Revista Educação em Questão
ISSN: 1981-1802
eduquestao@ce.ufrn.br
Universidade Federal do Rio Grande do Norte
Brasil

Ferrarini, Rosilei; Saheb, Daniele; Lupion Torres, Patricia
Active methodologies and digital technologies: approximations and distinctions
Revista Educação em Questão, vol. 57, no. 52, 2019, pp. 1-30
Universidade Federal do Rio Grande do Norte
Brasil

Artigo
DOI | 10.21680/1981-1802.2019v57n52ID15762

Active methodologies and digital technologies: approximations and distinctions

Rosilei Ferrarini
Daniele Saheb
Patricia Lupion Torres
Pontifícia Universidade Católica do Paraná (Brasil)

Abstract

The objective here was to discuss the concepts of active methodologies and digital technologies, besides describing the origin and its constituent elements. The study problem focused on the problematic: what would be the approximations and distinctions between the use of digital technologies and active methodologies? The research corpus approached the concepts about active methodologies and technologies, highlighting the digital ones in the present time, besides the origins and characteristics of active methodologies and their possible relations with the use of digital technologies, to which we constructed a synthesis table for each methodology. The methodologies considered were: learning through projects, problem-based learning, case study, peer instruction and flipped classroom methodology. As a qualitative research, it is consisted as an exploratory study, based on authors such Hernández (1998), Serra and Vieira (2006), Mazur (1997), Souza and Dourado (2015), Kensky (2012), Moran (2018) and Bergmann and Sams (2018), among others. The results point to the existence of active methodologies in the 19th and 20th centuries, even before the creation of digital technologies, so they cannot be confused; the use of digital technologies does not necessarily imply the application of active methodologies; and digital technologies enhance methodologies, whether active or not.

Keywords: Active methodologies. Digital technologies in education. Higher education didactics. Pedagogical practices.

Metodologias ativas e tecnologias digitais: aproximações e distinções

Resumo

Ao tratar a temática metodologias ativas e tecnologias digitais, objetivou-se discutir seus conceitos, além de descrever a origem e seus elementos constitutivos. O estudo centrou-se na problemática: quais seriam as aproximações e distinções entre o uso de tecnologias digitais e as metodologias ativas? O *corpus* da pesquisa abordou conceitos sobre metodologias ativas e tecnologias, destacando as digitais na atualidade, além das origens e características das metodologias ativas e suas possíveis relações com o uso de tecnologias digitais, ao que se construiu um quadro síntese para cada metodologia estudada. As metodologias consideradas foram: aprendizagem por projetos, aprendizagem baseada em problemas, estudo de caso, aprendizagem por pares e metodologia da sala de aula invertida. Enquanto pesquisa qualitativa, consistiu em estudo exploratório, tendo por base autores como Hernández (1998), Serra e Vieira (2006), Mazur (1997), Souza e Dourado (2015), Kensky (2012), Moran (2018) e Bergmann e Sams (2018), entre outros. Os resultados apontam para a existência de metodologias ativas

nos séculos XIX e XX antes mesmo da criação das tecnologias digitais, por isso, não podem ser confundidas; o uso de tecnologias digitais não implica necessariamente a aplicação de metodologias ativas; e tecnologias digitais potencializam as metodologias, sejam ativas ou não.
Palavras-chave: Metodologias ativas. Tecnologias digitais na educação. Didática do ensino superior. Práticas pedagógicas.

Metodologías activas y tecnologías digitales: aproximaciones y distinciones

Resumen

Al tratar la temática metodologías activas y tecnologías digitales, se objetivó discutir sus conceptos, además de describir el origen y sus elementos constitutivos. El estudio se centró en la problemática: ¿cuáles serían las aproximaciones y distinciones entre el uso de tecnologías digitales y las metodologías activas? El corpus de la investigación abordó conceptos sobre metodologías activas y tecnologías, destacando las digitales en la actualidad, además de los orígenes y características de las metodologías activas y sus posibles relaciones con el uso de tecnologías digitales, al que se construyó un cuadro síntesis para cada metodología estudiada. Las metodologías consideradas fueron: aprendizaje por proyectos, aprendizaje basado en problemas, estudio de caso, aprendizaje por pares y metodología del aula invertida. En cuanto investigación cualitativa, consistió en un estudio exploratorio, basado en autores como Hernández (1998), Serra y Vieira (2006), Mazur (1997), Souza y Dourado (2015), Kensky (2012), Moran (2018) y Bergmann y Sams (2018), entre otros. Los resultados apuntan a la existencia de metodologías activas en los siglos XIX y XX incluso antes de la creación de las tecnologías digitales, por lo que no pueden ser confundidas; el uso de tecnologías digitales no implica necesariamente la aplicación de metodologías activas; y las tecnologías digitales potencian las metodologías, sean activas o no.

Palabras clave: Metodologías activas. Tecnologías digitales en la educación. Didáctica de la enseñanza superior. Prácticas pedagógicas.

Context of study and research

The active methodologies, present in discourses and in educational practices current studies, have been the subject of studies and analysis of their possibilities of application in higher education, in the subject of *higher education didactics*, as part of the programming of master's degree graduation course program in education of the Pontifical Catholic University of Paraná, in the first semester of 2018. We interpreted, in this study, that some practices called active methodologies are conceived in this way by the bias of the use of

information and communication technologies, which may come be part of the educational process.

Therefore, the theoretical-practical concern motivated the realization of an exploratory study, using the bibliographical references adopted in this discipline, among others that became necessary, among which the following stand out: Hernández (1998); Serra e Vieira (2006); Mazur (1997); Souza and Dourado (2015); Kensky (2012); Leal, Moreira and Ferreira (2018); Cerqueira, Guimarães and Noronha (2016); Moran (2018); and Bergmann and Sams (2018). We investigated the following problem: what are the approximations and distinctions between the use of digital technologies and the active methodologies?

Our starting point was the assumption that active methodologies cannot be confused with digital technologies. The research corpus first considered the need to approach concepts related to active methodologies and technologies in education, with emphasis on those considered as digital, as a basis for the analysis to be carried out. In the sequence, we elaborated a synthesis framework for each of the selected active methodologies, considering the origin (country and date), learning focus, underlying conditions, didactic steps, role of the teacher and the student and, finally, technological resources involved. With this framework built, we could proceed to the analysis of the active methodologies and their relations with the use (or not) of the digital technologies. The following methodologies were considered in this research: project-based learning, problem-based learning (PBL), case study, peer instruction and flipped classroom in its first and second versions.

