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Evaluation of the Digital Proficiency Level of Teachers from the Federal Institutes of the State of Maranhão

Avaliação do Nível de Proficiência Digital dos Professores dos Institutos Federais do Estado do Maranhão
Evaluación del Nivel de Competencia Digital de los Docentes de los Institutos Federales del Estado de Maranhão

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ABSTRACT:
This scientific investigation aims to evaluate the relationship between technology and digital competences in education in the teaching-learning process in educational institutions in the contemporary world, whose fundamental function is the intellectual and professional training of the subjects. In this sense, the work entitled "Evaluation of the level of digital proficiency of teachers at Federal Institutes of Maranhão", sought to assess the level of digital proficiency of teachers at Campi of Federal Institutes in the State of Maranhão. The questionnaire proposed by DigCompEdu "CheckIn" EU Science Hub (Science Center of the European Union) was used to analyze the self-reflection of professors at Federal Institutes in the State of Maranhão.

KEYWORDS: Education. Technology. Teacher. Digital competence. IFMA.

Introduction

The phenomenon of globalization arising from technological innovations has transformed contemporary societies into societies of human beings without borders, in such a way as to provoke permanent changes in social relations that become increasingly complex. This panorama imposes on people new paradigms of thought and actions to meet the needs of the contexts and environments in which they operate for the exercise of their social, intellectual and professional activities, since the use of technology has become preeminent for our doings in all dimensions.

In this complex universe, Education establishes itself as the territory holding the power to amalgamate all human creations and actions, since it is the mentor of all spheres of knowledge. Concerns with the teaching-learning process, whose actors are teachers and students, permeate the entire history of education, since the process of teaching, of doing teaching, goes far beyond a simple mechanical act of "passing on"

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contents ready, but it requires multiple skills from the teacher to achieve the goals, as Melo (2018) reasons well:

> The new education paradigms demand a professional teaching performance that bypasses the pedagogical practice, despite the traditionalism of oral presentations, memorization and repetitions, of the teacher at the center of the teaching and learning process. On the contrary, they require skills, such as innovation and creativity, which they can extract from their students, accustomed to the use of digital technologies, knowledge, based on independent thinking (MELO, 2018, p.43)

The dialogue between Education and Technology establishes the computer as a resource with flexibility to adapt to the different individual needs of students and teachers, which is why the pedagogical activities, that use such resource, must be linked to educational principles. Thus, technology has occupied the school space, as an instance inherent to it, regardless of the teacher's previous preparation, imposing new challenges in pedagogical performance, with a reformatted posture of its doings, to meet the constant dynamics of innovation of the society, to the detriment of traditional and individualistic paradigms, where the teacher was the sole responsible and holder of knowledge.

Virtual technology has blurred the boundaries of concepts and perceptions of what is real and what is virtual, placing the real and the virtual on the same line. If, on the one hand, it can collaborate with the teaching-learning process, on the other, it can generate incoherent concepts and procedures of what this process is, leading both the teacher and the student to adopt ineffective conducts and behaviors to the proposal of education in contemporary times.

In this sense, Trindade and Moreira (2018) observe that digital technology has generated different possibilities, so that difficulties have arisen in distinguishing what is real or virtual.

The integration of the most contemporary means of communication, which are provisionally called Information and Communication Technologies (ICT), to educational processes is an urgent and necessary task, as such techniques are already present in all spheres of social life, in many cases generating or aggravating sociocultural inequalities.

It is known that the change in educational practice is essential for the training of students who, although they do not have access to a computer at home, find themselves in a computerized environment, in which digital inclusion becomes a visible need.

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Considering that education reflects the characteristics of its time and of the society in which the Educational Institution is inserted, transformations and technological advances in the forms of communication and information become visible. However, it appears that the incorporation of these technological innovations and teaching methodologies has not happened in most schools.

Given the above and considering the relationship between the digital competences of educators and technology, we bring as a central question to this research: What is the level of digital proficiency of the teachers at the Federal Institute of Maranhão?

General objective of the research was to analyze the level of digital proficiency of teachers from the campuses of the Federal Institute of Maranhão –IFMA, based on the DigCompEdu "Check in". The Specific Objectives were: To measure the digital competences of educators; Diagnose the level of pedagogical skills with regard to digital knowledge; Understand the aspects related to the promotion of students' digital competence; Identify possible differences in results from demographic and functional data of participants;

The research was justified by the change in the role of new technologies as an educational means, along with the questioning of the role of the school and the role of the teacher. The real function of the educational apparatus should not be to teach, but to create conditions for learning. This means that the teacher needs to stop being the conveyor of knowledge and become the creator of learning environments and the facilitator of the student's intellectual development process.

It is undeniable that digital inclusion in the teaching-learning process causes overcoming gaps in teaching, and the individual will be better prepared to deal with these situations outside of school. In a society already known as "computerized" the new technologies propose to the school a change in its pedagogical practices.

In this context, the present work is relevant to the academic environment, as educators constantly seek a better use of digital platforms, from the use of active learning methodologies to improve the knowledge passed on to students.

From a social perspective, the theme is justified by the fact that technology has favored the link between student and curriculum content; in this way, the social relevance of the work is directed to the whole society, as it presents the importance of technology in the intellectual formation of humanity.

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The globalized world has given new meaning to education and teaching work, leading the school to break with the historical paradigms of education to face new challenges, with new teacher training policies, in a context of the so-called "new technologies" or, more precisely, information and communication technologies (ICT).

The globalizing complex highlights the so-called scientific-technological revolution as an undue conceptual extrapolation, motivated by technological determinism (LERÉR, 2000), since technologies may not be seen as historical-social productions, but as a determinant of the origin of changes that, by in turn, they support the concept of "information society".

From this perspective, the "information society" is characterized as an articulation of theoretical, economic and political undertakings. In the context of studies on technology and education, it is possible, then, to distinguish those who depart from their questioning from those who assume such a society as a presupposition, since it is precisely at the level of presuppositions and implicits that ideology operates in the discourse (BARRETO, 2004).

These changes resulting from new technologies in the educational environment happen together with the questioning of the school and the role of the teacher, as education should not only teach, but also provide conditions for learning. This means that the teacher is not a mere conveyor of knowledge, but rather a creator of learning environments and a facilitator of the teaching process.

In the educational context, digital tools enable the emergence of new pedagogical practices from the interaction between the student and a particular activity with the objective of learning, as Dias –Trindade et al (2019) argues:

> Given the current technological challenges facing Education, the use of digital technologies and platforms, virtual learning environments and social networks becomes an unavoidable reality, arousing the interest of the academic and scientific community and increasing the need for training teachers (DIAS-TRINDADE et al, 2019, p. 2).

Before the difficulties of transforming pedagogical attitudes rooted within a traditional environment, it becomes convenient, perhaps even necessary, to transform teaching environments. In this sense, Moreira and Dias-Trindade (2018):

> As online environments are collective and collaborative spaces for communication and information exchange, they can facilitate the

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> creation and development of communities of practice or learning as long as there is an explicit educational intention. Thus, understanding how to teach and learn, formally or informally, in collaborative learning spaces, in a network on the Internet, and in mobility, is one of the great challenges facing all educators (MOREIRA; DIAS-TRINDADE, 2018, p. 2).

In this perspective, information technology has acquired great relevance in the educational scenario, since its use consists of a learning tool that causes structural and functional changes in the face of new technologies. With regard to the educational environment, current technology resources, new digital media (multimedia, internet), bring with them new ways of reading and writing, consequently, new ways of thinking and acting.

Digital Competence in Education

With regard to digital competence, Ferrari et al (2014) argue that the confident and critical use of information technology is involved in which tools are used to assess, retrieve, store, produce and exchange information in collaborative networks.

> The introduction of digital technologies in different scenarios and environments of human activity, including education and training, has contributed to the design of learning models and methodologies based on cooperation among its members. The acquisition of this type of skills, cooperative and collaborative, is of great relevance in the area of education and should be transversal to all scenarios in people's lives (DIAS-TRINDADE et al, 2019, p. 3).

A few years ago, digital competence was closely related to the computer. However, nowadays, this relationship extends, reaching media such as cell phones, televisions, video games.

From the perspective of From (2017), digital competence is related to the ability to consistently apply attitudes, knowledge and skills in teaching based on information and communication technologies.

Referring to a wide range of devices, digital competence requires quick and practical adaptations. The aforementioned authors also add that digital competence can be defined as the ability to use digital technologies.

Pettersson (2018) states that over the years, the concept of digital competence has been increasingly disseminated. In Europe, it has been used in describing skills needed in the digital social context. Therefore, the more teachers work with this cultural

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production in an interdisciplinary and creative way, the greater their contribution to quality education.

