-learning process. It is how he addresses his pedagogical knowledge of the use of the school space and uses teaching materials, multimedia resources, and other elements in the class to improve education.

Furthermore, it is necessary to consider that society influences professors; therefore, their ways of teaching follow the changes in man's relationship with his environment. According to Rasco and Recio (2013), man's daily life is overloaded with technologies, especially digital communication technologies, which have modified educational spaces and how they were developed over the last two hundred years. Digital technologies are virtual digital spaces that promote:

> [...] action, relationship, interaction, and sharing of representations of human beings are specific and particular to each social group [...]; improving the coordination of actions, [human beings understand actions and assign meanings]. (Backes & Mantovani, 2015, p. 561)

According to Rasco and Recio (2013), the presence of digital technologies in the everyday life of human beings and the high prevalence of active users of technology among students between 14 and 18 years old must be considered constant and inevitable. It should also be noted that people enrolling in university "[...] were raised, live, act, communicate, and learn in a densely digital environment" (Rasco & Recio, 2013, p. 422). Moreover, information dissemination through human interaction with digital technologies occurs abruptly.

Due to the ease and speed of access to information, educational institutions are no longer the most important socio-cultural and cognitive environments for human beings. According to Rasco and Recio (2013), two decades ago people attended universities to acquire the knowledge and basic tools that would allow them to become the professionals of the next generations. In this new context, educational institutions are no longer privileged places for the dissemination and transformation of information and knowledge, as information can be accessed through different means, such as portable devices with Internet access.

The challenges and possibilities arising from the use of digital technologies also affect the development of educational technologies and the methodologies adopted by professors. Among these

challenges are changes in the professor's relationship with their work object, students, and their continuing education. For the purposes of this study, we adopted the broader definition proposed by Gatti (2008, p. 57), which encompasses courses, work hours, meetings, "[...] and everything that can provide an opportunity for information, reflection, discussion, and exchanges favoring professional improvement, from any angle, in any situation."

Students are socialized and individualized human beings; thus, the relationship between professor and students involves "[...] human relations, individual and social at the same time" (Tardif, 2014, p. 129). These relations, imbued with feelings, are individual since students, as unique beings, have unique social capacities, possibilities, and social relationships. As individuals, they suffer countless influences that are beyond the control of the professor.

Tardif (2014) highlights two factors that impact pedagogy. The first is the professor's lack of control over his students' results. The second is the fact that the relationship with students is built through social relations. Thus, pedagogy plays an important role in the management of this interaction, which includes tensions and dilemmas, negotiations and exchange strategies.

A student's way of communicating, informing, and relating to the world influences the management strategies of the professor and the knowledge required in this interaction, which is reflected in the methodologies he adopts. In this sense, professors sometimes seek to improve this relationship with digital technologies. According to Brito and Purificação (2011), when using several technological resources in classroom practice, the professor must know the potential of these tools for each discipline and teach students how to benefit from them during their formation.

Facing new configurations in social relations, it is necessary that educational spaces be aware of the possibilities and challenges of these tools in teaching and learning. In this sense, Brito and Purificação (2011) argue that in both initial and continuing education, the use of technological resources can support professors and their action in class as well as research on their practices.

Professors can, by interacting with their peers using technological resources, seek ways of valuing their experiences and ways of living as well as promote "[...] interdisciplinary methodology, discussing the relationship between professional knowledge, experience, creativity, and critical-scientific reflection on human evolution and technological artifacts" (Brito & Purificação, 2011, p. 14). In this way, for interdisciplinary work, understood as an "[...] exchange of contents and methods between different disciplines, going beyond the segmentation of knowledge promoted by traditional multidisciplinarity [...]" (Silva & Silva, 2014, p. 237), to take place, it is necessary that professors of the most varied fields and localities communicate with each other. Technological tools could promote this mutual exchange of information and knowledge.

Despite the contributions made by technological resources or institutions for professor education, according to Tardif (2014), in the face of the singular features of professors' work and the unique events that happen in the classroom, most professors make decisions and prepare action strategies when they teach right at the moment. In this sense, training courses could contribute new experiences and extend the basic knowledge of the professor, including possibilities of application of such knowledge in their daily life. However, the likelihood of repeating a lived experience in a training course is minimal.