We employed the exploratory qualitative research, as it, according to Esteban (2010, p. 127), "[...] makes possible the discovery and development of an organized body of knowledge [...]", mainly, according to Sampieri (2013, p. 376), "[...] when the subject of studies has been little explored or research has not been carried out on it in any particular social group."

The study is necessary to analyze the approximations as well as the distinctions that may exist between what is considered as active methodologies and the use of digital technologies, so that their concepts are clarified, as well as elucidates procedures, didactic steps and technological resources. With this, it is possible to treat each object of study with the necessary rigor, although in

an exploratory way, contributing to the advancement of studies in the scientific field of didactics.

Reflective foundations

Concept of active methodologies

The concept of methodologies is taken from Moran (2018) as "[...] guidelines that guide the teaching and learning processes, which are achieved in concrete, specific and differentiated strategies, approaches and techniques" (Moran, 2018, p. 4). In this sense, we can say that there are several methodologies built throughout the history of educational with remarkable characteristics of their time, with more or less possibilities, having influenced school practices and even become perennial.

Currently, the term "active methodologies" is widely published, highlighting the need to understand in which sense it is used. We found in Moran (2018, p. 4) that active methodologies "[...] emphasize the student's protagonist role, his direct, participatory and reflexive involvement in all stages of the process." The author mentions that one learns actively from the birth of the human being and throughout its life in diverse processes from concrete situations, that little by little allows to the human being to extend and generalize. From the inductive process, and/or from ideas and theories to test them in the concrete world, and deductive process. These processes, for Moran (2018), are permeated by learning with someone more experienced and / or even through their own discoveries. It emphasizes that, in any case, one learns about what matters, what has an intimate resonance, which makes it possible to advance from what is known until it reaches stages of higher or more complex developments, in the face of what is found (MORAN, 2018).

Having said that, we can affirm that active learning involves the student's attitude and mental capacity to seek, process, understand, think, elaborate and announce, in a personalized way, what he has learned. Very different from the passive attitude of just listening and repeating the ready-made models. It is notorious, in this concept, that the cognitive activity of the learner in any situation becomes necessary, not only restricted to the capacity of memorization and repetition, although this means brain activity. In addition to this internal

movement, expressed in the use and development of diverse and more complex cognitive processes, there is an external movement, both of teachers and learners, as they need to act to select information, interpret, compare, analyze, discuss, reflect, among other processes that demand different postures and body dynamics, not only of the individual student, but of student groups or even the entire classroom.

The school model in which the teacher stands in front of the classroom and the pupils seated individually, one behind the other, to listen and then to repeat, in some way, has been significantly altered in order to transmit knowledge. New forms of space organization and movement of teachers and students are therefore present in the active methodologies, placing the student at the center of the process. Learning is the focus, as long as it activates and mobilizes different forms and cognitive processes of the student and also the interaction with other colleagues and teacher.

By this concept, there are several active methodologies, but they differ while they define their strategies, approaches and techniques, explaining what they conceive as the role of the teacher and the student in the teaching-learning process.

Concept of digital technologies

According to Kensky (2012), technologies are as old as the human species. For the author, "[...] it was human cleverness, at all times, that gave rise to the most varied technologies. The use of reasoning has guaranteed to man an increasing process of innovations" (KENSKY, 2012, p. 15). In this way, technologies are the different equipments, instruments, resources, products, processes and tools, fruit of the growing creation of the human mind, transforming the relations of production and of life in society throughout the history of humanity, differentiating us from the others living beings. According to Kensky (2012), technologies are not only machines and artifacts but also processes, which are technologies at the service of humanity, materialized in medicine, prostheses – in the case of medicine, for example – and in languages, radios and telephones, among others, in the case of language and communicative processes.

Throughout this concept, in education, technologies can be represented by blackboards, books, pencils, pens, notebooks, projection machines,

digital slates, tablets, computers, among other artifacts. Resources and products created in historical moments with different purposes, not exclusively for the teaching and learning process. But educational technologies can also be evaluative methodologies and processes, for example, that do not constitute palpable products, but delimit a way of acting and producing knowledge. For this reason, they should be considered in the analysis of technologies in education. In this way, every methodology is itself a social technology. From force of a limited concept or linked to the concrete world, technologies in education end up being recognized as the products, instruments and equipment that teachers and students use to teach and learn.

According to Kensky (2012), innovation and technologies can be confused with the speed of current technological development. That makes difficult to establish the limit of time to designate the new knowledge that led to the creation of "new technologies". However, the author emphasizes that the term "new technologies", at the present time, refers mainly to the processes and products related to the knowledge coming from electronics, microelectronics and telecommunications, which are based on immateriality, since its space is the virtual action and its main raw material is information (KENSKY, 2012, p. 25). This focus rests, especially, on what has been designated as information and communication technologies, which have significantly altered the ways of producing and disseminating of information and entertainment, the relationship and even the way of thinking and producing one's own existence.

The concept of Information and Communication Technology (ICT), according to Gewehr (2016), is used to express the convergence between information technology and telecommunications, bringing together computer tools and telecommunication resources, such as radio, television, video and internet, which facilitate dissemination of information (GEWEHR, 2016, apud CARDOSO, 2011; LEITE, 2014a e 2015).

With this assumption, the New Technologies of Information and Communication (NICT, in Portuguese abbreviation) may not be so new as this. Another term that is widely used is the Digital Information and Communication Technologies (TDIC, in Portuguese abbreviation), replacing the NICT. According to Kensky (2012), digital technologies are electronic devices that base their operation on a language with binary codes, through which it is possible, in addition to informing and communicating, interacting and learning.

Digital derives from digit, from the Latin digitus, which means finger (GEWEHR, 2016). Therefore, digital represents the new phase of information and communication technologies, both by the way information processing and storage as by access. Through the touch or slide of the fingers on the screen of different equipment, we find a multitude of information and interactions.

According to Kensky (2012), the convergence of information and communication technologies to the configuration of a new technology, the digital, has caused radical changes in speed and power capable of recording, storing and representing written, sound and visual information in virtual environments. To better understand these radical changes and even the distinctions between TICs and TDICs, Gewehr (2016) states that:

> [...] it is possible to make a comparison between the different slates currently available: the analogue and the digital slate. A blackboard (analogue slate) is a technology, it is a TIC, the digital board is a TDIC, because through digital technology it allows navigation on the internet, as well as access to a database full of educational software (GEWEHR, 2016 apud FONTANA; CORDENONSI, 2015).