> In this context, it is essential that teachers themselves know how to appropriate the advantages of these technologies, and use them to create new learning environments that are more motivating, more stimulating and, above all, are able to develop, in their students, the essential skills for its integration in this new digital age of the 21st century (MOREIRA, 2018, p. 8).

Digital education needs skills to be fostered, combining knowledge and attitude. In this regard, the department of the European Union, EU Science Hub, created the DigCompEdu Checkin, in order to identify competences educators so that they can make significant use of the digital technologies and innovating education.

Ferrari et al (2014) add that the launch of the study was carried out by the JRC-IPTS, that the translation is valid as a Joint Research Center - JRC, administrative unit, in order to contribute to a better understanding of digital competence from development of the digital competence framework in Europe. The project took place between January 2011 and December 2012, following a structured process: conceptual case study analysis, online consultation, workshop closes and stakeholder consultation.

The first phase involved collecting data from different sources, such as academic and policy literature, tables and expert opinions. The project was then submitted to a designated group of experts for reiterative feedback and consultation. More than 150 stakeholders actively contributed to the construction and the result was presented at different stages of development at various seminars and conferences.

According to Ferrari et al (2014), the DigComp framework consists of five areas of digital competence and 21 competences detailed in three levels of proficiency, consisting of a matrix with different dimensions. This table is presented in the form of a table form (Figure 1).

Figure 1. Aspects evaluated by DigCompEdu Checkin

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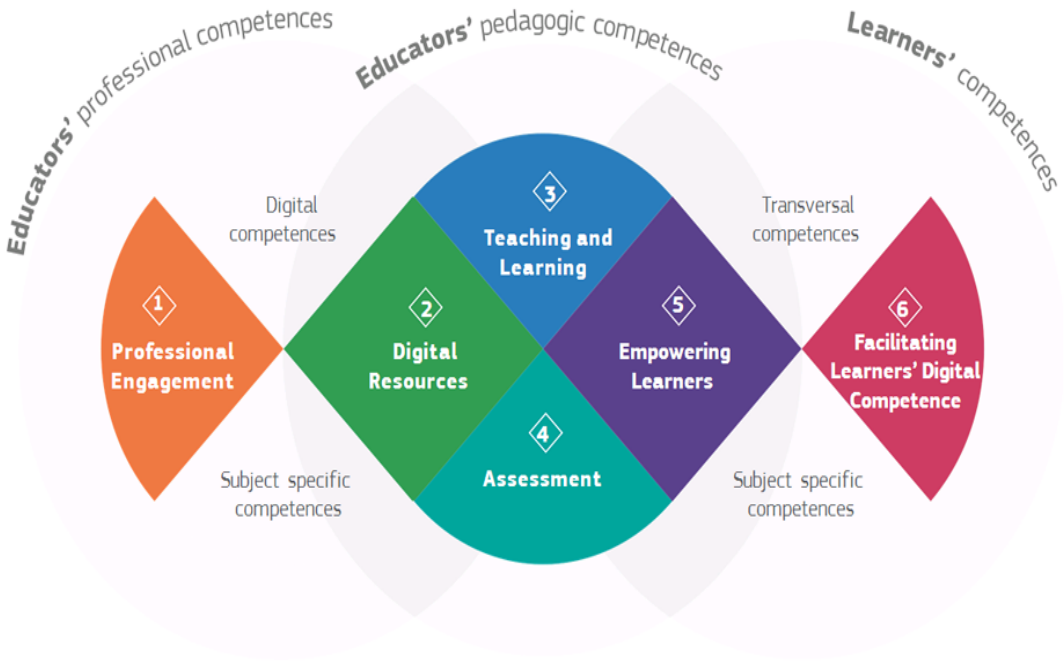

Source: Areas and Dimensions of Digital Teaching Competencies. Source: Authors, translated and adapted from REDECKER; PUNIE, 2017

Supported by the re-reading of the aforementioned literature, which supports the discussions on the themes that interface within the research theme, for the field research, the questionnaire proposed by DigCompEdu was used to analyze the self-reflection of IFMA professors on digital competences in Education.

DigCompEdu was created by the department of the European Union, EU Science Hub, with the objective of identifying the digital competences of educators so that they can make significant use of digital technologies and innovate education, determined by a consensus in the European Council on the components of digital competence.

Its first version appeared in 2013 and also had two updates, one in 2016 and another in 2017 (Lucas et al, 2017). Ferrari et al (2014) argue that DigCompEdu was developed with the aim of awakening to the use of digital technology in a reflexive and critical way, raising awareness of the possibilities and risks offered by technological changes.

In 2018, a new model was configured based on the composition of the original DigCompEdu Check In model adapted by Dias-Trindade and Moreira (2018). Preserving the dimensions, sub-dimensions/areas and the scale of competence levels, the authors carried out a redistribution of competences, through which the twenty-two competences were reallocated and individually assessed for the degree of significance, through a factor analysis confirmation. The new structure was validated by Dias-Trindade, Moreira

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and Nunes (2019), resulting in only 21 competences, since a competence from Dimension II was excluded.

In view of the application of the self-assessment questionnaire of that model, the evaluated participant may be aware of their performance on a progressive scale of digital competences, which comprises the following levels: A1, A2, B1, B2, C1, C2, forming a continuum between the lowest level – A1 and C2 the most advanced.

For the constitution of the scale, the same point levels were assigned to each item, ranging from 0 for the first hypothesis to 4 points for the last. In this sense, the total test score is 84 points, thus configuring the following levels of proficiency: A1 - Newcomers less than 19 points; A2- Explorers between 19 and 32 points; B1- Integrators between 33 and 47 points; B2- Specialists between 48 and 62 points; C1- Leaders between 63 and 77 points and; C2- Pioneers over 77 points as shown in table 01.

Table 1. Level of digital competence and respective score

Level of digital competence	Score
A1- Newcomers	less than 19 points
A2- Explorers	between 19 and 32 points
B1- Integrators	between 33 and 47 points
B2- Specialists	between 48 and 62 points
C1- Leaders	between 63 and 77 points
C2- Pioneers	More than 77 points

Source: Dias-Trindade, Moreira, (2019).

The aforementioned questionnaire consists of 21 questions organized according to the levels of competence, divided into 06 areas to be analyzed as: Area 1 – Professional involvement; Area 2: Technologies and Digital Resources; Area 3: Teaching and Learning; Area 4: Evaluation; Area 5: Student Training; Area 6: Promoting Students' Digital Competence

Through the institutional G-mail Platform, we had access to the groups of professors from each unit, from which the e-mails of each professor were appropriated, for which the professors' participation in the research was requested, through the response of the questionnaires, between May 21 and 22, 2019. The questionnaire was sent four successive times to groups from each campus, until a satisfactory number of questionnaire-answer to the survey was obtained.

Methodology

The general characterization of the research:

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The investigation for the elaboration of this research was crossed by a methodological complex that included bibliographic and field research, when the survey of approaches and theories that present analysis models that meet the aforementioned objectives was covered, thus establishing , as an investigation of a quanti-qualitative nature, with elements that culminate the purposes of analyzing, measuring and evaluating, which are, thus, complex activities that need to be analyzed from different aspects, aiming to understand the entire dynamics of the phenomenon. Qualitative research is based on the fact that there is a dynamic relationship between the real world and the subject, a living interdependence between the subject and the subject's subjectivity, where the researcher tends to reduce the distance between data and theory.

It is understood with Marconi and Lakatos (2009) that from the survey of bibliography already published in books, magazines, written publications, the researcher appropriates the knowledge and knowledge already built in the sphere of the theme, such as theoretical discussions, methods and techniques of analysis, research results, which guide the observation of phenomena and natural and social factors that drive us to prepare and carry out new investigations, within the same universe and/or interfacing with new areas of knowledge, as argued by Gil(2010):

> The main advantage of bibliographic research lies in the fact that it allows the investigator to cover a much broader range of phenomena than he could directly research. This advantage becomes particularly important when the research problem requires data that is widely dispersed across space (GIL, 2010, p. 50).

In this sense, there was a re-reading of the works and methodological models of scholars such as Ferrari et al (2014); Dias-Trindade, Moreira, (2017, 2018, 2019); Melo (2018); Gonçalves(2015); Garcia(2011); Silva (2016); Joly et al (2012); Lucas et al (2017); Almeida Júnior(2013), Gonzáles-Fernandez-Villavicencio (2015), among others, to support ourselves with elements that support thinking and doing in the investigative path.

The field research was carried out in the Federal Institutes of Education of the state of Maranhão, with the exploratory and descriptive objective, as Gil (1994) categorizes well, the research, as to the objective, as exploratory, explanatory and descriptive. Exploratory research aims to understand a phenomenon that has been little studied or specific aspects of a broad theory. Explanatory research identifies the factors that determine or contribute to the occurrence of phenomena, explaining their causes.

