



PEDAGOGICAL PRACTICES AND TRAINING IN HIGHER EDUCATION WITH TECHNOLOGICAL FIELD: A CASE STUDY IN AN INSTITUTION LOCATED IN THE INTERIOR OF THE STATE OF SÃO PAULO, BR

PRÁTICAS E CAPACITAÇÕES PEDAGÓGICAS DE ENSINO SUPERIOR COM DOMÍNIO TECNOLÓGICO: ESTUDO DE CASO EM INSTITUIÇÃO LOCALIZADA NO INTERIOR DO ESTADO DE SÃO PAULO, BR

PRÁCTICAS PEDAGÓGICAS Y FORMACIÓN EN EDUCACIÓN SUPERIOR CON ÁMBITO TECNOLÓGICO: UN ESTUDIO DE CASO EN UNA INSTITUCIÓN UBICADA EN EL INTERIOR DEL ESTADO DE SÃO PAULO, BR

Shara da Silva Queiroz ^{1*} & Manoel Gonçalves Filho ²

^{1,2} Faculdade de tecnologia de Sumaré (FATEC – SMR)

^{1*}shara_queiroz@hotmail.com ²manoel.goncalves01@fatec.sp.gov.br

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*Corresponding Author: Queiroz, S. da S.

ABSTRACT

There is a technological revolution underway that will transform, above all, the way in which information is operated and transmitted. This research identifies facilities and difficulties of higher education professors at a higher education institution in science and technology, referring to active methodologies and technologies for use in the classroom. The objective is to present proposals for improvement/qualification of competences, for new technologies, adequate to the new requirements demanded by the educational institution. The approach is qualitative and the technical procedure is the case study. The results obtained based on the practical experience of professionals with individual technological knowledge and skills, based on the literature, show that there is considerable mastery and clarity. However, customized training is required to use specific technologies for disciplines among the courses offered. The contribution of this work is to present proposals for improvements, being the use of: (i) digital tools – Quizizz, Kahoot, Pear Deck Mentimeter, Trello, Miro, Mural, Mindmeister, Padlet, Jamboard, Symbaloo, Edmodo Blackboard, Notion, Piktochart, Visme, etc.; (ii) active methodologies – learning between teams; less use was identified of some that they know and others that they do not use, such as: Socratic Seminar, Gamification, Inverted Classroom and Hybrid Teaching; (iii) Digital skills – improve skills on digital tools.

RESUMO

Há uma revolução tecnológica em curso que transformará, sobretudo, o meio como se atua e transmite a informação. Esta pesquisa identifica facilidades e dificuldades dos docentes do ensino superior, de uma instituição de ensino superior em ciência e tecnologia, referente às metodologias ativas e tecnologias para uso em sala de aula. O objetivo é apresentar proposições de melhorias/capacitação de competências, para as novas tecnologias, adequadas aos novos requisitos exigidos

pela instituição de ensino. A abordagem é qualitativa e o procedimento técnico é o estudo de caso. Os resultados obtidos com base na experiência prática dos profissionais com conhecimentos e habilidades tecnológicas individuais, embasados pela literatura, mostram que existem domínio e clareza consideráveis. No entanto, são necessárias capacitações customizadas para utilização de tecnologias específicas para as disciplinas entre os cursos oferecidos. Todavia, a contribuição deste trabalho está na apresentação das proposições de melhorias, sendo a utilização de: (i) ferramentas digitais - Quizizz, Kahoot, Pear Deck Mentimeter, Trello, Miro, Mural, Mindmeister, Padlet, Jamboard, Symbaloo, Edmodo Blackboard, Notion, Piktochart, Visme, etc.; (ii) metodologias ativas - na aprendizagem entre times foi identificado menor uso de algumas que conhecem e outras que não utilizam, como: Seminário Socrático, Gamificação, Sala de Aula Invertida e, Ensino Híbrido; (iii) Competências digitais - aperfeiçoar as competências sobre as ferramentas digitais.