In this article, the term digital technologies is used, designating all the technologies that support binary language, especially the use of the internet, named the web 2.0 version, which enabled communication, dissemination, sharing and even the production of information among people around the world, at any time and place.

These reflections make possible to deduce that the teaching-learning processes had their technologies according to the historical-scientific moment of their time, which does not mean that they made use of the available apparatus, either in terms of equipment, processes, products or even methodologies.

Active methodologies and digital technologies: relations

In order to establish a possible relation between the active methodologies and the digital technologies, we constructed a reference framework of the elements characterizing each methodology, highlighting the necessary technological resources and provided in the origin of the methodology with analysis for the current time.

We opt, therefore, for the content analysis, since, accordingly Bardin (2016, p. 129), "the framework of analysis is not determined" and "it is based on an exposition of the texts' properties". The exploration procedures allow, from the texts themselves, to understand the connections between the different variables (functional, according to a deductive process) that facilitate the construction of hypotheses.

Table 1

Project-based learning

Element	Descriptive
Source	In 1919, Kilpatrick (USA) relied on ideas from Dewey (1889), also from the United States, to work in classrooms based on real issues and problems of student interest, in order to rebuild and reorganize his experiences through which he believes that learning happens. Throughout the last century, it obtained different denominations, and with greater application in basic education, such as: centers of interest and method of projects (1920s), work by themes (1960s) and work projects (1980s). Design thinking today is considered an attractive design methodology in higher education, although it has the distinct step-by-step of the projects in their original form.
Focus of learning	To work with real themes, close to the life and reality of students that motivate them to learn in a meaningful and contextualized way and to build something at the end of the process. They promote the development of skills and abilities as well as collaborative learning.
Underlying Conditions	The teaching-learning process must be linked to the students' interest, to have an intrinsic value in their activities, to promote the discovery and enjoyment of learning. It requires addressing issues that arouse curiosity and creativity, with the possible construction of something at the end. They organize and develop in a certain time delimited and demand diverse information and the need to continue learning. It can be developed in a discipline, in a part of it, between linked disciplines and even the most global model, through a curriculum organized in interdisciplinary subjects. They can be of short duration (two weeks, for example) to the more complex, involving cross-cutting themes that require interdisciplinary collaboration, lasting longer than a semester or a year. The themes can be delimited by the institution, the teacher, the teaching staff, or yet negotiated with the students or, also, of free choice.

Table 1

Project-based learning (Continuation)

Element	Descriptive
Didactic steps	Initially, through the discovery and experimentation, today it involves several stages, such as the exploration and problematization of the study subject, its contextualization, the realization of brainstorming for possible solutions or creation of the expected product. It also requires the organization of the stages of realization, search for information in different sources (including field lessons), interviews, observations and experimentation, as well as contact with specialists, registration and reflections for understanding, construction and application of concept. It is necessary the conscious use of processes and procedures in the elaboration of what we want and, finally, the actual production, with the use of tests, if necessary, and the presentation of the final product. They can be: constructive, when the purpose is to build something, be it a product, process, idea, usually innovative; investigative, when the purpose is to explain a situation or question from scientific foundations; explanatory, when they intend to demonstrate the functioning of objects, mechanisms or systems, also from scientific principles. Design thinking is a project methodology focused on user needs, in which designers, with a multidisciplinary vision, searching for data with the customer, create, test, improve and implement solutions, always returning to the client, from an intense collaboration.
Teacher role	To know the students, their interests and significant problems; to know the school curriculum to articulate the projects; to negotiate with the students, to facilitate the next steps, to mediate the knowledge to be built and to guide the whole process.
Student role	To plan the sequence of realization and project schedule with the teacher and other colleagues, as a team; to be responsible for seeking and treating information, analyzing them, synthesizing them, developing relevant knowledge, making decisions, thinking and creating, and sharing and working together, therefore, to be involved in the whole process in a responsible and collaborative way.
Technology resources	Different sources of information and learning strategies, including locations beyond the classroom. Various materials and equipment depending on the nature of the project.

Source: the authors, based on Hernández (1998) and Moran (2018).

In the analysis of the origin of the project-based approach to learning, prior to the last century, TDICs were not yet present, but the exploration of the

medium, with all its cultural and even natural resources, was the basis for experimentation and discovery. It required active learning, which involved students in meaningful activities and the resources of the time. Over time, with different denominations and approaches, the learning by projects lasts, undoubtedly incorporating the facilities and possibilities of the digital technologies.

Therefore, in its origin the project methodology used technologies of the last century that responded to the needs of that period of time. However, they can approach TDICs, as projects, today in the different stages, can be enhanced by digital technologies. At the development stage, for example, projects can be housed in specific software, fed by the students in the process, generating one-click reports for teachers at any time; basic study references and libraries can have a digital library that facilitates expanded access to materials, as well as minimizing replacement and maintenance costs. In the conclusion stage, virtual tools and programming software can help prototypes of what is desired as a result of the project, in addition to 3D printers, that allow the visualization and testing of products, when applied. In the evaluative stage, throughout the process, there is the possibility of virtual spaces for sharing of elaborations and organization of evaluation e-portfolios of each student, for example.

Thus, with an active methodology of the last century, project methodology, incorporating the current and proper digital technologies of the 21st century, transform study models, registers and shares information and knowledge, as well as evaluations, maximizing time, space and ways of processing, producing and disseminating possible solutions to the problems studied.

By working the teaching and learning process through this secular active methodology, which incorporates and uses digital technologies, the school institution, whether basic or higher education, will have made significant transformations in the teaching-learning model from analog[1] to digital, doing justice to the technological innovations of the present century.