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And finally, the descriptive ones describe a certain population or phenomenon. Considering the proposed theme, this work can be characterized as an exploratory and descriptive research, in which data will be analyzed, collected through a standard questionnaire, which is already established as a procedure model for data collection, which it dealt with later, from a specific population, in the case of teachers from the Federal Institutes in the state of Maranhão.

From the analysis procedure:

To analyze the data collected in the different research instruments, the general strategy pointed out by Yin (2005) was used, which is based on theoretical prepositions, competing explanations or descriptive structures.
In this sense, a quantitative analysis of the data obtained was carried out, as it is a complex issue that needs to be analyzed from various aspects, aiming at understanding the entire dynamics of the phenomenon, supported by the assumption that there is a dynamic relationship between the world. real and the subject, a living interdependence between the subject and the subjectivity of the subject, thus reducing the distance between data and theory.

It is also important to highlight the use of survey research which, according to Freitas et al (2000), is described as obtaining data or information about characteristics, actions or opinions of a certain group of people, indicated as representative of a target population, through a research instrument, usually a questionnaire, which is intended to produce quantitative descriptions of a population and makes use of a predefined instrument. Gil (2011) endorses that the aforementioned methodology aims to directly investigate the behavior of the people studied, consisting of requesting information collected through questionnaires answered by a target population.

From the results obtained in the field research, the items were listed according to the areas of competence. In Area 1, related to professional involvement, the teacher's competences were identified in relation to the use of digital technologies for communication, collaboration and professional development. In area 2, data related to technologies and digital resources, usability, sharing and protection were obtained, with a view to safety in use. In area 3, relating to teaching and learning, data were obtained that showed the teacher's ability to identify the management and organization of the use of digital technologies in the teaching and learning process. In Area 4, the assessment sought to reference how digital technologies can improve the student assessment process. With area 5, which deals with the training of students, data was

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obtained on the ability to use digital technologies to improve the inclusion, personalization and active involvement of students in the teaching and learning process. And finally, in Area 6, data was collected on the promotion of digital competence of students with the help of teachers, so that students use digital technologies in a creative and responsible way.

The definition and characterization of the universe and the sample:

The universe covered by our investigation was constituted by all the professors of the Federal Institute of Education, Science and Technology of Maranhão (IFMA) in all its 29 campuses, with a total of 1990 professors.
The institutional nature of IFMA is that of an autarchy that has administrative, patrimonial, financial, didactic-pedagogical and disciplinary autonomy. Considered a public institution of higher, basic and professional education, multi-curricular and multicampi, with the following points of presence: São Luís-Monte Castelo; São Luís – Maracanã; São Luís - Historic Center, Codó, Imperatriz, Zé Doca, Buriticupu, Açailândia, Santa Inês, Caxias, Timon, Barreirinhas, São Raimundo das Mangabeiras, Bacabal, Barra do Corda, São João dos Patos, Pinheiro, Alcântara, Coelho Neto, Grajaú , Pedreiras, Presidente Dultra, Viana, São José de Ribamar, Carolina, Rosário, Porto Franco, Santa Rita, Bacabeira and Itaqui – Bacanga, specialized in offering professional and technological education in different types of teaching, based on the combination of human knowledge, technical and technological, with their pedagogical practices under the terms of the Law.

Its mission is to promote professional, scientific and technological education, through the integration of teaching, research and extension in order to form citizens and focused on sustainable socioeconomic development. It seeks recognition as an institution of excellence in education, science and technology, training critical citizens and promoters of social transformation.
For the characterization of the universe, the SUAP system - Unified Public Administration System of the Federal Institute of Maranhão - IFMA was used, from which qualitative and quantitative data were collected, regarding the history, characteristics, mission and number of IFMA campuses, as well as the number of professors on each campus. From the universe of 1990 professors that make up the faculty of all IFMA campuses, 421 response questionnaires were collected. Thus, the total number of questionnaires collected for analysis was taken as a sample, which exceeded the minimum sample size, from the following calculation, proposed by Barbetta (2001), to build a minimum sample, with which to obtain credibility and scientific consistency in research as shown below.

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Considering:

N: population size;

n: sample size;

no: a first approximation of the sample siza; and

Eo: tolerable sampling arror.

If a tolerable sampling error of 5% is admitted in a first approximation,

Then: (Eo = 0,05). Usind the formula: $no = \frac{1}{Eo^2} = \frac{1}{0,05^2} = \frac{1}{0,0025} = 400$

As the size (N) of the population is known, it is possible to correct the previous calculation by:

$$n = \frac{N \times no}{N + no} = \frac{1990 \times 400}{1990 + 400} = \frac{796.000}{2390} = 333,05$$

Thus, the sample having surpassed this minimum profile with 421 responses obtained in the survey. As can be seen, the sampling exceeded 21% of the universe, establishing itself as a relevant sample for obtaining reliable results.

Digital Skills Data Analysis

After the exhaustive analysis of each question according to the variables age, area of education and level of education, the procedure of analysis of competences begins, considering the variables, A1- Newcomers less than 19 points A2- Explorers between 19 and 32 points; B1- Integrators between 33 and 47 points; B2- Specialists between 48 and 62 points; C1- Leaders between 63 and 77 points and; C2- Pioneers over 77 points.

After tabulating the data obtained, it was found that none of the 400 professors participating in the research, 1.19% reached the minimum score for level C2 – Pioneers. In Graph 01, it can be seen that the level of digital competence of most teachers is moderate, as 40.48% of respondents had a performance at level B1 – Integrators and 23.10% at level B2 – Specialists. The lowest level identified was: C1 – Leaders, with 9.76% of respondents. Only 1.90% of the participants are at the beginner level, the A1 – Newcomers.

Graph 01. Global Percentage by Digital Competence Levels

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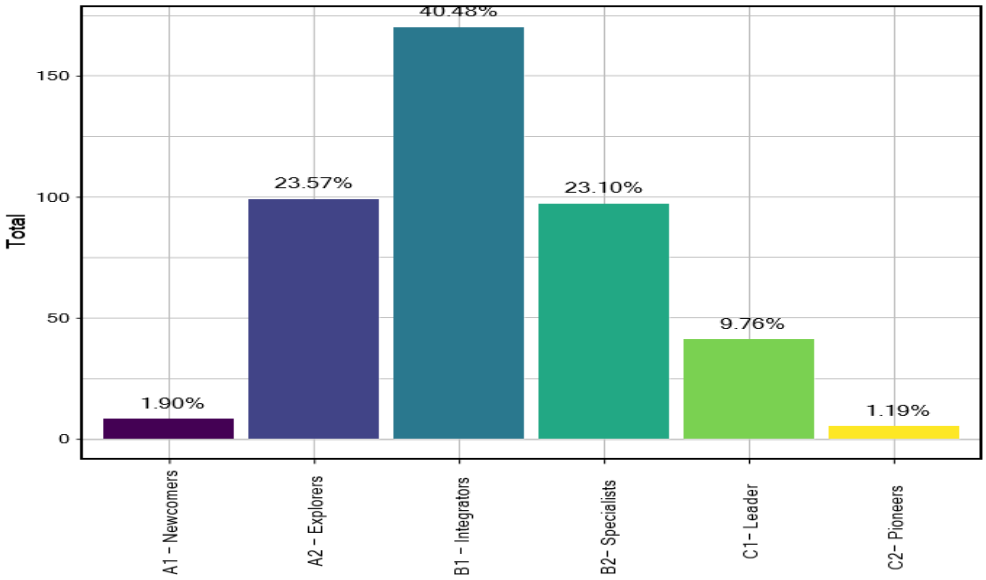

Source: Research Data.

It can be considered that most participants (75%) have presented a medium to high level performance, although a considerable portion (25%) registered a low score in the self-assessment of their TDIC practices in their teaching activities. This profile favors a relevant challenge for professors who seek to adapt to the new paradigms of teaching practice in the current century, since there is an urgent need to raise the level of their digital competences.

It is relevant to consider that only 34% of the informant professors presented competence profiles B2, C1 and C2. At the border of this interval, according to information contained in the Feedback of the online questionnaire: DigCompEdu Check-In – Results, the participant with level B2 performance has the following characteristics:

> This means that you use a variety of digital technologies, with confidence, creativity and critical thinking to improve your professional activities. Purposely selects digital technologies for specific situations and demand. Understand the advantages and disadvantages of different digital strategies. He is curious (a) and open (a) to new ideas, knowing that there are many things he has not tried yet. It uses experimentation as a means of expanding, structuring and consolidating its repertoire of strategies (Online questionnaire Feedback: DigCompEdu Check-In – Results., 2019).