Professors' narratives about technological resources in education

The professors' narratives were analyzed qualitatively and classified into two categories: continuing education and the relationship with technological resources in education; and technological resources and the relationship between professor and students. The first category, 'continuing education and the relationship with technological resources in education,' comprises that part of the reports considering technological resources as enablers in the teaching-learning process or facilitators in interactions with other professors and their practices, as well as promoters of access to information, such as dilemmas and challenges. The second category, 'technological resources and the relationship between professor and students,' in turn focuses on the dilemmas faced by the professors while interacting with their students; possibilities offered by technological resources; challenges of information processing; inequality of information and access by the students; and limitations of these resources.

After defining the categories, it was possible to follow the process by describing and interpreting the narratives. The analysis was based on the theoretical framework but did not disregard the individuality of the participants, promoting an articulated connection between theory and professors' perceptions.

Continuing education and the relationship with technological resources

From the professors' narratives, it was possible to perceive that they understand continuing education as something inseparable from the profession, since "[...] professors can never stop studying; they must always seek improvement" [M5]. One of the reasons for carrying out continuing education is the need to "[...] keep pace with changes in technology" [M2]. In this sense, Rasco and Recio (2013) affirm that due to the progressive and unstoppable technological dissemination common in the daily life of most human beings, it becomes almost impossible to imagine a different attitude on the part of professors. According to Kenski (2015), considering that the role of professors is to prepare other professors for these new scenarios, they should be the first to adopt positions consistent with the educational requirements of today's society. Thus, professors must follow and incorporate technological innovations to implement when training new professors. However, training professors for newly emerging scenarios is not the only reason to adopt new technologies. It is suggested that this attitude aids the professors in maintaining their relevance in a competitive context by allowing them to follow their peers who follow and adopt new technologies.

Professor M3 pointed out that through technological resources it is possible to have access to a list of information that can be transformed into knowledge and skills that he had lacked before. It should be emphasized that access to information does not directly imply continuous education, since each subject appropriates the displayed content uniquely. There must be a process, as explained by Gimeno Sacristán (2013), whereby information that has been appropriated by the subject is later converted into knowledge and then transformed into the contents of intelligible methods. In this process, "[...] the possible appropriation will depend on the information, the subject, and the type of relationship between them" (Gimeno Sacristán, 2013, p. 165). From this perspective, in light of the different possibilities, professors do not all experience continuing education in the same way. For some professors, technology allows them to keep abreast of what is happening in the world, while for others it is a way to deepen their studies, using the scientific knowledge at their disposal. In the case of a professor, both perspectives are highlighted.

The professors commented on the possibilities of continuous training offered by the Internet for several course options, fulfilling the specific needs of each one. M3 reported that he was taking a distance specialization in technology in mathematics teaching and that he had benefited from it in the past to take a postgraduate course and, whenever possible, on-site or distance courses. According to Kenski (2015), distance education in Brazil has become a feasible way to study and learn. Due to the ease of continuing education promoted by technological resources, the search for information on the Internet has now been directed, rationalized, and organized in several places and times precisely because of the interest aroused by professors in distance learning courses. Not only national institutions but also international ones provide quality distance learning courses that can serve the continuing education of professors.

The professors explained that when they feel the need for training not offered by the institution where they work, it is necessary to "[...] access the internet, read books, or access distance courses at the end of the week" [M2]. In this sense, Gimeno Sacristán (2013) clarifies that the use of information that is relevant and coherent with internal needs and that results in useful functionalities can support and improve processes of continuing education. M4 adds, "[...] on Google we search for novelty and to learn how an already dated subject was addressed, considering, however, that other views on the subject may exist. It does not get registered, but we are always doing it, all the time." Such tools, which ease access to information and reduce the time spent searching, allow many possibilities of comparison, enabling professors to deepen their knowledge of specific themes and establish relationships between topics.

The narratives of these professors reflect their actions and a reaction that shows a desire for renewal. Professor M2 explained: "[...] the class has to be renewed," "[...] it is always necessary to prepare a class different from the other." And M3 adds: "[...] the good professor who wants to teach has to look for new methodologies all the time." When technological resources are used, the dynamics of the classroom stimulate the students and motivate the professor to use diversified methodologies.

Technological resources, when used as a support tool, can contribute to continuous education, since, as explained by M2, enabling processes of teaching-learning: "[...] technology allows me, for example, even if I have limited locomotion, to give excellent video lessons." According to Mallmann, Jacques, and Schneider (2015), the knowledge produced by professors and shared on the Internet allows them, among other understandings and didactic

productions, to exchange ideas and experiences from their personal and professional formation. Pedagogical practice in professor activity is facilitated through technological resources used to produce texts collaboratively, debate specific subjects, use Wiki tools, create educational objects, promote chats and forums, and thus provide collaborative learning between the professor and his students.