Table 2

Problem-Based-Learning – PBL

Element	Descriptive
Source	In the 1960s, it was initially applied in medical schools at MacMaster University, in Canada, and at Maastricht University, in the Netherlands. It then expanded to other countries, areas of knowledge and levels of education (in addition to higher education) and is the object of research and current scientific-academic events, and their own, that analyze the consolidation of the method, including in Brazil.
Focus of learning	Research of several possible causes for the resolution of a problem, preferably real problems, in a specific context, specifically of the profession for which the training is intended. They are poorly structured problems that allow students to delineate various problems and search for possible different solutions.
Underlying Conditions	Curricular matrix of the non-disciplinary course, usually transdisciplinary, organized by themes pertinent to the professional formation, besides the proposal of competences development for the expected profile. Therefore, an integrated and contextualized curriculum-based learning model, which also delimits the space-time search of the problem solution, but can also be applied in isolation in disciplines and / or areas of a course at specific moments, which does not portray a methodological project of the institution.
Didactic steps	There are usually seven basic steps around the group discussion of students in cooperative research, accompanied by the teacher: 1. Identification of the problem scenario – new terms and concepts. 2. Definition of the problem by analyzing the facts from the scenario. 3. Formulation of hypotheses about possible solutions with existing knowledge. 4. Identification of new learning needs, drawing up a study plan, usually in the 5W2H model. 5. Realization of research in search of new learning – self-directed and with socialization in the group. 6. Application of new knowledge generating new hypotheses and selecting the best solution, its elaboration and presentation. 7. Evaluation, abstraction and reflection on the learning process. There is no consensus on the number of students per group, a middle ground would be between 6 and 12 members. Students assume different roles in group self-organization: leader/chairperson, writer/secretary and/or active members.

Table 2

Problem-Based-Learning – PBL (Continuation)

Element	Descriptive
Teacher role	The teacher acts in a tutorial group to support the students. He creates learning situations in collaboration with other colleagues. He is the facilitator of the process of learning, group work and communication between students. He guides the students' learning process, as he can guide the definition of the problem, the relationship with reality and professional experience, in addition to aim and develop the expected professional profile. He mediates the discussions and productions of the students.
Student role	He is the protagonist of the learning process: he defines their problems of study together with the teacher, establishes a schedule of studies and responsibilities, carries out the individual study and shares it in the study teams. He has control of its own learning in every process and in the elaboration of the possible routes for the solutions to the problem. He needs to know how to work and to share in teams. He assumes different roles in the study groups. He takes responsibility for his and the group learning.
Technology resources	Rooms for work, study and group discussions. Scenarios or problematic contexts, elaborated by the team of teachers. Real or academic problems. Basic references of studies and library for research.

Source: the authors, based on Souza and Dourado (2015); Cerqueira, Guimarães and Noronha (2016) and Moran (2018).

We can conclude that the PBL is an improved active methodology based on project-based learning, with a focus on delimited problems and, especially, for the formation of professionals, although it is not limited to this. As with project-based learning, it is identified that, at the PBL's origin, there were no digital resources as available today.

Technological resources, on the other hand, implied in a new curricular organization of the students, the role of teachers and different school spaces, and tables for study meetings, not more individual chairs, where students sat in rows. These are relevant characteristics that conceptualize the active methodology.

Referring to current resources, this active methodology can also be enhanced by digital technologies, with an important approximation between

the two, as the steps of solving the problem and the basic references of study and library collection can use the same possibilities for learning by project.

A highlight differential for this methodology, is the possibility to create virtual archives of problem scenarios, which can be accessed, updated and feed periodically, including shared consent among universities from all over the world. Among other possibilities are the virtual space for sharing of elaborations, realization of forums and organization of evaluation e-portfolios of each team and of each individual student.

Accomplished by institutions of this century, the PBL, as an active methodology, although of the last century, can operate timely and interesting digital transformations to the teaching and learning process, in the same way that the project methodology incorporates the digital technologies in its step by step.

Table 3

Case study

Element	Descriptive
Source	Harvard Law School, by Chistopher Langdell, in the 1880s. Has undergone changes to be used in managerial areas. It is currently well-known in sociology, law and administration. Methodology little used in Brazil, with little literature and research.
Focus of learning	Case reports of situations occurring in the real world presented to students for the purpose of preparing them for practice at the same time as teaching the theory. A case study always involves a dilemma, which requires a student's positioning. It is rich in description of data and information. It involves the ability to interpret, analyze, elaborate arguments, transfer between theory and practice, persuasion and openness to learn with others, make decisions and review points of view. We do not seek consensus, but the richness of different points of view, based on theoretical foundations.
Underlying Conditions	It requires the elaboration of real cases according to a specific and systematic methodology, which lasts around 1 to 6 months. It is necessary to elaborate a case, considering the selection of the theme and sources; definition of organizations and field visits; definition of the scope, sources of information, communication and schedule with the institutions; to conduct interviews; writing, revision and validation with the company and, finally, preparation of didactic notes. The case study may be confined to one subject or contain interdisciplinary aspects – for this reason, it is deposited in a database. Teaching notes are elaborated that deal with the objectives of didactic approach, and also instruct teachers on the topics of discussion, study materials and different strategies to be used.

Table 3

Case study (Continuation)

Element	Descriptive
Didactic steps	The fundamental didactic aspect of the case study in the teacher's work is its approach with questions that guide the reading, interpretation, analysis, synthesis and decision making by the students. It requires the theoretical study before or during the resolution of the case, using, for that, other methodologies. It contemplates individual moments (interpretation and preparation of possible solutions), debates in small groups (presentation of the possible solution, demonstration of theoretical foundations and capacity for persuasion and even revision of their points of view) and debate in the collective (mediation by the teacher and organization with student participation). The teacher organizes summaries of what is being discussed and evaluates student participation. We suggest self-evaluation by the student of his participation in the application of the method.
Teacher role	To elaborate or select cases. To define prior theoretical study material for mastery by students. To organize and select strategies to apply the method highlighting the focus of the discussion. To be the mediator of the debate, to maintain the focus, to organize the participation of the students and to analyze the contribution of the students. To punctuate and to focus on what you want to discuss and deepen. To stimulate different points of view.
Student role	To be responsible for your quality participation in the application of the method. To prepare and define your arguments with theoretical bases. Listening and respecting others. To know how to position himself without considerable loss of formative quality.
Technology resources	Access to a case archive. Reference material for theoretical studies. Table for synthesis record. Classrooms in appropriate format, curved level or tables with microphones. Online environment specific for use in distance education.

Source: the authors, based on Serra and Vieira (2006); Leal, Medeiros and Ferreira (2018).

Although restricted to business areas, the case study methodology, notably also ancient (19th century), demonstrates its active approach by involving students, both individually and in groups, in order to develop several important cognitive processes for deeper learning, that is, going beyond observation and memorization.

It is clearly identified that this methodology was also used in historical moments in which there were no digital technologies, for this reason the two cannot be confused, because there is such a distance. The reference to its use in on-line environments for distance education was found in the current

bibliography, although in these references there was no evidence of how to conduct the process. In this sense, there is an opportunity to use functionalities such as opening forums, in on-line environments, in an asynchronously[2] way, students leave their contributions, making decisions or maintaining them based on the contribution of others.