The suggestion made by the authors of the feedback from the questionnaire is that this B2 group share their knowledge with other teachers and continue to critically develop their digital strategies to reach the next level of Leader (C1).

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Regarding the overall frequency of teachers at level A1 (1.90%) observed in Graph 01, this model denounces that the participant has an opportunity to start improving the way they use digital technologies for teaching. In feedback, several actions are suggested that can be used by the teacher to improve their teaching strategies, such as: experiencing a digital environment to support collaboration; make communication more efficient and transparent; join an online faculty community.

On the right border of the scale are those at the highest level, C1 (9.76%), the model in question defines them as individuals who have a wide repertoire of digital strategies, from which they know how to choose the most suitable for any situation concrete, although it must evolve to reach the maximum point of the scale, which is level C2 – Pioneer (a) which, in our sample, is very little represented, with only 1.19%.

The reading of the global average results, in Graph 02, reveals a great predominance of level "B1" among the eight areas registered in the data collection, with a relatively low difference between the averages of this predominant group, thus reflecting on the average result general.
The areas of Biological Sciences (53.12); Linguistics, Letters and Arts (49.12) and Agricultural Sciences (47.37) bring the highest averages at level B1, compared to the lowest score in Health Sciences (26.32), with the lowest average performance overall (38 points - B1).

Level B1 categorizes teachers as integrators, who are characterized by experimenting with digital technologies in a variety of contexts and for a variety of purposes, using them creatively to improve various aspects of their professional involvement, with a willingness to expand their repertoire of practices, which will benefit the understanding of which tools work best in certain situations and the adequacy of digital technologies to pedagogical methods and strategies. The suggestion given by the questionnaire authors' feedback to the integrator is to give themselves more time to experiment with other technologies, valuing the exchange of knowledge in collaborative environments, to reach the next level, that of Specialist (B2).

The areas of Biological Sciences and Linguistics, Letters and Arts are evident, with a zero rate of attendance of teachers at level A1, that is, these areas did not present any teacher categorized as newcomer in the sample. The areas of Human Sciences and Applied Social Sciences appear with the lowest attendance rates of teachers at the lowest level of competence (1.49% and 1.57%, respectively in A1), followed by the areas of Agricultural Sciences (2, 43%), Exact and Earth Sciences (2.52%) and Engineering (2.59), with the highest rate in Health Sciences, with 5.2%.

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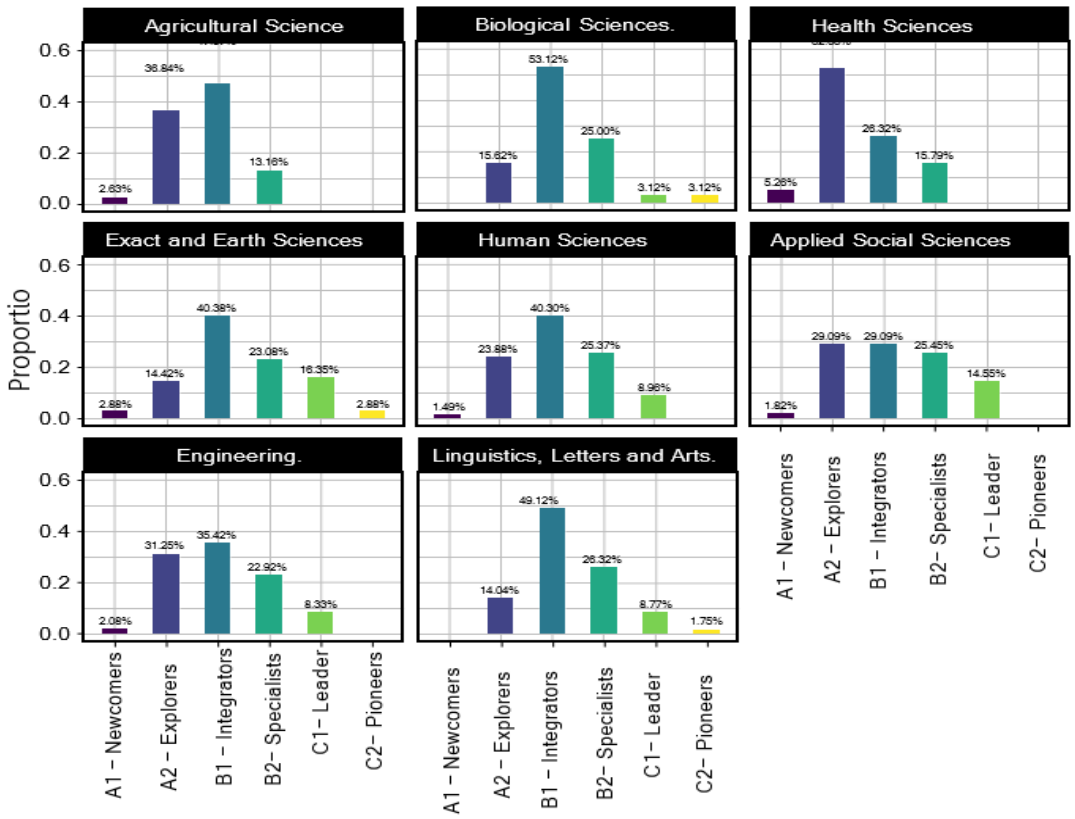
Categorized as Leaders, teachers from the areas of Applied Social Sciences stand out (14.55%), followed by those from the areas of Exact and Earth Sciences (10.35%), Human Sciences (8.9%), Linguistics, Letters and Arts (8.7%) and engineering (8.32%). The areas of Agricultural Sciences and Health Sciences did not present, according to the sample, any index of professors at this level. At the highest level, C2, categorized as Pioneers, only the areas of Biological Sciences (3.12%), Exact and Earth Sciences (2.52%) and Linguistics, Letters and Arts (1.75) presented frequency rates, as shown in Graph 02.

Graph 02. Proportion of skill levels by area of knowledge



Source: research data.

As for the proportional result of the participants' performance by level of education, there is a relative average between the degrees in terms of level, B1, with a lower frequency in post-docs, with 26.57%, according to the sample. At level A1, there is only a low frequency of masters (2.47%) and specialists (2.50%). At level C1, there is an advantage of doctors (14%) in relation to masters and specialists, respectively with 9.37% and 7.42%, as shown in graph 03.

Graph 03. Proportion of skill levels by level of education

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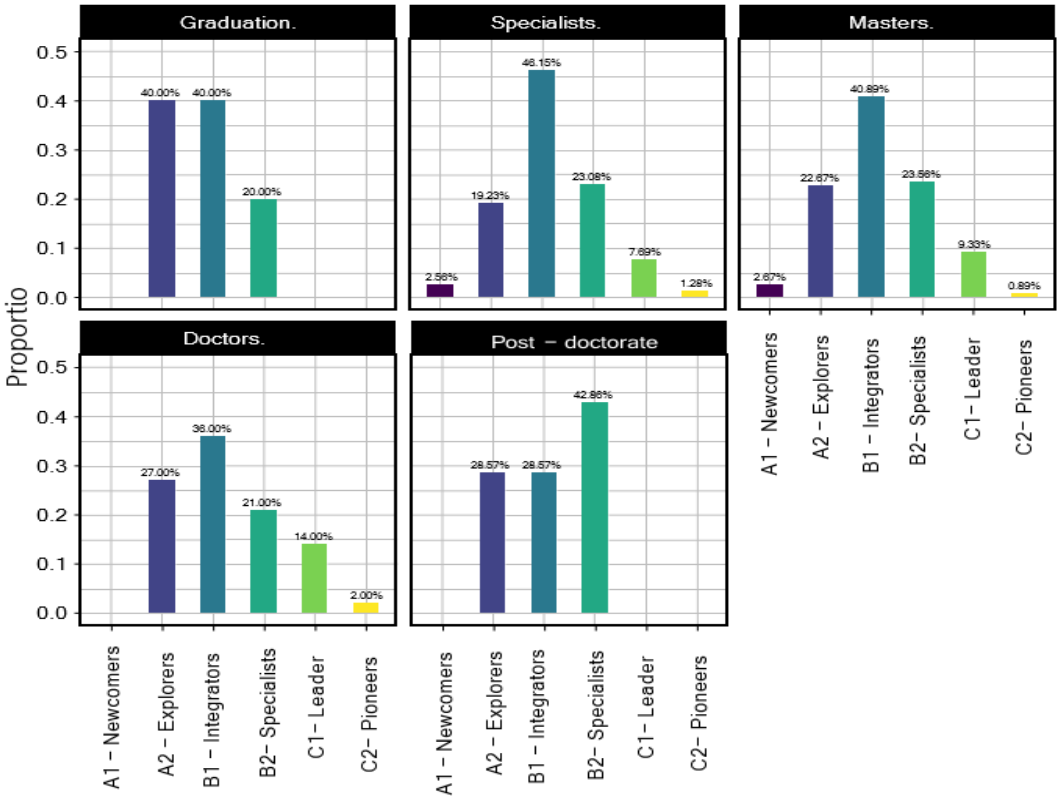

Source: research data.