RESUMEN

Hay una revolución tecnológica en marcha que transformará, sobre todo, la forma en que se opera y transmite la información. Esta investigación identifica facilidades y dificultades de los profesores de educación superior de una institución de educación superior en ciencia y tecnología, referente a metodologías y tecnologías activas para su uso en el aula. El objetivo es presentar propuestas de mejora/calificación de competencias, para las nuevas tecnologías, adecuadas a los nuevos requerimientos que demanda la institución educativa. El enfoque es cualitativo y el procedimiento técnico es el estudio de caso. Los resultados obtenidos a partir de la experiencia práctica de profesionales con conocimientos y habilidades tecnológicas individuales, con base en la literatura, muestran que existe un dominio y una claridad considerables. Sin embargo, se requiere una formación personalizada para utilizar tecnologías específicas para disciplinas entre los cursos que se ofrecen. Sin embargo, el aporte de este trabajo está en la presentación de propuestas de mejora, siendo el uso de: (i) herramientas digitales – Quizizz, kahoot, pear deck mentimeter, trello, Miro, mural, Mindmeister, padlet, jamboard, Symbaloo, Edmodo Blackboard, Notion, Piktochart, visme, etc; (ii) metodologías activas – Aprendizaje entre equipos, se identificó menor uso de algunas que conocen y otras que no utilizan, tales como: Seminario Socrático, Gamificación, Aula Invertida y Enseñanza Híbrida; (iii) Habilidades digitales: mejorar las habilidades en herramientas digitales.



INTRODUCTION

The training of pedagogical practices with the use of technologies for higher education institutions with the arrival of the 4.0 revolution was marked by the incorporation of machine intelligence, connectivity and data processing (Chaguri, 2022). This research addresses the pedagogical practices and technologies, and seeks to identify which individual technological knowledge and skills are shown by professors on a permanent/indeterminate contract, at a higher education institution in science and technology in the interior of the state of São Paulo-BR. The objective is to present proposals for improvements/qualification of competences for the new technologies of the 4.0 revolution, adequate to the new requirements demanded by the educational institution being studied and the job market, compared to the recognition of good practices of an institution of higher education in science and technology.

BIBLIOGRAPHY REVIEW

The 4.0 revolution is the use of emerging technologies, and education is no different. It is the way of understanding the various available technologies, learning to use them to bring students closer to school, making learning more interactive to obtain better results (Canto et al., 2019). It is complemented by Chaguri (2022) on what it takes to implement the Information and Communication Technologies (ICTs) of the 4.0 revolution, pointing out: (i) outdated infrastructures for the application of new technologies, (ii) cultural transformation that must occur to meet new needs, and (iii) present an assessment of the confrontations to achieve the minimum requirements necessary for the implementation of technologies. Above all, there is a need to consider individual difficulties for the digital transformation of education and the lack of continued training of digital skills for students and teachers (Abellon, 2015).

Oliveira e Souza, (2020) and Garofalo (2018) report that the digital transformation in education, in addition to the use of technology, digital skills needed by students and teachers, it is important to adopt innovative pedagogies and practices.

Santos (2021) reports on the practices of active methodologies that are usually associated with technology. However, according to the author, what will make the difference is to carry out actions in which students can get involved and engaged. The ways of using active teaching methodologies, indicated by Goularte and Arenas, (2021), are: (i) Flipped Classroom: in this practice, the teacher initially proposes that students perform a specific task or simply research before a class; (ii) Hybrid Teaching/blended learning: teaching modality that combines face-to-face classes with distance education (EAD); (iii) Project based learning: has several definitions, being a very broad concept that seeks to teach curricular concepts to students by integrating several disciplines, ideally based on real problem-situations of the school context and the students, seeking a solution in the form of a product - involving hypotheses, investigations, construction of a plan for the solution and a lot of collective and collaborative work. Gamification: it is a methodology that uses game elements in the learning process, increasing student engagement and autonomy in the proposed



activities. In Team-Based Learning (TBL), students are gathered in small learning groups, in the same physical space, to solve challenges launched before, during or after classes.

Budin and Lopes (2019) mention that changes for development, based on technology, must start from the whole. Silva and Behar (2022) point out the need for a corporate pedagogical strategy to establish and apply a pedagogical architecture for building digital skills, such as: taking care of technical skills; obtaining aptitude for carrying out the activities; ensuring qualification to carry out procedures, and presenting evaluation proposals. According to the authors, with the use of materials in different formats, namely: texts, games, learning objects, among others.