It was possible to observe in the narratives the professors' concerns about the use of these tools: "We have to be more flexible and follow the changes. Otherwise, we will be swallowed by them over time " [M2]. "The one who is not willing to learn and open his mind to the new technologies ... has died ... it is better for him to take the coffin and lie inside it" [M5]. The narratives reflect the pressures that professors face in response to the need to use and master new technological resources. Even though the narratives of the professors may seem exaggerated, however, they do still reflect the pressures of both students and the institutions for the adoption of new technologies.

These tensions can be analyzed by considering that professors have had mastery of the tools used in the classroom for a long time; however, now even refresher courses are outdated in the face of digital market news. According to Kenski (2015), the educational context is currently one of the largest challenges for this market and, despite the efforts exerted through the availability of virtual environments and the implementation of digital laboratories in higher education, there is no guarantee of the development of a digital culture. "On the contrary, there is a great chasm between the teaching mediated by digital technology practiced in many universities and colleges, and the dynamic processes enabled by the Internet concerning the relationship between professor and students" (Kenski, 2015, p. 432). Thus, the author believes that teaching should be restructured, as well as professors' attitude towards technological resources, so that both are in line with the needs of a digital society.

Before expecting to master new technological resources, professors should be aware of circumstances:

> [...] in the face of the new miracle worker who, blatantly acquiescent with industry interests and service companies, sees in schools and students a fruitful market to be stocked with devices that expire before they are even used (Gimeno Sacristán, 2007, p. 43).

In this sense, when the professor follows and incorporates the new technological resources without adequate reflection on the possible benefits of these tools to his classroom, he contributes to the consolidation of projects that are not always known to him. Gimeno Sacristán (2013) warns that only professors can confirm the relevance of the functionalities of information and communication technologies, not the interests that surround the use of these tools and try to impose an educational model.

Brito and Purificação (2011) argue that private schools and public agencies buy machines with educational software already installed and professors must be trained to use them. Thus, the professor is pressured to master resources that were not evaluated by him. According to Gimeno Sacristán (1999), the professor only defines the role that he assumes in practice, and it is through his performance "[...] that the multiple determinations coming from the contexts in which he participates are disseminated and concretized" (Gimeno Sacristán, 1999, p. 74). Consequently, the professor must perform constant self-analysis. His actions must be rationalized and have to align with his pedagogical projects so that idiomatic factors do not influence him.

It is worth noting that the professors interviewed belong to the faculty of the few licentiate degree courses in mathematics offered in Curitiba, which requires these professionals to have a differentiated profile and constant involvement in academic productions. Thus, the search for knowledge on the part of these professionals derives from their concerns and also from the pressures of their work environment. Gimeno Sacristán (2001) explains that in human beings there is a constant restlessness before knowledge—something inherent to their relationship with technology—since knowledge clarifies, enables, and propitiates capacities.

Regarding this concern in the face of the knowledge, it was possible to perceive in analyzing the narratives of the professors that at certain moments these professors engage in projects of continuous education motivated by an individual search, which can be observed in the narratives of M5 on the eve of retirement: "[...] I am learning new methodologies and new teaching technologies, [...] it is giving me a lot of work, it is changing my whole way of being a professor... it is challenging for me" [M5]. The constant search for knowledge can be observed in the reports by M7. The professor, who began his career in the sixties, says he is aware of the news in his area, but that for most of his career there were no online means of accessing this information. Therefore, he explained how he

managed his continuing education: "All my life I dedicated myself, I studied, took books, bibliographies, searched for people with specific knowledge, exchanged ideas, and everything the students wanted I did" [M7]. From the chalkboard to smart tools, we have come a long way. Gradually, access to knowledge has become easier and faster, but at the same time, the amount of information produced each day transforms the professor's task of managing continuous education in times of tension and anxiety. If in the past libraries were the places where they read and studied, they are no longer so today.

According to Gimeno Sacristán (2007), reading as means of searching for knowledge is an incentive for continuing education; it is a practice that determines and reflects the way of relating to others' experience. "We are what we read and how we read" (Gimeno Sacristán, 2007, p. 95). In this way, what motivated M7 to rely on books was to attend to his students' desires, as well as the possibility of reading and assigning new meanings to the content he had read by interacting with others.