The analysis of the level of competence by age group, in Graph 04, reveals an average frequency of performance B2 among those in the range of 20 to 29 years old (45.15%), 30 to 39 years old (41.67%) .40 to 49 years (40%) and 50 to 59 years (16.67%), with low only in the last age group, above 60 years, with a frequency of 16.67%.

Level C1 is represented by teachers between 20 and 29 years old (12, 17%) and 40 and 49 years old (12%), followed by the group between 30 and 39 years old (9.21%), with a large low in the 50-59 age group (0.51%) and none of those over 60 years old.

The lowest level (A1) was seen in three ranges, between 30 and 39 years old; 40 to 49 years, and 50 to 59 years, 2.19%, 1.00% 4.28, respectively.

Graph 04. Proportion of competence levels by age group

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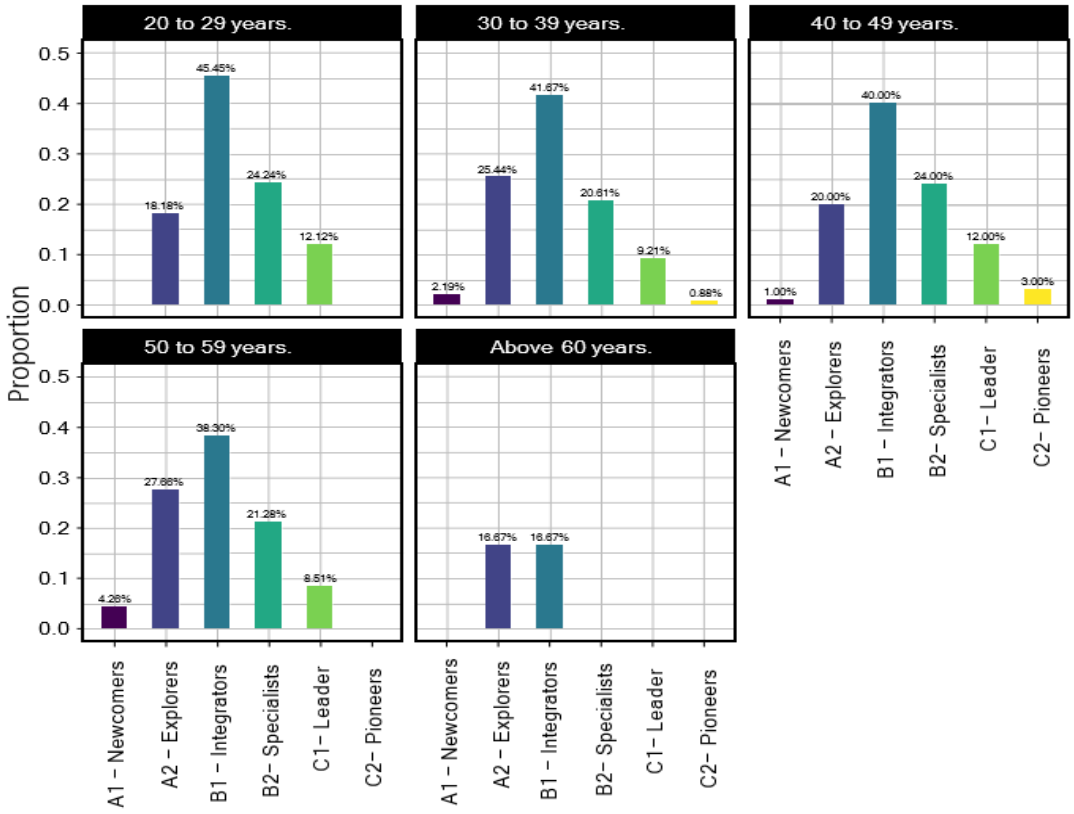

Source: research data.

As demonstrated in the studies carried out by Dias-Trindade and Moreira (2018, p. 637), when they state that "there is no linear progression of results by age group that allows us to state that the younger, the greater the digital competence" , in the IFMA sample under study, the same was found, since in the first four age groups included in the graph, there is a relatively close frequency of teachers at level C1, with the exception of the age group above 60 years old. The same profile is observed at levels B1 and B2, where there is a relative similarity between the first four age groups, except for the last one, of teachers over 60 years old, whose frequencies at levels B1 and B2 drop considerably.

The observation of graph 05 - Average Score by Age Group - ratifies that the age variable does not influence the level of digital competence of the IFMA professors.

Graph 05. *Average Score by Age Group*

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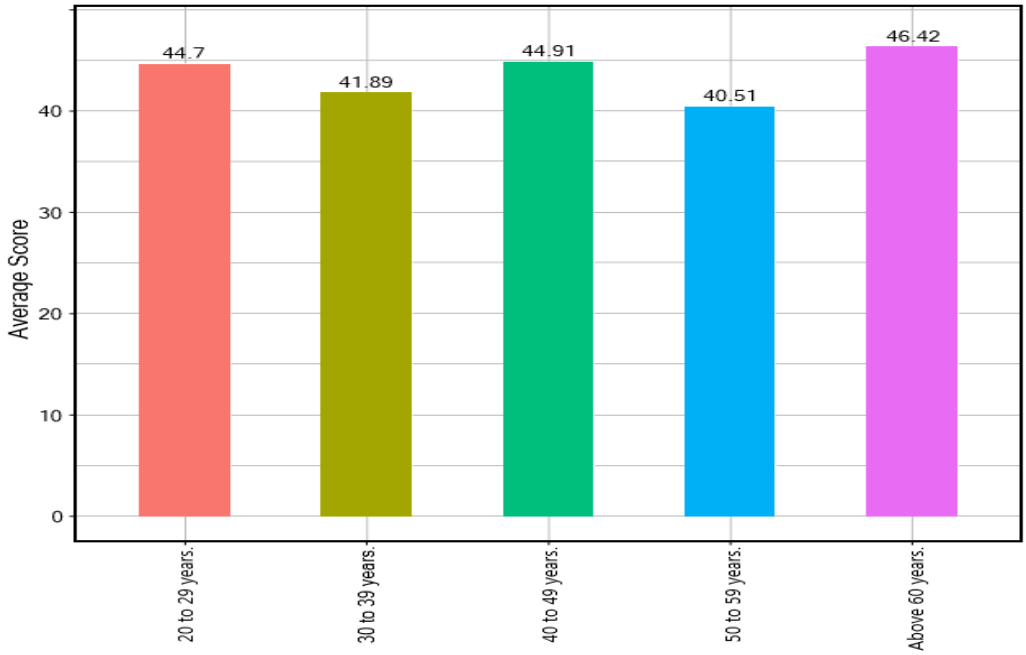

Source: research data.

Observing Graphs 06 and 07 reveals that the levels of digital competence do not undergo signicant variations depending on the Sex variable. At levels B1, B2, there was a small superiority in the sample, of female teachers (43.05% and 24.31%) and male teachers (38.08% and 22.18%), respectively. The same margin is also observed at levels A1 and A2, when in the sample the female sex has a lower proportion (1.00% and 22.10%) compared to 2.09% and 24.02% of the male sex, respectively. However, the female audience showed a lower proportion at levels C1 and C2, (7.73% and 0.55%) as opposed to the male audience, with a higher proportion at these levels (11.30% and 1.67%) , respectively.

Thus, although with a small difference in proportion, female teachers have a lower concentration in the initial levels, (A1 and A2), categorized as newcomers and explorers; with greater concentration in intermediate levels, B1 and B2, categorized as integrators and specialists, losing to male teachers, at levels C1 and C2, categorized as leaders and pioneers.