There are digital tools/applications used in the market to: increase engagement; conflicts and problem resolution; knowledge and simulation; debates and exposition of understanding. These technologies are: (i) Content creation: Genially, Canva, Flipgrid, Piktochart, Loom, Visme, Powtoon, Prezi, Nearpod, Office Suite, Google Suite, Thinglink. Generally used for creating some file or material; (ii) Communication and community: Teams; Telegram; Discord etc. Meetings or availability of both academic and professional study materials; (iii) Learning Assessment: Kahoot; quizz; Google Forms; Pear deck Mentimeter, among others, contributes to creation for interaction, formative assessment in classes, quizzes in web conference format; (iv) Organization of ideas and blackboards: Miro; Mural; Mindmeister; Trello; Padlet; Jamboard can be used to build schedules, timeline, portfolio, messages and meetings (v) Content management: Moodle; Symbaloo; Canvas; Google sites; Edmodo Blackboard; Notion; etc. They are able to provide online courses, classes and training, focusing on distance learning (vi) Educational content: Youtube, Google, Google Scholar, Ted, Slideshare, Podcast, Medium, Khan Academy, Deepstash, Duolingo. are online platforms that allow the creation and use of videos or learning (Oncare, 2021).

In order to learn and improve, training is needed to understand specific subjects, initially through the development of basic skills. One technique used to learn about any subject effectively is the Feynman technique (Richard Feynman). This technique is advantageous because the best way to learn about something is by explaining it, sharing knowledge to multiply learning (Barbosa, 2021).

METHODOLOGY

This research has a qualitative approach. According to Ludke and André (1986), the approach considers different points of view of those involved in the interviews. Therefore, according to the authors, it enables subjective analysis, that is: the researcher's perception of the information coming from the field is considered.

The objective is bibliographical and exploratory, and materials such as articles, books, dissertations and specialized websites were used, preferably from the last 10 years on the main theme, in Portuguese, Spanish and English, to identify theoretical assumptions (PT) that supported the practical results of this research. For the survey of materials, three databases were used: (i) Academic Google; (ii) journals CAPES - Coordination for the



Improvement of Higher Education Personnel, and (iii) Academia.Edu. The keywords used in the databases were: technologies of the 4.0 revolution; challenges of the 4.0 revolution; skills profile; technological skills and; education 4.0.

The research has an explanatory character, according to Gil(2017), the objective is to analyze the way things come together and interact, identifying the phenomena and clarifying the reason for things in a practical way, enabling the generation of knowledge through the application identification and explanation of facts.

The comparative method was adopted, which consists of investigating things or facts, explaining them according to their similarities and differences (Fachin, 2001). In the case of this research, the findings in the literature were compared with the surveys carried out in the field, in order to present proposals for improvements.

The technical procedure used is the case study, which provides the experience of real situations and applies the techniques learned to solve problems (Yin, 2001). According to the author, the case study requires the researcher to have basic skills, such as: being able to ask good questions; be a good listener and not be fooled by your own ideologies and prejudices; be flexible to see situations as opportunities rather than threats; have a clear sense of the issues being studied, and be impartial to preconceived notions. The author observes that if the researcher does not have these basic skills, he should be able to develop them.

Conducting a case study can be seen, according to Miguel(2007), in six stages for its conduction, namely: (i) Defining a conceptual-theoretical structure – mapping the literature, outlining propositions, delimiting the boundaries and degree of evolution; (ii) Plan the cases – select the units of analysis, choose the means for data collection and analysis, develop a protocol for data collection; (iii) Conduct pre-pilot testing – test application procedures, verify data quality, make necessary adjustments; (iv) Collect data – contact cases, record data; (v) Data Analysis – reduce a new narrative, reduce data, build panel, identify causality; and (vi) Generate reports – draw theoretical implications and provide structure for replication.