Kenski (2015) believes that in order to meet the aspirations of contemporary society, it is necessary to create a culture of partnership and collaboration among all sectors, actions, and modalities of universities—research, teaching, extension, and management—a means of integration and intercommunication that can be facilitated through social networks. It is important to note that here we not refer to online social networks but to physical spaces of the work environment, according to the way the professor has found to interact with his peers. As said by the professor: "[...] I am even willing to help my colleagues, and if I have to, I ask for help from them as well. [...]. To exchange ideas with my colleagues, this, in a certain way, is continuing education" [M7]. In interacting with others, the professor influences and is influenced, and in this way he constructs himself. Brito and Purificação (2011, p. 45) confirm that "[...] the professor, as a human being, is a constructor of himself and his history. This construction occurs through actions, in an interactive process permeated by the conditions and circumstances surrounding him."

In short, with regard to continuing education and the relationship with technological resources, these tools were represented in professors' narratives as enabling teaching-learning processes; facilitating interaction with other professors and their practices; and promoting access to information at different moments and places. The reports also showed the dilemmas and challenges professors experience when desiring to innovate. It can be observed in the narratives that the motivation to innovate originates from the desire to master technological resources, the pressures exerted by the institutions where they work, their anxieties about knowledge, and the will to exchange ideas.

Technological resources and the relationship between professor and students

The professor's relationship with his students is complex because it involves individual, social, and human aspects. For Tardif (2014), since the focus of the work of the professor refers to human beings, much of the technology of his work is found in the social relations built thereby. The narratives on technological resources and the relationship between professor and students were analyzed from this perspective.

It was possible in the narratives of the professors to identify characteristics of affective human relationships between them and their students. In the Professor M7's report, his dedication to the relationship with the students was evidenced, as well as his satisfaction in helping those who had doubts, even outside the class hours. Other professors also reported the importance of the relationship with the students and that to be "[...] a professor, you first need to like people" [M4]. The management of the relationships established, for Tardif (2014), depends on professor's experience, as well as his beliefs, knowledge, and temperament. In this sense, technological advance has allowed the professor and students to become closer, thus allowing professors to better follow up on the student's performance, as well as stimulate and evaluate them.

The relationship between professor and students and its social characteristics can be explained in the form of dilemmas faced by professors: "[...] the greatest challenge is to make the student pay attention" [M1]. "Twenty years ago, [...] the student was concentrating, he paid attention in class, writing down. There has been a great change, and this transition is happening now" [M3]. As professors' attitude towards new technologies and continuing education has changed, students' behavior has also changed. Writing down lessons today is not the only way to access knowledge. It is necessary to guide students so that they can search for knowledge and from there come to understand, apply, analyze, synthesize, and finally create it.

Concerning these dilemmas, Professor M5 says that the challenge lies in the ability to understand this new generation. He adds that his "[...] generation could not do two or three things at the same time," but that he has the feeling that in his

classes the students are recording, listening, listening to music, answering messages, and other actions. He reports: "[...] they can do several things at the same time; I do not know if they are well done, who am I to judge? They can do three things at the same time, but I could not" [M5]. It seems that digital technologies do not generate discomfort among professors, but rather students' attitudes when dealing with them, the diffuse attention that causes the false perception that they can attend to many things at the same time without concentrating on what the professor says.

These students are molded by the information society even before they enter the classroom, explains Gimeno Sacristán (2013). Brito and Purificação (2011) point out that some professors forget to work with the real student and that students usually master digital technologies better than they do.

The professors interviewed did not grow up surrounded by these technological resources; thus, they strive to understand this new generation, as the following narrative explains: "[...] we are working with the so-called '*Zap*' generation, Generation Z. It is a generation that has the remote control in one hand and the mobile in the other. The student is very immediatist and wants to solve everything on time. It is a different generation, and the professor has to adapt to it" [M3]. Piva Junior (2013) agrees with Professor M3 when he states that familiarity with technology characterizes the Y, '*Net*,' or Z Generation, as well as the difficulty in planning, aversion to orders and manuals, and need for communication and improvisation; so the way to relate to this generation needs to be different, especially when the goal is teaching-learning. The immediacy perceived in the students is not exclusive to school but characterizes an individualistic and competitive society in which ends and means are confused in the accomplishment of objectives, most often private when not selfish.