Although it is more used in classroom courses, the methodology of case study can also be benefited by the use of digital technologies, with an approximation between both, having an online case archive, which, like PBL, that can be accessed, updated and fed periodically, including with consenting sharing between universities from anywhere in the world. In addition, digital technologies make possible to provide online material for studies, sharing of summaries between students in virtual space, as a prior preparation for the face-to-face moment, besides sharing of the different decision making / solution of the cases as query material.

Table 4

Peer instruction

Element	Descriptive
Source	Created by professor Eric Mazur, of Harvard University (USA), for the course / discipline of introductory physics in the late 1990s. Applied and tested also at the University of Massachusetts, Lowell University and State University of Palachia (Ap) .
Focus of learning	Instruction among students for the conceptual domain with practical application in different situations. From the results of answers to questions of multiple choice, the debate / discussion is carried out among students who, in a language closer to their colleague, help them learn and choose the correct alternative.
Underlying Conditions	It presupposes more structured, preferably unpublished, questions about the contents under study with practical application of the concepts studied. The issues must be challenging, but not excessively difficult. They directly involve all students in the class. Use of digital technologies for instantaneous measurement of student responses during class. Students should prepare / study before class.

Table 4

Peer instruction (Continuation)

Element	Descriptive
Didactic steps	Previous reading or study at home by students of material indicated by the teacher. In the classroom, the following steps are followed: 1. Brief explanation by the teacher of the study material. 2. Students respond to questions through technology with projection of the real-time measurement. 3. According to the percentage of class correct answers to each question, the class goes to: 3.1. Less than 30% of correct answers – retaking of concepts. Ambiguous questions or absence of previous study and difficulty of understanding without teacher's guidance may be the causes. 3.2. Between 30 and 70% of correct answers – discussion between peers, redesigning the questions to reassess; is the key scenario where it is evident how the students help others to change their answers and to achieve success – focus on peer instruction. 3.3. More than 70% of correct answers – explanation as synthesis and progress to the next topic of study. Debate among students makes no sense and is not fruitful in this scenario.
Teacher role	To prepare previously the study material and, mainly, to elaborate questions with good level of application of the concepts, nominated by Mazur (1997) Concept Test – provoking discussions and reflections among the students. Choose and use technologies that favor the process. To mediate the students' learning, organizing and provoking the debates on the questions with divergence of percentage of correct answers. To review the process when most do not go well.
Student role	To take responsibility and commitment to the prior study. To participate actively in classes, both in both answers to the questions and in the explanation, and in debates with colleagues. To review their concepts and knowledge as you discuss with colleagues.
Technology resources	Archive of application questions of concepts for different contents. Classroom with internet access; equipment for teachers and students to carry out the tests, with real-time results and equipment for projection.

Source: the authors, based on Mazur (1997); Pinto, Bueno, Silva and Koehler (2012).

The peer instruction methodology, created a few decades ago, already had digital technologies in favor of what it intended to develop and apply, which, today, certainly have advanced with different free tools available to

teachers. Therefore, it is a methodology that has a very close approximation with respect to the use of digital technologies, leading to the conclusion that it may not occur in the expected way without the necessary digital technological apparatus in the classroom. Focusing on the use of objective questions for practical application of concepts, we visualized that, without digital technologies, the manual processes of testing and measuring match answers to objective questions are time consuming for the teacher and consume precious time that could be reverted to the occupation with student learning.

In this sense, the use of digital technologies is fundamental in the presented methodology, since processes that involve automation and the repetition of data are object of development by the use of big data[3] in computation and can be incorporated by the school institutions, in order to generate more time, devote to learning outcomes than to the process of correcting and computing data, when it comes to objective questions.

However, it is necessary to be clear about the concept of teaching and learning that is being practiced, for the coherence that is expected of a school institution and an educator in the theoretical-practical relation. By adopting the concept of active methodologies, we invest on the student's commitment and responsibility for his/her learning and sharing among colleagues for everyone to learn more and better, which seems to happen in peer instruction. However, when they are restricted to the materials consulted and indicated by the teacher, they do not advance to an actually active methodology, in that sense, they distance themselves. The studies carried out did not present any evidence of learning to happen through experimentation in laboratories and field classes, for example, to go beyond theoretical studies and their practical application, perhaps because of the nature of the discipline in which the methodology was originated.

In this regard, it is also necessary to reflect on what is methodology and technique. We understand that peer instruction is much more a technique than a methodology in itself. A technique is a mean to accomplish something restricted. A methodology implies a framework that influences and intervenes in the ways of organizing the curriculum, in the conception of teaching and of learning, therefore, the role of the teacher and of the student, and also of the evaluation, constituting a methodological proposal, besides the techniques of the classroom.

We identify that peer instruction requires the teacher time and ability to elaborate various questions to check the learning, above all, the practical application of concepts and processes as learning objects. However, it is necessary to investigate how much this model allows to develop and activate diverse cognitive processes, besides the understanding and application – although it is an important initiative, mainly, for being originated in the areas of exact sciences in which the pedagogical processes tend to be more traditional.

Table 5

Flipped classroom – 1st version

Element	Descriptive
Source	Between 2007 and 2008, at Wooddland Park High School, Colorado, USA, created by chemistry professors Jonatham Bergmann and Aaron Sams.
Focus of learning	Students learn in their rhythm. Personalized assistance for those who have more difficulties.
Underlying Conditions	Video production of lessons by the teachers themselves, which they would usually do in the classroom, making them available on the internet for students to study at home. What is traditionally done in the classroom, become carried out at home and vice versa. The classroom becomes a space to ask questions and perform other activities, such as laboratory and problem solving.
Didactic steps	In the classroom, time is organized in: warm-up activity (5 minutes), questions and answers on videos (10 minutes) and guided and independent practice (research activities, problem solving or testing) and / or activity laboratory (75 minutes). By the Cornell method, home-watched videos should become annotations: transcribing important points, recording questions, and summarizing the content learned, such as proving that the video was watched, which will be shared in the classroom with the teacher. When the class is laboratory, there are no videos for home, but preparatory activities for the next day. In the classroom, experiments are carried out under the prior guidance of the teacher and a subsequent video is proposed as homework, afterwards, they finish the laboratory practices in the later class.