The unit of analysis is an institution of higher education in science and technology has 511 enrolled students; it offers two technological graduation courses, and it is part of a conglomeration of teaching units spread throughout the state of São Paulo. It is located in the Microregion of Sumaré-SP (MRS). However, the conglomerate has 75 higher education units located in several cities in the state of São Paulo, distributed in 69 municipalities in São Paulo, namely: Adamantina, Americana, Araçatuba, Araraquara, Araras, Assis, Barretos, Barueri, Bauru, Bebedouro, Botucatu, Bragança Paulista, Campinas, Capão Bonito, Carapicuíba, Catanduva, Cotia, Cruzeiro, Diadema, Ferraz de Vasconcelos, Franca, Franco da Rocha, Heron, Guaratinguetá, Guarulhos, Indaiatuba, Itapira, Itapetininga, Itatiba, Itu, Jaboticabal, Jacareí, Jales, Jau, Jundiaí, Lins, Marília, Matão, Mauá, Mococa, Mogi das Cruzes, Mogi Mirim, Osasco, Ourinhos, Pindamonhangaba, Piracicaba, Pompéia, Praia Grande, Presidente Prudente, Registro, Ribeirão Preto, Santana de Parnaíba, Santo André, Santos,



São Bernardo do Campo, São Caetano do Sul, São Carlos, São José do Rio Preto, São José dos Campos, São Paulo, São Roque, São Sebastião, Sertãozinho, Sorocaba, Sumaré, Taquaritinga, Tatuí and Taubaté.

Therefore, data collection was carried out at one of the conglomerate's institutions, within MRS, through semi-structured interviews. Nevertheless, a questionnaire with open questions was created to facilitate the interviews with professors at the institution of higher education in science and technology being studied. The profiles of the interviewees were based on the selection of professors with different academic backgrounds in the unit of analysis, and are shown in Table 1.

Table 1. Profiles of respondents

interviewee	Title	Training Area	Function	Time in Experience
E1	Business management	Master's in Education management	higher education teacher	10 years (teaching)
E2	Psychology and Business Management	Master's Degree in Social Psychology and post in entrepreneurship	higher education teacher	14 years (teaching)
E3	Mathematics	Masters in Mathematics	higher education teacher	10 years (teaching)
E4	Business Administration	Master in Business Administration	higher education teacher	11 years (teaching)
E5	IT for management of business	Post in quality, post in ICT project management	higher education teacher	13 years (teaching)

Source: Authors.

The interview participants were chosen because they all have an indefinite contract, have more than 10 years of experience and are professionals at the higher education institution.

Therefore, the subject developed in this work transited through various methods and technical research procedures that were used to support the study, and can be considered of the multimethod type (Morini and Pires, 2005). However, in short, the different phases of content analysis were also followed and organized around three steps, as proposed by (Bardin, 2016), namely: (i) pre-analysis through literature review; (ii) exploitation of available material; and (iii) treatment of results, inference and interpretation presented in the chapter on analysis and discussion of results. Thus, after defining the theoretical conceptual structure, planning the case – unit of analysis, defining the sample, conducting the pre-pilot test of the questionnaire and interviews, collecting and analyzing the data, the results of the case study were discussed with the theoretical implications to generate the final report.

RESULTS AND DISCUSSION

Based on the literature, it was possible to identify the contributions and recommendations of the authors for an analysis and application of the research method, on the knowledge and individual technological skills, of teachers under permanent/indefinite contract, in an institution of higher education in science and technology.

Prior to the interviews, a pre-test of the questionnaire was carried out to improve the questions that would be addressed, promoting the exclusion and restructuring of the order



of approaches to eliminate redundancies and improve the focus on the main objective of the research.

But there was a doubt as to whether the same opportunity for technological development would be offered to professors on a permanent/indeterminate contract at a higher education institution in science and technology. From the survey of data collected in the field, based on the practical experience of professionals in the educational field on the characteristics of teaching at a higher level, comparisons were made with the recommendations in the literature and opportunities were identified to present proposals for improvements in the process.

All respondents were unanimous about the existence of training and qualification provided by the institution. Respondents mentioned that all professors at the institution undergo training at least twice a year (at the beginning of each semester), through a program known as Pedagogical Planning and Improvement Week (SPAP), to improve knowledge and develop skills and abilities. Through the SPAP and with the theme “the development of digital competences”, the seventh edition was exclusive and offered training for digital competences, seeking to improve skills in the use and development of technological tools, since the exploitation of technological and digital resources promotes development. student engagement and better use of classes. The training for teachers was applied at a distance (EaD) - through the Canvas platform and with practical activities and examples brought during the approach of the contents. The participants who concluded the training received certificates in the following topics: Active Methodologies Module on 05/02/ 2023 and Information and Communication Technology (ICT) module on 06/5/2023, with a workload of 36 hours per module. The objective of these trainings was to contribute to the better performance of the teaching activity on digital skills and to obtain information on the subjects for which they moderately knew.