Professors have been learning to deal with the relationships of their students with technological devices. Rasco and Recio (2013) argue that technological gadgets have become more portable and closer to the physical body, and have come to be used almost as an accessory. Kenski (2015) adds that portability and flexibility of access enable the integration and interaction of people, as well as access to a great body of information at any time and place. From this perspective, it is possible to understand the reason why the student "[...] does not concentrate much [...]," since "[...] he has many more attractions [...]" [M3] to focus on than just the class.

Concerning the search to manage this new configuration of relationships, M5 reported that two years ago he did not allow cell phones in class; however, he had to revise his position and directly consulted the students in the classroom. He reported: "[...] since they did use it, they can leave it on the table and use it at least twice during class." It is possible to see in his report a certain discomfort with the situation, which led him to adopt negotiation with students to convince them to use the gadgets only for educational purposes as a strategy of teaching-learning. In this case, the distance between the reality of the students and the school proposal is evident.

The relationship between professor and students indicates that human beings must learn certain rules of conviviality. They must be "[...] domesticated and subjected politically to certain properties and values" (Gimeno Sacristán, 2013, p. 156). This, however, should not be seen as a surrender by the professor, especially because the professor, when dealing with the excess of information to which the students are subjected, has one more role to play.

In virtual spaces, information circulates in great quantity, which does not necessarily mean high quality. For Kenski (2015), it is necessary to develop means of "[...] filtering, critically selecting, and collectively reflecting on and dialoguing [...]" the information available (Kenski, 2015, p. 427). Rasco and Recio (2013, p. 167) add that there is much information flowing and much knowledge available; the problem is "[...] the deregulation, lack of criteria, disorientation, absence of structures and schemes to order learning, consolidate the order of thought, and promote coherence in actions."

The professors interviewed reported being aware that the amount of information does not reflect competence in accessing relevant information or how to use it. Professor M6 reported this concern with the treatment of the information by the student, affirming that there are classes published on the internet but that the student needs to be selective when choosing what to consult and to learn who is publishing the material, because on the Internet anyone can publish what he wants.

Even if students obtain information from an unreliable source, this may be an opportunity for the professor to assist them in better directing and selecting their search, explains Gimeno Sacristán (2007, p. 65).

> [...] the knowledge on knowledge, the information on the value of existing information, is necessary because any of its components or contributions need not serve to make people more reflective and critical,

> reflecting on the order and the disorder that reign in their globalized environment.

Thus, professors "[...] become mediators who guide, establish criteria, suggest, and know how to integrate dispersed information for others" (Gimeno Sacristán, 2007, p. 32). With the professor's mediation, the student can gain a proper and focused orientation on how to reflect on and select information to convert into knowledge. Furthermore, the author adds, available sources, information technologies, and their pedagogical applicability can generate more interesting learning spaces for students. For example, Professor M5 reported that students asked for more group work and criticized him because he "[...] did not like them to use technology" [M5]. After reflecting, the professor reported that he revised his position: "[...] I opened my mind; we are using technology at the service of education, it is important [...]. Now almost every class I question and problematize an issue, and then pass it on to them" [M5]. In this sense, digital technology serves as a support tool for professor-mediated work.

Concerning this subject, Piva Junior (2013) reaffirms how important group discussion of the issues is, and warns that machines are not fundamental in teaching. They are only "[...] tools that reinforce what [...]," in some way, "[...] has already been transmitted or absorbed" (Piva Junior, 2013, p. 125). Mallmann et al. (2015, p. 545) in turn emphasize that a professor's actions based on digital technologies should provide a "[...] problematized dialogue, interaction, and collaborative construction of knowledge." Apparently, professors are up to date with these instructions.

Professor M5 reported another proposal involving digital technologies. According to him, the first 45 minutes of each class should be prepared and taught by students, and in the final 45 minutes the professor takes over. It sounds simple; however, the practice is a bit more complex, as evidenced by his report: "[...] I see that some students cannot even read the text, they cannot watch the movie. [...]. You need for the student to be prepared with something for each class" [M5]. This reveals the professor's impotence in the face of the actions of his focus of work. This report is close to the proposal of the 'flipped classroom', an inverted classroom, in which students come prepared for what will be developed during the class.