Table 5

Flipped classroom – 1st version (Continuation)

Element	Descriptive
Teacher role	Ability to prepare and record videos of the most diverse classes that he usually gives in person. More guiding function and tutorial from videos watched by the student at home. Constant interaction with the students circulating through the classroom and helping them in learning. He provides personalized feedback and supports students with more difficulties.
Student role	Take responsibility for your learning process: watch the videos within your pace – with liberty to "pause" or "return" the teacher's speech as often as necessary. Realization and presentation of school work, especially the annotations of videos watched. Perform and check their activities through the solutions guide and turn to the teacher whenever necessary.
Technology resources	Videos recorded by the teacher himself or selected on the internet. Website or server to make videos available. Study guide for students to follow the lessons.

Source: the authors, based on Bergmann and Sams (2018).

The flipped classroom methodology, although created in the last decade in high school classrooms, may not, at first, seem an active methodology because it only reverses the traditional model of classes, being restricted to the concept of learning based on conventional models, in which explanations ready are spread, centered on the figure of the teacher. On the other hand, using digital technologies substantially modifies the role of the teacher in the classroom, which focuses on student learning, making them responsible for this process, which is a considerable advance.

In this methodology, the emphasis is on the use of digital technology, through the production of video lessons, as a tonic of innovation, placing in the students' hands the "remote control" over their learning pace, as the authors attest, pause or return the video when and how many times they want. This discharge the teacher's in "giving classes", not needing to repeat the same content to different classes. The approach of the methodology with the digital technologies is evident, but is distinguished and distanced of the concept of active learning.

The concept of learning is not active, because it still focuses on the figure of the teacher as transmitter and holder of knowledge. We resume here the concept of active learning defended in this article. It can be said that active learning involves the student's attitude and mental capacity to seek, process, understand, think, elaborate and announce in a personalized way what he has learned, very different from the passive attitude of just listening and repeating the ready-made models. It is notorious, in this concept, the cognitive activity of the learner in any situation, not only restricted to the capacity of memorization and repetition, although this means brain activity.

The authors indicate that there are other flipped classroom models, which are not based only on videos, but for them, however, it is essential in the model they created. The production of videos, with the purpose of flipped classroom, or even as a possibility to teach to students of any place of the world and in the moment that they wish, has expanded considerably in the internet, even in a "homemade" form. Again, this is confirmed by the fact that mechanical and automaton processes can be performed via technology, freeing the teacher and students for more crucial and significant questions of the learning process, in any methodology, whether active or not.

We concluded that the flipped classroom, in the presented form, is a traditional methodology, which has reversed the technique related to the roles of teacher and students, only by benefiting from the possibilities of digital technologies, which is very distant from the concept of methodology and active learning, although it is a considerable advance, since it focuses on student learning in the face-to-face moments with the teacher, and not the teaching.

Table 6

Flipped classroom – 2nd version: inverted learning model for the domain

Element	Descriptive
Source	Same school, site and teachers, who felt challenged to further personalize learning and to make students learn with greater mastery.
Focus of learning	Students achieve a set of self-paced learning objectives, predicted in a curriculum with a particular body of knowledge, in which an objective is a necessary condition for the success of the subsequent objectives, based on Bloom's taxonomy. Deeper learning: understanding and thriving. Learn by strategies of their own preference and not just by videos.

Table 6

Flipped classroom – 2nd version: inverted learning model for the domain (Continuation)

Element	Descriptive
Underlying Conditions	To explore technology to enable learning for the domain. Students advance on video lessons and lab activities according to their pace and tell when they can be evaluated to advance on the domain. The customization is even more evident than the previous one in which everyone still saw the same videos for the same classes. They also utilize the digital technologies easiness for examinations / tests.
Didactic steps	All students work on different tasks, at different moments, committed and engaged in their own learning. For example, one group is ready for the experiment, other to watch a demonstration, other to watch a video lesson, and other still make tests on the computer, while a student may need a particular orientation. Test on computers with immediate results for teacher feedback and guidance on recovery plans. Evolution to prove mastery with other possibilities, besides the tests: oral presentations, PowerPoint presentations, short videos, prose writing and discussions, for example.
Teacher role	To customize and to differentiate the classroom for all students by turning it into different learning spaces. To assist students in developing a plan for how and when to master content. To circulate through the classroom and give constant feedbacks. To clarify misunderstandings, support and motivate students throughout the process. To balance "expectations" and student needs.
Student role	Take responsibility for his own learning with autonomy and self-learning. To choose the best strategies for learning. To announce when he is ready to be evaluated and move forward in the areas foreseen.
Technology resources	Prerecorded video lessons for more feasible goals based on direct instruction. Organizational guides for each course unit available to the students, including: list of objectives, videos and accompanying notes, reading of the textbook, learning activities and laboratories. Test bank in a computer-generated evaluation system.

Source: the authors, based on Bergmann and Sams (2018).

In the process of creating and applying the flipped classroom methodology and analyzing its effects and results, almost a decade after its creation, the authors moved towards a more active model of methodology by seeking greater

customization and quality of learning for the domain, although they still use the inverted model.

In both versions of the flipped classroom, the uses of digital technologies are essential. These methodologies have a direct relation and even confuse themselves with the use of technologies. The use of the digital technology in the first version attended the rhythm of each student to learn the same content, in the same day of class, with an emphasis on video lessons. In the 2nd version, the digital technology is at the service of personalization and management of learning based on data. Personalization moves forward as each student develops the organizational guide at their pace and time, including choosing the learning strategies most appropriate to their profile, and video lessons are available at any time and place, not just at home. Learning management for a growing domain also uses digital technology, resulting in instant results, allowing immediate and personalized feedback to each student, after the application of objective test questions in computer.

The classroom itself gains new contours, organizing itself in different spaces, in order to meet the students' needs. For example, some students may be watching video lessons individually on their smartphone, or tablet, or in groups on a TV; others still debating and performing tasks at a roundtable; others in the experimentation space, following protocols; and, still, others on the evaluation of the on-line environment, each one on a computer.

However, it is emphasized that a great characteristic of active methodologies is to enable students to have mental activities in different cognitive processes, in addition to memorization and repetition, although in different forms of the objective exam/test, which should be researched more deeply to understand how it occurs in this 2nd version of the flipped classroom. Another aspect concerns collaborative and reflexive learning, absent in this proposal, although the movement of students in different stages of learning is mentioned.