Graph 06. Proportion of competency levels by gender

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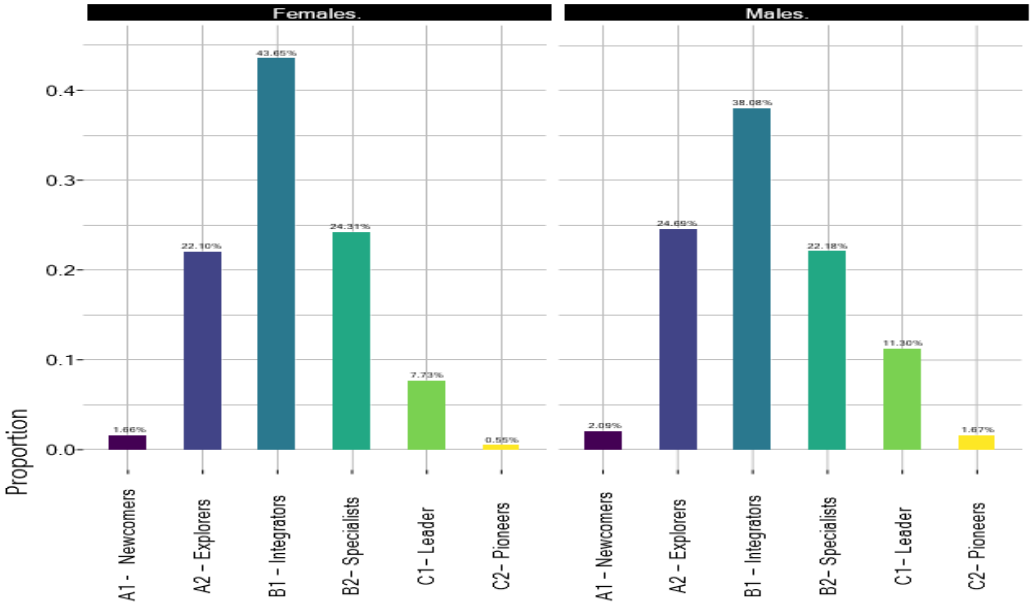
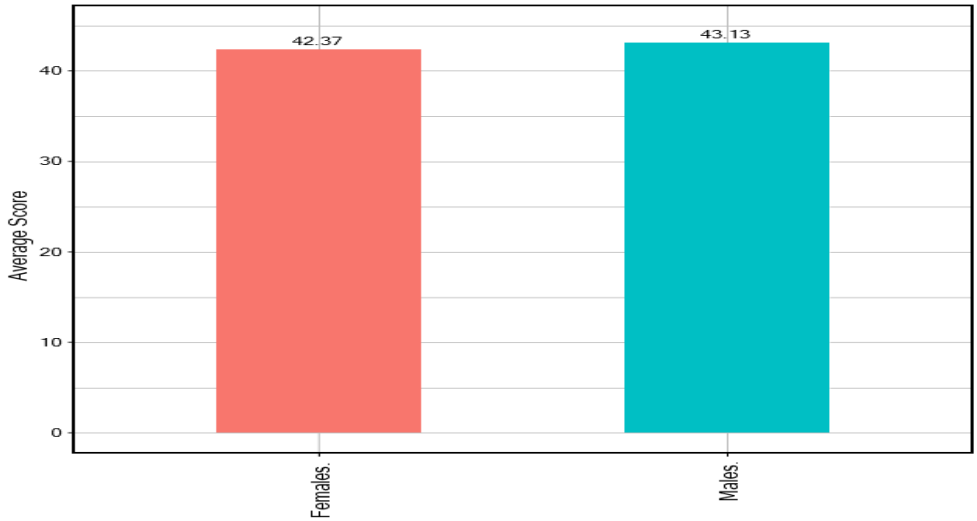


Source: research data.

This profile is confirmed in Graph 07, where the average score by sex is drawn, showing a small margin of difference between females and males.

Graph 07. Average Score by Sex



Source: research data.

However, it is easily noticeable that the training area and the level of education are determining variables for the variation in the digital competence of teachers, as can be seen in Graphs 08 and 09, respectively. It can be seen in Graph 08, where an average score is made by area of knowledge, that the sample reveals greater digital competence in professors in the areas of Exact and Earth Sciences (46.21), Linguistics, Letters and Arts

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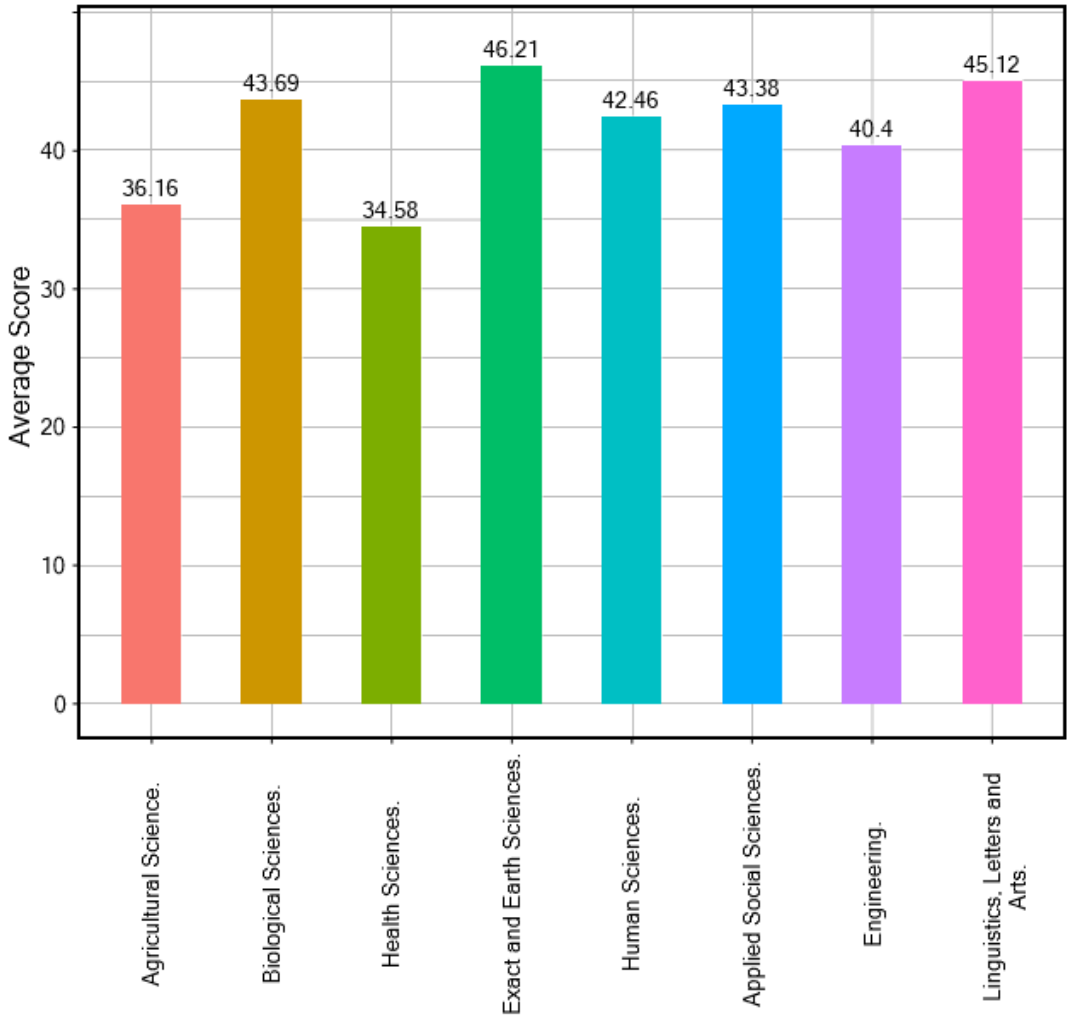
(45.12) and Biological Sciences (43.09), while the professors of Agricultural Sciences and Health Sciences occupy the last places, with 36.16 and 34.58 points, respectively.

Graph 08. Average Score by area of knowledge



Source: research data.

Likewise, the level of education variable is established as a determinant of variation, since the ascendancy of scores from the left border (graduation) to the right border (post-doctoral) is easily noticeable. It is important to note that, although with a small difference, the experts' scores overlap that of the masters, without considering the value of absolute participants in each degree.