Table 2 shows the results of this survey carried out prior to the training offered by the seventh SPAP.

Table 2. Compression on digital skills of respondents.

Skills Mentioned	Compression About What It Is	interviewee
Pedagogical; Digital Citizenship and Academic/Professional development	Ability to make safe and critical use of information technologies in the classroom	E1
Use of software, digital systems, digital teaching methodologies	Skills for the use of ICT	E2
Knowing how to conduct research on reliable sites, use software to elucidate reasoning and teamwork	The importance of using software to assist in the teaching-learning process, knowing how to better assimilate the skills of the subject and being able to use new technologies at ease	E3
Intellectual skills in handling notebooks, tablets, smartphones and related applications for work, research and leisure	Learn and develop technological skills in addition to knowledge and attitudes for a good use of these technologies	E4
Electronic devices, communication system, data analysis, data security, computational thinking, among others	Digital skills the use of technology as a competitive factor in the market	E5

Source: Original research collections (2023).



It was possible to verify the new educational context after the technological digitization in the institution. Three of the interviewees (E1, E2 and E4) commented on the term: digital and technological illiterate, that is, there are people who do not know about technologies or know little about them. Oliveira and Souza (2020) corroborate and report that the digital transformation in education goes beyond the use of technology and digital skills needed by students and teachers, with the adoption of pedagogical and innovative practices being equally important.

About the term “emerging technologies”: in the understanding of E5, they are tools that are growing and fostering learning for larger applications. E1, on the other hand, understands that they are about new technologies/trends that are emerging. E2 mentions that these are new technologies that are being introduced into the market. E3 reports that the term favors access to databases. Finally, E4 understands that emerging technologies are all the growing technological knowledge associated with contexts: big data, digitization of information, collection of product and customer data, among others.

However, there are some opportunities and challenges in the implementation of technologies for higher education institutions. Everyone agrees that there is a certain financial and physical infrastructure deficiency on the part of the student and the institution. But, it was pointed out by E5 that the institution seeks and has enabled investments. However, E1 reports that this is not an obstacle to the student's growth, who must seek means and alternatives to learn and get involved.

The lack of knowledge and/or use of certain active methodologies in an individualized format was evidenced, interviewees 3 and 5 reported not frequently using certain Active methodologies, but using others. Table 3 presents a summary of the active methodologies available in the literature and their use by the professors of the unit of analysis.

Table 3. Use of active methodologies

Active Methodologies	Know and use	Knows, used and/or no longer uses	Does not know and therefore does not use
PBL	E1; E2; E3; E4 e E5		
Socratic Seminar	E1; E4	E2; E3; E5	
Gamification	E2	E1; E3; E4; E5;	
Flipped classroom	E1; E2; E3	E4; E5	
Blended Learning	E1; E2	E3; E4; E5	
Learning between Teams		E1; E2;	E3; E4; E5

Source: Original research collections (2023).

Gaps were seen on the six active methodologies during the interviews, in which less use of some was identified, although everyone knows PBL. The PBL know, but the E3 and E5 don't usually use it. However, the other interviewees make use of the methodology. E3 added two new methodologies: storytelling and scout movement (learning by doing). Three of the interviewees (E3, E4 and E5) do not know about Learning between Teams, but E1 and E2 do.

In the context of technologies and digital media in an individualized format, respondents know between 15-18 out of a total of 40 tools mentioned in the survey. Applications for creating and managing content (Genially, Canva, Flipgrid, Piktochart, Loom, Visme, Powtoon, Prezi, Nearpod, Office Suite, Google Suite, Thinglink, Moodle, Symbaloo, Canvas, Google