Therefore, the flipped classroom, in its 2nd version, approaches and becomes confused with the use of technologies and begins to approach the adopted concept of active methodology. It is reinforced once again that it is necessary to have clear the concept of learning and teaching, related to the curricular development composing a pedagogical proposal, because through this concept the role of teacher and student is delineated, and also the use that is made of the technological resources available, whether digital or not.

Final considerations

In dealing with the thematic active methodologies and digital technologies, the study aimed to discuss its concepts, besides describing the origin and its constituent elements. With this framework, plausible and grounded relationships could be established between the themes. We assumed that active methodologies should not be confused with digital technologies, since there is not necessarily a direct relationship between TDCI and active methodologies. In some discourses and current productions tendencies of compulsory association between TDCI and active methodologies were observed, that is, we affirm in these lines that active methodologies are being practiced, when using digital technologies in the learning teaching processes. The concern was centered in the problematic of unveiling what would be the approximations and distinctions between the active methodologies and the digital technologies.

As an exploratory study, some conclusions can be drawn, but an in-depth study may reveal other findings and even refine or refute what we presented here. The conclusions revolve around the concept of active methodologies and whether or not they can use digital technologies.

One of the first findings is that in identifying the origins of the studied methodologies all have their creation proposed by North American teachers, which could be inferred that the active methodologies have their basis in pragmatist theories and assumptions, widely adopted in the cultural historical thought of colonization, expansion and hegemony of North America.

The concept of active methodologies, as presented throughout this study, is synthesized as one that necessarily implies placing learning as the center of the process, in which students are mobilized, internally and externally, to produce knowledge, with activities that enable development of several and complex cognitive processes, being protagonists of their learning, usually from problems to be solved or thematic to be explored, in the interaction with the teacher and with other students. The emphasis of this concept is on problem solving, a situation that requires students to produce knowledge rather than simply reproducing it. As explained, this process involves the ability to search, analyze, synthesize, elaborate, present, doubt, question, among others. All this process can be carried out with or without the use of digital technologies. However, the uses of digital technologies ease and potentiate this process, as can be demonstrated in the studies carried out.

For these propositions, it is concluded that project learning, PBL and case studies are active methodologies, although they were created and applied even before the development of digital technologies in the educational field. Therefore, active methodologies and digital technologies do not have the same characteristics. There are centuries of distance between these methodologies and the creation of digital technologies. However, at present, these methodologies can and should be enhanced by the use of digital technologies, as detailed in the studies. In this way, TDCI and active methodologies distance themselves conceptually, but they approach as potentialities, because the digital technologies are very useful tools available to educators to improve the learning teaching process.

In its turn, created in this century, the peer instruction methodology and the flipped classroom, in its 1st and 2nd version, were created precisely from the possibilities of using digital technologies in the learning teaching processes. There is an approximation between its origin and digital technologies, so there is often a wrong impression of this imbrication and consequent conceptualization. In the case of the flipped classroom, the use of video recording and its provision is an indispensable situation to realize the proposal. In the case of peer instruction, even if you can correct answers manually, the process is slow and depends on analog technologies to happen. The uses of digital technologies ease teacher work and real-time visualization by students. However, only the use of digital technologies does not make possible to conceptualize them as active methodologies. To assist the teacher, even through video lessons and answers to objective questions, albeit by digital means, are activities typical of traditional methodologies, that is, those still centered on the figure of the teacher and the transmission of knowledge.

Thus, although they can be performed without technologies, it was the use of them, although not created for the educational environment, that pointed out different possibilities for the peer instruction methodologies and the flipped classroom, to be considered as "active", although, from the concepts adopted in this study, they are not.

When considering the term "potentializing", according to its meaning in the online dictionary of Portuguese language dicio.com, "to the possibilities of making more effective, more active, increasing and reinforcing the effects of something", then the methodologies pointed out in this study as non-active, can become active when using digital technologies, although restricted to that

meaning. This is because they seek a more effective learning, yet not active, also making students responsible for this process. They may also not mean deep learning, at various and more complex cognitive levels. It is in this sense that the term "active" methodologies seem to be used, as proposed in the peer instruction and flipped classroom approaches – to use digital technologies to make the process more effective by generating more time to focus on learning. However, it is not clear which learning and at what level.

For this reason, we concluded that the use of digital technologies in the learning teaching processes does not necessarily imply the practice of active methodologies, based on the concept adopted in this study. On the other hand, it is clear that methodologies, whether active or not, can be enhanced by the use of digital technologies, as exemplified in each methodology analyzed. This approach is important and necessary nowadays in any adopted methodology, so that the educational processes are connected to the use of current technological resources, created or not for educational purposes.

However, we reiterated that the concepts of teaching and learning reveal the essence of the methodology, linked to curricular conceptions, the role of the teacher and the student, and the technological resources that contribute to the process. Thus, we emphasize that more in-depth studies are necessary to understand the level of activities required of students, in the peer instruction and flipped classroom methodologies, which really can involve more complex mental processes than simple memorization and understanding, approaching the concept of active methodologies advocated in this study.

It is also necessary to reaffirm the need to differentiate techniques from methodologies. Techniques are understood as a means to accomplish something restricted. A methodology, in turn, implies a framework that influences and intervenes in the ways of organizing the curriculum, in the conception of teaching and of learning, therefore, the role of teacher and student, evaluation and the school organization itself and, mainly, of the classroom, constituting a methodological proposal beyond the techniques.

Notes

1 The term analog is used in reference to the processes that, in the case of the school, are carried out manually, handwritten and physical way in counterpoint to the digital term.

2 The asynchronous form refers to the possibility of students interacting in the on-line environment regardless of the moment. However, everyone accesses the same space, usually on a teaching platform that has the functionality of forums, their contributions that are known by others in the moment and place they could be or wish.

3 Big data refers to programmable technological processes to process and analyze large volumes of information that allow the extraction of useful knowledge, in varying degrees of granularity, that manual methods are not able to collect, in order to improve the process of decision (SCAIO, QUEIROZ; SCAICO, 2017).

Referências

BARDIN, Laurence. **Análise de conteúdo**. Tradução Luís Antero Reto e Augusto Pinheiro. São Paulo: Edições 70, 2016.

BERGMANN, Jonathan; SAMS, Aaron. **Sala de aula invertida**: uma metodologia ativa de aprendizagem. Tradução Celso de Cunha Serra. Rio de Janeiro: LTC, 2018.