Graph 09. Average Score by Level of Education

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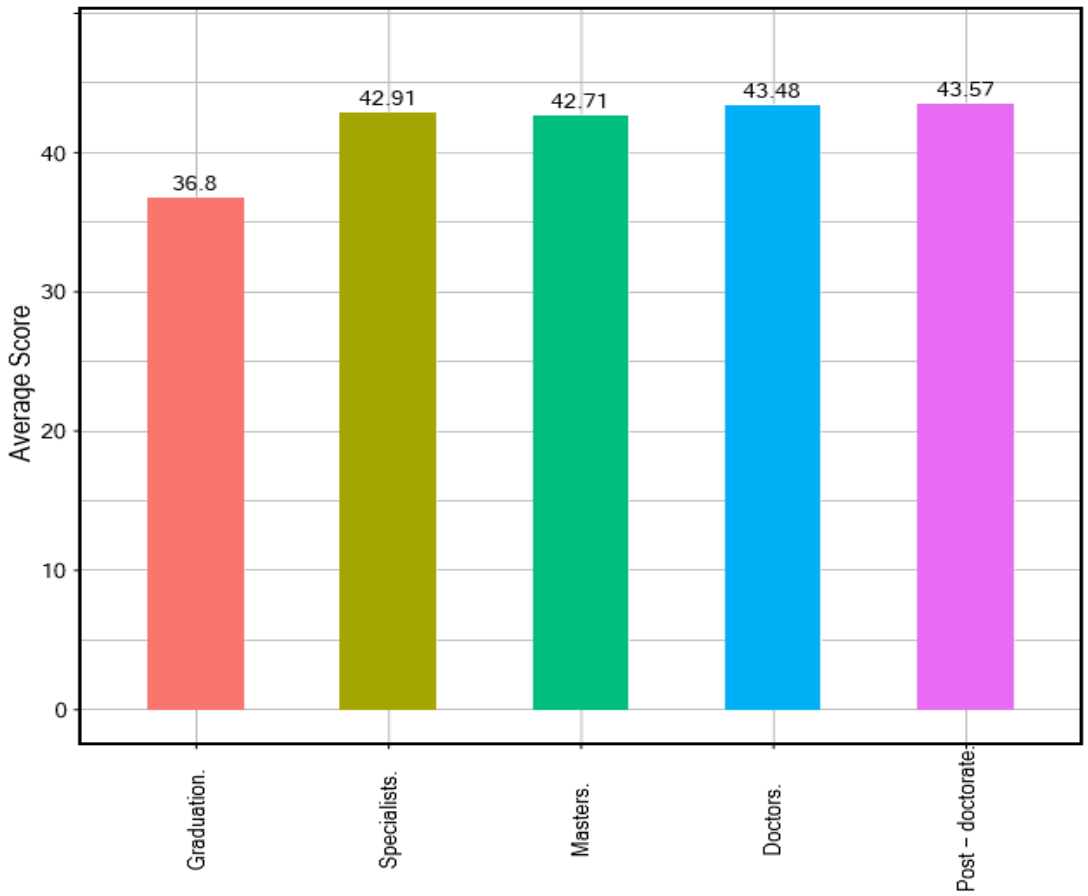

Source: research data.

In Graph 10, the averages of each of the twenty-one digital competences postulated by Trindade-Days are registered; Moreira; Nunes (2019).

Dimension I - Professional Skills of Teachers consists only of a sub-dimension/area called "Professional Motivation", with the aim of identifying the skills of the teacher with regard to the use of digital technologies to communicate, collaborate and professionally evolve, it is the which presents the highest average results, notably, in the questions, "organizational communication" (2.48), "digital skills" (2.56) and "resource selection" (2.04).

When analyzed in Table 01, the numbers show that the areas of Exact and Earth Sciences and Linguistics, Letters and Arts stand out in the competence of Professional Motivation, with scores of 9.95 and 9.40, respectively, with a lower average in the area of Health Sciences (7,16).

Table 01. Average results for the different areas and subdimensions

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Area of knowledge (training)	Assessment	Student Training	Teaching and learning	Professional Motivation	Promoting Students' Digital Competence	Digital Resources
Agricultural Science.	4.16	3.92	9.24	8.24	7.32	3.29
Biological Sciences.	5.25	4.47	11.38	8.69	10.09	3.81
Health Sciences.	4.26	3.21	10.11	7.16	7.05	2.79
Exact and Earth Sciences.	5.95	4.37	11.57	9.95	10.13	4.24
Human Sciences.	5.07	4.18	10.51	8.61	10.42	3.67
Applied Social Sciences.	5.42	3.95	10.49	9.09	10.33	4.11
Engineering.	5.21	3.90	10.23	8.71	8.52	3.83
Linguistics, Letters and Arts.	5.72	4.12	11.32	9.40	10.72	3.84

Source: research data.

Dimension II - Teachers' Pedagogical Skills is comprised of four sub-dimensions/areas: a) Technologies and Digital Resources (2), which refers to the ability to use digital technologies and resources, as well as share them and protect data and information; b) Teaching and Learning (3), which refers to the management and organization capacity of teachers in the use of digital technologies in the teaching and learning process; c) Assessment (4), which refers to the teacher's skills in using digital technologies to improve the student assessment process; d) Student Training (5), which refers to the ability to use digital technologies to increase the inclusion, personalization and active involvement of students in teaching.

In this dimension, the sub-dimension "Teaching and Learning" stands out, with a high average in all questions, notably, Collaborative Learning (2.35), Content Creation (2.27), Active Motivation of Students (2.25), and Teaching (2.21). The other subdimensions have a lower score, with the “Assessment” subdimension being more evident.

Dimension III - Student Competencies - comprises only the sixth and final sub-dimension/area, called "Promotion of Digital Student Competence", with the objective

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of verifying teaching competences to assist students in the use of digital technologies in a creative and responsible manner. In this sub-dimension, the results indicate moderate levels of digital skills, highlighting the questions "Communication" (2.19), "Problem solving" (2.14), "Information and Media Literacy" (2.1).

The general panorama shows that the informants in this research performed better in subdimensions 1 and 3; "Professional Motivation" and "Teaching and Learning", with lower performance in the 4-Assessment sub-dimension, as shown in Graph 10, which shows the averages of each of the twenty-one digital skills validated by Dias-Trindade; Moreira; Nunes (2019).

It appears that Dimensions II - Pedagogical Skills of Teachers and III - Student Skills are those with the lowest average results, similar to the reality pointed out by Dias-Trindade and Moreira (2018), in a study to assess skills and fluency of teachers in public education in Portugal. As the research carried out by Melo (2019) and Dias-Trindade and Moreira (2018) a concentration of the highest results in Dimensions I and II, and the lowest results in Dimensions II and III.

Based on the analysis carried out, the main digital competences that IFMA teachers have deficiencies in their daily teaching practices are identified, highlighting the digital competence of students, digital resources and assessment. However, they demonstrate better performances in skills related to professional motivation and teaching and learning.

Graph 10. Average Results by Competence

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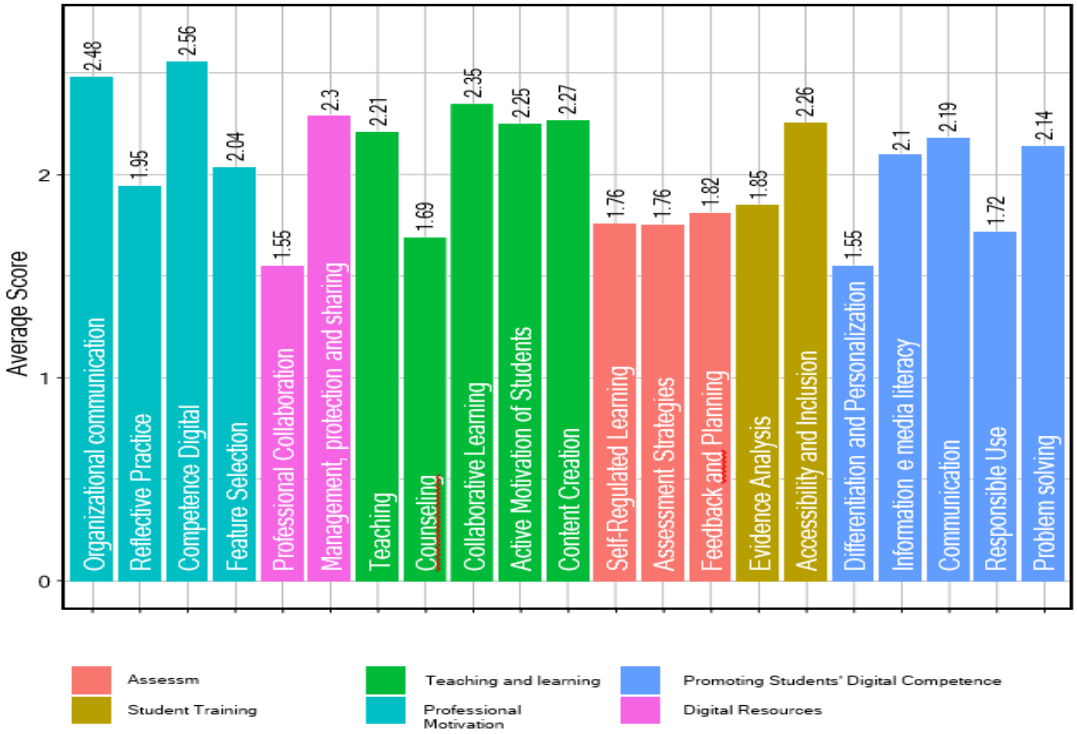

Source: research data.

Finally, it can be identified that the profile presented by the IFMA professors denounces that they are in average consonance with the skills and competences of the 21st century, as mentioned by White (2013, p.8) when he lists that collaboration, communication, problem solving and research Competence; critical thinking; Digital commons and copyrights; Digital fluency; Ethic; Identity and privacy; and Safety are Competence and attitudes that must be inherent to teachers, especially with regard to the internet. The statement is based on the results obtained, whose scores above (2.00 points), which are considered the best, represent 57% (12 questions) in contrast to 9 questions with scores below 2.0 points and above 1 ,0 point, as drawn in graph 10.