sites, Edmodo Blackboard, Notion) were less commented on by the interviewees, most of them did not know the tools. Only E1 and E2 knew some content creation and management tools, E1 knew and used: Google Suite, Office Suite.Moodle; and E2 used: Google Suite, Office Suite, Google Sites. On the other hand, they knew but did not use: Canvas, Prezi. In the Communication and Community part: all respondents knew the tools, but E1 knew and did not use: **Telegram**. Learning assessment and Organization of ideas and tables: Kahoot (know and use: E1, E2, E3 and E5); Quizizz (knows and uses: E4; and knows and does not use: E5); Google Forms (all interviewees know); Trello (E2 and E5 know); Miro (E1 and E5 know). Only E1 knows the apps: Mindmeister and Jamboard. And respondents don't know: Pear Deck Mntimeter; Mural and Padlet. In the Educational Content group, everyone in the interview knew Youtube, Google, Google Scholar. The other apps-tools: Slideshare (knew, but not used: E3 and E4), Podcast (knew and did not use: E1, E4 and E5), Medium (knew and used: E1), Khan Academy (knew and used: E2 and E3), Deepstash (knew and used: E1), Duolingo (knew but did not use: E2, E3, E4 and E5). The one none of them knew about: TED. Table 3 presents a summary of apps-digital tools available on the market and their use by the professors of the unit of analysis.

Three applications were added by E3: WolframAlpha; Geogebra; Chatgpt. Loureiro et al.(2020) argues that the incorporation of digital tools in education and their use, especially in higher education, are necessary as part of a strategy to better teach and learn in digital environments.

However, from Table 4 the main theoretical implications were presented - Categories of Analysis (CA), in a comprehensive and relevant way of what was used from the theoretical review in the case study and in the results of this research. For each CA, proposals for improvements/developments were prepared. In this context, the contributions worked by the authors - Theoretical Assumptions (PT) were detailed, compared to the findings of the field interviews of the case study of this research for the recognition of proposals for improvements/development.

Tabela 4. Use of apps-tools.

Group	APPS-tools	Know and use	Knows, used and/or no longer uses	Does not know and therefore does not use
Communication and community	<i>Teams; Telegram; Discord</i>	<i>Teams; Discord; Telegram</i>	<i>Telegram</i>	-
learning assessment	<i>Kahoot; Quizizz; Google forms; Pear deck Mntimeter; etc.</i>	<i>Kahoot, Google Forms;</i>	<i>Quizizz</i>	<i>Quizizz, Kahoot e Pear deck Mntimeter</i>
Organization of ideas and boards	<i>Miro; Mural; Mindmeister; Trello; Padlet; jamboard; etc.</i>	<i>Miro; Mindmeister; Trello; Wolfram Alpha; Chat GPT; Geogebra; jamboard</i>	-	<i>Trello; Miro; Mural; Mindmeister; Padlet; jamboard</i>
Content creation and management	<i>Genially, Canva, Flipgrid, Piktochart, Loom, Visme, Powtoon, Prezi, Nearpod, Office Suite, Google Suite, Thinglink, Moodle; Symbaloo; Canvas; Google sites; Edmodo Blackboard; Notion; etc.</i>	<i>Google Suite, Office Suite; Moodle; Google Sites;</i>	<i>Canvas; Prezi</i>	<i>Symbaloo, Edmodo Blackboard; Notion; Genially, Flipgrid, Piktochart, Loom, Visme, Powtoon, Nearpod, Thinglink,</i>



Educational content	Youtube, Google, Google Scholar, Ted, Slideshare, Podcast, Medium, Khan Academy, Deepstash, Duolingo	Medium; Google Scholar; Youtube; Deepstash, Google; Khan Academy;	Podcast; Duolingo; Slideshare;	Ted, Slideshare, Podcast, Medium, Khan Academy, Deepstash, Duolingo
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Table 5. Main aspects applied in the research results.

Analysis Categories (Ca)	Theoretical Assumptions (Pt)	Authors	Improvement / Development Proposals
digital tools	Content creation; Communication and community; Organization of ideas and blackboards; Content management	Loureiro et al., 2020; Oncare, 2021	Make digital learning objects available: games, simulations, video lessons, animations to facilitate the learning process. In addition to availability, the proposal is in the use of tools and in the quest to learn and use them in the classroom
active methodologies	Flipped classroom; Learning between teams; hybrid teaching; Project-based learning and gamification	Camargo, 2018; Santos, 2021; Gaularte & Arenas, 2021.	Proposals for the training and development of professors worked on by the teaching institution in a customized way by discipline/teacher are relevant. A final assessment of individual learning, based on the application of the FEYNMAN methodology (teaching and learning – sharing to multiply) may be valid
Emerging Technologies	Artificial Intelligence (AI); DataOps; Internet of Things (IoT); BigDate; Augmented Reality (AR); Blockchain and Combinable Networks	Canto et. al., 2019	
digital skills	Professional skills of educators; pedagogical competences of educators and competences of learners	Loureiro et al., 2020; Silva & Behar, 2022; Lucas & Morera, 2018	Promote a pedagogical architecture, based on the construction of the necessary digital skills, to stimulate, improve and develop

Source: Original research collections (2023).