CERQUEIRA, Rodrigo Júlio; GUIMARÃES, Loevanil Marcial; NORONHA, José Leonardo. Proposta de aplicação da metodologia PBL (aprendizagem baseada em problemas) em disciplina do curso de graduação em engenharia de produção da Universidade Federal de Itajubá (UNIFEI), **Internacional Journal Active Learning**, Rio de Janeiro, v. 1, n. 1, p. 35-55, jul./dez. 2016. Disponível em: <http://apl.unisuam.edu.br/revistas/index.php/ijoal/article/view/1098>. Acesso em: 12 jul. 2018.

ESTEBAN, Maria Paz Sandín. **Pesquisa qualitativa em educação**: fundamentos e tradições. Tradução Miguel Cabrera. Porto Alegre: AMGH, 2010.

FONTANA, Fabiana Fagundes; CORDENONSI, André Zanki. TDIC como mediadora do processo de ensino-aprendizagem da arquivologia. **ÁGORA**, Florianópolis, v. 25, n. 51, p. 101-131, jul./dez. 2015. Disponível em: <http://oaji.net/articles/2015/2526-1445867359.pdf>. Acesso em: 8 jul. 2018.

GEWEHR, Diógenes. **Tecnologias digitais da informação e comunicação** (**TDICS**) **na escola e em ambientes não escolares**. Dissertação (Mestrado em Educação) – Programa de Pós-Graduação do Centro Universitário UNIVATES. Lajeado, 2016. 136f. Disponível em: <https://www.univates.br/bdu/bitstream/10737/1576/1/2016DiogenesGewehr.pdf>. Acesso em: 8 jul. 2018.

HERNÁNDEZ, Fernando. **Transgressão e mudança na educação**: os projetos de trabalho. Tradução Jussara Haubert Rodrigues. Porto Alegre: Artmed, 1998.

KENSKY, Vani Moreira. O que são tecnologias e por que elas são essenciais. In: KENSKY, Vani Moreira. **Educação e tecnologias**: o novo ritmo da informação. 8. ed. Campinas: Papirus, 2012.

LEAL, Edvalda Araújo; MEDEIROS, Cintia Rodrigues de Oliveira; FERREIRA, Layane Vitória. O uso de método do caso de ensino na educação na área de negócios. In: **Revolucionando a sala de aula**: como envolver o estudante aplicando as técnicas de metodologias ativas de aprendizagem. 2. reimp. São Paulo: Atlas, 2018.

MAZUR, Eric. **Instrução de pares**: um manual do usuário. 1997. Disponível em: <https://edisciplinas.usp.br/pluginfile.php/.../0/Mazur_0.pdf>. Acesso em: 22 jul. 2018.

_____. **Peer Instruction**. Disponível em: <https://www.uq.edu.au/teach/flipped-classroom/docs/FAB/FABPeerInstructionTipsheet.pdf>. Acesso em: 22 jul. 2018.

MORAN, José. Metodologias ativas para uma aprendizagem profunda. In: MORAN, José; BACICH, Lilian (Org.). **Metodologias ativas para uma educação inovadora**: uma abordagem teórico-prática. Porto Alegre: Penso, 2018.

PINTO, Antonio Sávio da Silva; BUENO, Marcilene Rodrigues Pereira; SILVA, Maria Aparecida Félix Amaral; SELMANN, Milena Zampieri; KOEHLER, Sonia Maria Ferreira. Inovação didática – projeto de reflexão e aplicação das metodologias ativas de aprendizagem no ensino superior: uma experiência com "peer instruction". Janus, **Revista de Pesquisa Científica – UNIFATEA**, Lorena, v. 6, n. 15, jan./jul. 2012. Disponível em: <http://publicacoes.fatea.br/index.php/janus/article/viewFile/582/412>. Acesso em: jul. 2018.

SAMPIERI, Roberto Hernández; COLLADO, Carlos Fernández; LUCIO, María del Pilar Baptista. **Metodologia da pesquisa**. Tradução Daisy Vaz de Moraes. 5. ed. Porto Alegre: Penso, 2013.

SCAICO, Pasqueline Dantas; QUEIROZ, Ruy José G. B. de; SCAICO, Alexandre. **O conceito big data na educação**. 3º Congresso Brasileiro de Informática na Educação (CBIE 2014) / 20º Workshop de Informática na Escola (WIE 2014). Rio de Janeiro: SESES, 2017. Disponível em: <http://www.br-ie.org/pub/index.php/wie/article/view/3115/2623>. Acesso em: jul.2018.

SERRA, Fernando; VIEIRA, Patricia Serra. **Manual do estudo de caso**: como redigir, como aplicar. Rio de Janeiro: Lab, 2006.

SOUZA, Samir; DOURADO, Luis. Aprendizagem Baseada em Problemas (ABP): um método de aprendizagem inovador para o ensino educativo. **HOLOS**, Natal, v. 5, n. 31, p.

182-200, 2015. Disponível em: <http://www2.ifrn.edu.br/ojs/index.php/HOLOS/article/view/2880/1143>. Acesso em: 10 jul. 2018

Mestranda Rosilei Ferrarini
Pontifícia Universidade Católica do Paraná (Brasil)
Escola de Educação e Humanidades
Programa de Pós-Graduação em Educação
Mestrado em Educação
Grupo de Pesquisa Práticas Pedagógicas com Tecnologias Educacionais (PUC-PR)
ORCID ID: https://orcid.org/0000-0002-6050-3510
E-mail: ruferrarini1@gmail.com

Prof.ª Titular Daniele Saheb
Pontifícia Universidade Católica do Paraná (Brasil)
Escola de Educação e Humanidades
Programa de Pós-Graduação em Educação
Coordenadora do Curso de Pedagogia e Professora Titular do Mestrado em Educação
Grupo de Pesquisa Aprendizagem e Conhecimento na Prática Docente (PUC-PR)
Grupo de Pesquisa Educação, Meio Ambiente e Sociedade (UFPR)
ORCID ID: https://orcid.org/0000-0003-1317-6622
E-mail: danisaheb@yahoo.com.br

Prof.ª Titular Patricia Lupion Torres
Pontifícia Universidade Católica do Paraná (Brasil)
Escola de Educação e Humanidades
Programa de Pós-Graduação em Educação
Coordenadora e Professora Permanente do Mestrado em Educação
Coordenadora do Grupo de Pesquisa Práticas Pedagógicas com Tecnologias Educacionais (PUC-PR)
ORCID ID: https://orcid.org/0000-0003-2122-1526
E-mail: patorres@terra.com.br

Recebido 31 out. 2018
Aceito 25 jan. 2019