Final Considerations

The theoretical panorama that supported the investigation permeates from the concept of teaching, from an epistemological perspective of being and doing teaching, with functions and actions strictly inherent to a professional conduct that contemplates a specific paradigm of activities and postures that involve, from the psychic, the psychological, intellectual, mental, social, cultural and the contexts and surroundings of the different historical moments in the evolutionary process of humanity.

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Public policies for technology in education in Brazil have had vulnerable paths in the last three decades that are considered the peak of technology in the world, being crossed by the vested interests of government officials and, therefore, they never reach the goals established in theoretical projects, compromising , in this way, an evolution of the digital competences of teachers and students, due to the lack of, in addition to devices, a teacher training policy that favors the development of digital competences in the territory of schools and, consequently, in the outside world and intercepted by she, in the social relations of the students.

Based on the epistemology of teaching being and doing and interfacing with digital competences, our investigation has an unfinished character, since, although the methodology and resources for research have proven efficacy throughout the world, the conditions of appropriation and data collection can generate a certain degree of errors, but, on the other hand, we endorse our zeal and commitment to the entire investigation process, from the literature that supported our thinking to analyze the data to the commitment to the objectives and faithfulness to the methodology. In this sense, it is a scientific responsibility to appropriate a research method that has already been tried out in the great research centers of the world, notably in Europe, where it was created; which inspires a commitment to each phase of the research, from data collection and analysis procedures.

Recovering the research objectives that consist of Analyzing the level of digital proficiency of teachers from the Campi of the Federal Institute of Maranhão - IFMA, based on the DigCompEdu "CheckIn", seeking to measure the digital competences of educators; diagnose the level of pedagogical skills with regard to digital knowledge; understand the aspects related to the promotion of students' digital competence; and to identify possible differences in the results based on demographic and functional data of the participants, the following considerations must be made:

In a global perception, the results show that IFMA teachers have a moderate level of digital proficiency, at level B1 – Integrators. The ascension process to level B2 – Specialists and subsequent levels C1 – Leaders and C2 – Pioneers. It is necessary that teachers participate in training that enables them to experiment and reflect on new technologies in collaborative environments and exchange of experiences; share your knowledge with other teachers; and, critically, develop their digital strategies to devise new pedagogical approaches.

It is relevant to conclude that teachers perform better in the Professional Competences (I) dimension, whose highest values were registered in the competences

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"organizational communication" and "digital competences", and the lowest, "reflective practice".

Dimensions II and III, Pedagogical Skills of Teachers and Skills of Students, respectively, had lower overall values in the DigCompEdu Check In scale. In dimension II, they are evidenced by the results observed in the subdimensions: Digital Resources; Assessment and Promotion of Students' Digital Competence. The first is related to the ability to use, share and secure TDIC; the second, with the way in which TDIC are used to improve the student assessment process, and the third, related to teaching skills to help the student to use digital technologies in a creative and responsible way. Teachers showed a greater degree of difficulty in the questions: reflective practice (Dimension I); self-regulated learning, assessment strategies, planning feedback, evidence analysis, counseling, professional collaboration (Dimension II); differentiation and personalization and responsible use Dimension III). Regarding the particularities of the research audience, it was possible to conclude that in the group of 400 professors participating in the research, 1.19% reached the minimum score for level C2 – Pioneers; that the level of digital competence of most teachers is moderate, as 40.48% of respondents had a performance at level B1 – Integrators and 23.10% at level B2 – Specialists; having the lowest level C1 – Leaders, with 9.76% of respondents and only 1.90% of participants, at level A1 – Newcomers.

Considering the age group of the sample teachers, it is concluded that there is an average frequency of performance B2 among those in the range of 20 to 29 years old (45.15%), 30 to 39 years old (41.67%), 40 to 49 years old (40%) and 50 to 59 years old (16.67%), with low only in the last age group, above 60 years old, with a frequency of 16.67%. Level C1 is represented by teachers between 20 and 29 years old (12, 17%) and 40 and 49 years old (12%), followed by the group between 30 and 39 years old (9.21%), with a large low in the range of 50 to 59 years old (0.51%) and none of those over 60 years old. The lowest level (A1) was seen in three ranges, between 30 and 39 years old; 40 to 49 years, and 50 to 59 years, 2.19%, 1.00% 4.28, respectively.

With regard to gender, it is concluded that the levels of digital competence do not vary significantly due to this variable, with a concentration in levels B1, B2, with a small superiority, in the sample, of female teachers (43.05% and 24.31 %) compared to males (38.08% and 22.18%), respectively. The same margin is also observed at levels A1 and A2, when in the sample the female sex has a lower proportion (1.00% and 22.10%) compared to 2.09% and 24.02% of the male sex, respectively. However, the female audience showed a lower proportion at levels C1 and C2, (7.73% and 0.55%) compared to the male audience, with a higher proportion at these levels (11.30% and 1.67%) , respectively.

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Considering the eight areas registered in the sample, there is a predominance of level "B1", standing out among the areas of Biological Sciences (53,12); Linguistics, Letters and Arts (49.12) and Agricultural Sciences (47.37), compared with the lowest score in Health Sciences (26.32). Categorized as Leaders, teachers from the areas of Applied Social Sciences stand out (14.55%), followed by those from the areas of Exact and Earth Sciences (10.35%), Human Sciences (8.9%), Linguistics, Letters and Arts (8.7%) and engineering (8.32%). The areas of Agricultural Sciences and Health Sciences did not present, according to the sample, any index of professors at this level. At the highest level, C2, categorized as Pioneers, only the areas of Biological Sciences (3.12%), Exact and Earth Sciences (2.52%) and Linguistics, Letters and Arts (1.75) presented rates of frequency.

With regard to the level of education, there is a relative average between the degrees with regard to level B1, with a lower frequency in post-docs, with 26.57%. At level A1, there is only a low frequency of masters (2.47%) and specialists (2.50%) and, at level C1, an advantage of doctors (14%), compared to masters and specialists, respectively with 9 .37% and 7.42%.

In this way, resignified to teaching in a context of digital skills, it is the responsibility and commitment of government officials to provide resources for public policies on technology in education so that they not only acquire materials, but that, prominently, favor the training of teachers for the development of digital skills that are today so multiple and that are still unknown and not used by teachers for an effective education for a world that has appropriated such essential tools for the development of cognitive, intellectual and professional capacities of the human being.

In this perspective, given the results obtained, it is proposed to establish a policy of continuing education for teachers, within the Institutes themselves, using the digital skills of teachers with higher levels (C1 and C2), such as extension courses, or lato sensu post-graduation, enabling teachers with competence level A1, A2, B1, B2, a rise to higher levels and, consequently, an evolution in teaching practice with uses of digital technologies that favor the teaching-learning process within the parameters of today.

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RESUMO:
A presente investigação científica tem como objetivo avaliar a relação entre tecnologia e as competências digitais na educação no processo de ensino-aprendizagem nas instituições de ensino no mundo contemporâneo, cuja função fundamental é a formação intelectual e profissional dos sujeitos. Nesse sentido, o trabalho intitulado "Avaliação do nível de proficiência digital dos professores dos Institutos Federais do Maranhão", buscou avaliar o nível de proficiência digital dos professores nos Campi dos Institutos Federais no Estado do Maranhão. Foi utilizado o questionário proposto pelo *DigCompEdu"CheckIn"* EU Science Hub (Centro de Ciências da União Europeia), para análise da autorreflexão dos docentes dos Institutos Federais no Estado do Maranhão.

PALAVRAS-CHAVES: Educação. Tecnologia. Docente. Competência digital. IFMA.

RESUMEN:
Esta investigación científica tiene como objetivo evaluar la relación entre la tecnología y las competencias digitales en la educación en el proceso de enseñanza-aprendizaje en las instituciones educativas del mundo contemporáneo, cuya función fundamental es la formación intelectual y profesional de los sujetos. En este sentido, el trabajo titulada "Evaluación del nivel de competencia digital de los profesores de los Institutos Federales de Maranhão", buscó evaluar el nivel de competencia digital de los profesores de Campi de los Institutos Federales del Estado de Maranhão. El cuestionario propuesto por DigCompEdu "CheckIn" EU Science Hub (Centro de Ciencias de la Unión Europea) se utilizó para analizar la autorreflexión de los profesores de los Institutos Federales del Estado de Maranhão..

PALABRAS-CLAVES: Educación. Tecnología. Docente. Competencia digital. IFMA.