FINAL CONSIDERATIONS

Using the qualitative approach, subjective analysis and comparative method between the perceptions of the interviewees with the literature recommendations, it was possible to carry out a case study in a unit of analysis of the educational sector, located in the interior of the State of São Paulo. The institution's employees (unit of analysis) have their way of working altered by the use of active technologies and methodologies.



Doubts about the development opportunities of professors under a permanent/indeterminate contractual regime were resolved, it was identified that professors have general and robust knowledge about the various topics covered in the research, such as: digital tools; active methodologies; emerging technologies and digital skills.

The necessary customized training for the use of specific technologies for the disciplines among the courses offered are: (i) digital tools – Quizizz, Kahoot, Pear Deck, Mentimeter, Trello, Miro, Mural, Mindmeister, Padlet, Jamboard, Symbaloo, Edmodo, Blackboard, Notion, Genially, Flipgrid, Piktochart, Loom, Visme, Ted, Slideshare, Podcast, Medium, Khan Academy, Deepstash and Powtoon; (ii) active methodology – Learning between teams is not used by any of the interviewees, however, two of them know and less use of others was identified, even though they know they do not use it, namely: Socratic Seminar, Gamification, Flipped Classroom.

Therefore, the guiding question of this research - which are the individual technological knowledge and skills shown by professors under a permanent/indeterminate contract, in a higher education institution in science and technology, located in the interior of São Paulo - was answered.

The identified opportunities are limited to only five interviewees; they were not investigated by discipline, but were identified for future realization of the survey of the individual need in each of the higher education disciplines for the realization of a learning that directs the teaching and classroom use.

In the view of the five interviewees, directing and maintaining financial resources and adapting the infrastructure to place new tools and equipment in the institution and classrooms can contribute in more productive ways to the training of employees and, consequently, of students. For the infrastructure, updated technological equipment and software and adapted environments are required.

The proposals for improvements and the real contribution of this research are: (i) for active methodologies and emerging technologies, the application of the FEYNMAN methodology (teaching and learning) was considered, after offering individualized practical training, it generated sectorizations that led to the divisions based on the identified individual facilities and difficulties and learning between teams; (ii) customized training by professor according to the needs of the discipline for several digital tools: Quizizz, Kahoot, Pear Deck, Mentimeter, Trello, Miro, Mural, Mindmeister, Padlet, Jamboard, Symbaloo, Edmodo, Blackboard, Notion, Genially, Flipgrid, Piktochart, Loom, Visme, Ted, Slideshare, Podcast, Medium, Khan Academy, Deepstash and Powtoon. The proposal is to emphasize the use in the classroom and keep those that are already known, encouraging teachers to seek, learn and operate; (iii) continuously improve or develop the various digital skills, perfecting the skills to use and develop knowledge about digital tools, maintaining those that are already



used through a pedagogical architecture, by defining the structure according to the needs of these skills.

Therefore, the objective of this research is to present proposals for improvements/skills training, for the new technologies of the 4.0 revolution. Through the identification in the literature of concepts, tools and technologies for use in the classroom, compared to the recognition of the institution's good practices, they were recognized and registered.

The delimitation of this work lies in the subjective analysis carried out by the researchers according to the notes of each interviewee, quantity of analysis unit (institution of the case study) and sample (interviewees in the research), in which they do not offer possibilities of generalization and replication for a larger number of institutions, restricting only the case study institution.

Proposals for future work are: (i) Seeking means to master the analysis categories (CA) of this work, namely: emerging technologies, active methodologies, digital skills and digital tools, to identify the facilities and difficulties of teaching education technological superior; (ii) investigate other software, equipment and forms of learning assessment, to contribute to the training of teachers and students; (iii) carry out research with a quantitative approach with a larger number of analysis units and interviewees to replicate the results and contributions to the entire educational sector; (iv) carry out survey research to identify individual/customized needs by teacher and discipline, on technological capabilities for use in the classroom; and (v) research and design a pedagogical architecture for an educational institution through the necessary digital skills individualized and identified in the educational sector.

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