Even if the professor seeks new knowledge and tries to follow and establish a critical use of material technologies, he can also try to decide what will be the course of his relationship with the students. Despite all his efforts at teaching, he has no control over the final product of his work. Sacristán comment on this subject:

> [...] there is a kind of anthropological condition that has led the whole society to invent resources and institutions that are in charge of teaching and that favor, stimulate, and instill a series of special learning that needs to be worked on. School institutions are a specialization of this teaching that does not necessarily reflect the desire to learn from those who are obliged to attend these places (Gimeno Sacristán, 2013, p. 157).

Professor M4 seems to understand this situation. He reports: "[...] I am fully aware that I will give a message and not everyone will be interested in it, even though they [the students] are paying to, theoretically, receive useful information." According to Tardif (2014, p. 132), "[...] there is nothing and no one [...]" that can compel "[...] a student to learn [...]" if he is not committed "[...] to the learning process." This becomes a dilemma in the relationship between professor and students that generates disagreement.

Moreover, there are other social issues beyond the control of the professor. Commenting on the reality of the pilot project in which he participates, M5 reports: "[...] many of the students work; in fact, these students only have the weekend to study, especially those who work and study at night; this is a difficulty" [M5]. Although the professor is responsible for managing the group, it is the responsibility of the students to learn. The transformation of information into knowledge is something personal that requires time and dedication and does not depend only on the professor.

This professor commented on an important issue, namely, the time for studying. Gimeno Sacristán (2007) adds that the greater the time dedicated to activities related to studying and other activities, the greater the probability they become common in the student's daily life. From this point of view, time generates social inequalities, as not everyone has the same amount of time to dedicate to reading or other demands.

For Tardif (2014), it is a mistake to establish formulas and techniques for teaching work, since the professor works with groups formed out of singular individuals. The professor needs to be aware of the particularities of these unique human beings and consider that "[...] although schooling is not a definitive solution to combat inequalities, it should never cause greater inequality" (Gimeno Sacristán, 2001, p. 64). Considering that the Internet is the most emblematic element in the information

society, it is necessary to consider the inequality of access to the Internet. In short, it may not be a sensible attitude to develop a single project and assume that everyone will have the same time available or access to content. Alternatively, "[…] the professors should be able to work with masses, pick up a mass of people and show them a direction" [M2]. At the same time as professors work with different groups of people, their objectives are "[...] inherent to a mass organization based on general standards" (Tardif, 2014, p. 145).

Final considerations

From our findings, it is possible to infer that professors are aware of the possibilities and challenges arising from the use of technological resources, in both continuing education and the relationship between professor and students. Through the narratives, it was possible to identify the way professors perceive the use of technological resources in continuing education. In their perception, technological resources allow continuous formation in several spaces and the access to a body of information that can be used in the practices of classrooms. Moreover, for the professors interviewed, there are multiple ways of undergoing continuing education, and each professor should reflect on his professional needs before deciding on the best training option.

Professors' narratives on the use of technologies and on the relationship between the professor and students in the teaching-learning process have demonstrated that, despite the benefits promoted by technological resources, professors are concerned about students' use of these technologies. Professors believe that students have access to too much information, but not always of adequate quality, and that educational technology resources are not always equally experienced by all students. The challenge, therefore, is to accompany the speed of innovations and their application in the classroom.

In summary, it can be affirmed that even if the professor seeks continuing education by keeping pace with new available technological resources, the decision to use them in the classroom should be well thought out, taking consideration of whether there is a real need and of the class where the tool will be used. In this way, thinking of the professor as the technology itself, the teaching-learning process is associated with the resources he provides. Finally, the pressure exerted under the participants of this study, professionals from private higher education institutions, was evident, since they are responsible for the use of technological tools, under the assumption that better learning of the students depends on them.

References

Alberti, V. (2004). *Manual da história oral*. Rio de Janeiro, RJ: FGV.

Backes, L., & Mantovani, A. (2015). A formação do educador no contexto do hibridismo tecnológico digital: o processo de autonomia. *Revista Diálogo Educacional, 15*(45), 557-576. doi: 10.7213/dialogo.educ.15.045.DS09

Bardin, L. (2011). *Análise de conteúdo*. São Paulo, SP: Edições 70.

Brito, G. S., & Purificação, I. (2011). *Educação e novas tecnologias: um (re)pensar*. Curitiba, PR: InterSaberes.

Coelho, M. A., Morales, A. P., & Vogt, C. (2016). Percepção dos professores de ensino médio sobre temas relacionados a ciência e tecnologia. *Revista Iberoamericana CTS, 11*(32), 9-36.

Fombona, J., Vázquez-Cano, E., & Reis-Jorge, J. (2016). Los problemas de los recursos informáticos en el contexto universitário. *Revista Iberoamericana CTS, 11*(32), 145-163.

Gatti, B. A. (2008). Análise das políticas públicas para a formação continuada no Brasil, na última década. *Revista Brasileira de Educação, 13*(37), 57–70.

Gimeno Sacristán, J. (1999). Consciência e ação sobre a prática como libertação profissional dos professores. In A. Nóvoa (Org.), *Profissão professor: 3*. (2a ed., p. 63-92). Lisboa, PT: Porto Editora.

Gimeno Sacristán, J. (2001). *A educação obrigatória: seu sentido educativo e social.* Porto Alegre, RS: Artmed.

Gimeno Sacristán, J. (2007). *A educação que ainda é possível: ensaios sobre uma cultura para a educação*. Porto Alegre, RS: Artmed.

Gimeno Sacristán, J. (2013). O currículo na sociedade da informação e do conhecimento. In J. Gimeno Sacristán (Org.), *Saberes e incertezas sobre o currículo* (pp. 153-174). Porto Alegre, RS: Penso.

Goodson, I. F. (1992). Dar voz ao professor: as histórias de vida dos professores e o seu desenvolvimento profissional. In A. Nóvoa (Org.), *Vidas de professores* (p. 63-78). Lisboa, PT: Porto Editora.

Kenski, V. M. (2015). A urgência de propostas inovadoras para a formação de professores para todos os níveis de ensino. *Revista Diálogo Educacional, 15*(45), 57-70. doi: 10.7213/dialogo.educ.15.045.DS03

Mallmann, E., Jacques, J. S., & Schneider, D. R. (2015). Formação de professores na perspectiva transdisciplinar: interação dialógico-problematizadora mediada por tecnologias educacionais. *Revista Diálogo Educacional, 15*(45), 537-556. doi: 10.7213/dialogo.educ.15.045.DS08

Nóvoa, A. (1992). *Vidas de professores*. Lisboa, PT: Porto Editora.

Piva Junior, D. (2013). *Sala de aula digital: uma introdução à cultura digital para educadores*. São Paulo, SP: Saraiva.

Purificação, M. M., & Pessoa, T. (2015). O ensino da matemática em meio à tecnologia: desafio aos programas de formação de professores. # Tear: *Revista de Educação Ciência e Tecnologia, 4*(2), 1–10.

Rasco, J. F. Â., & Recio, R. M. V. (2013). O currículo e os novos espaços de aprendizagem. In J. Gimeno Sacristán (Org.), *Saberes e incertezas sobre o currículo* (p. 420-442). Porto Alegre, RS: Penso.

Silva, V., & Silva M. H. (2014). *Dicionário de conceitos históricos*. São Paulo, SP: Contexto.

Tardif, M. (2014). *Saberes docentes e formação profissional*. Petrópolis, RJ: Vozes.

Vieira, A. M. D. P. (2013). Instituições escolares: memórias, fontes, arquivos e novas tecnologias. In J. C. Silva, & P. J. Orso, A. P. Castanha, & L. R. Magalhães (Org.), *História da educação: arquivos, instituições escolares e memória histórica* (p. 65–78). São Paulo, SP: Alínea.

Received on May 12, 2017.
Accepted on September 3, 2017.

ABOUT THE AUHORS

[1]**Alexandra Ferreira Martins Ribeiro**: Bachelor in Business Administration, Master in Education - PUCPR
E-mail: alexandrafmribeiro@gmail.com
http://orcid.org/0000-0002-3942-8050

[2]**Alboni Marisa Dudeque Pianovski Vieira**: University degree in Pedagogy, Bachelor in Law, Master in Management of Institutions of Higher Education, Master in Education, Ph.D. in Education. Professor of the Graduate Program in Education (master's and doctorate degrees) at the Pontifical Catholic University of Paraná. Editor of the Educational Dialogue Journal - PUCPR.
E-mail: alboni@alboni.com
http://orcid.org/0000-0003-3759-0377

NOTES:

Author 1 was responsible for designing, delineating, analyzing and interpreting the data, writing the manuscript, critically reviewing the content, and approving the final version to be published.
Author 2 was responsible for writing the manuscript, critically reviewing the content, and approving the final version to be published.