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Preface

This book is composed of the papers written in English and accepted for presentation and discussion at The 2024 International Conference on Information Technology & Systems (ICITS'24). This Conference had the support of Universidad de La Frontera, Information and Technology Management Association (ITMA), IEEE Systems, Man, and Cybernetics Society, and AISTI (Iberian Association for Information Systems and Technologies). It took place in Temuco, Chile, January 24–26, 2024.

The 2024 International Conference on Information Technology & Systems (ICITS'24) is an international forum for researchers and practitioners to present and discuss the most recent innovations, trends, results, experiences, and concerns in the several perspectives of Information Technology & Systems.

The Program Committee of ICITS'24 was composed of a multidisciplinary group of 264 experts and those who are intimately concerned with Information Systems and Technologies. They have had the responsibility for evaluating, in a 'double-blind review' process, the papers received for each of the main themes proposed for the Conference: A) Information and Knowledge Management; B) Organizational Models and Information Systems; C) Software and Systems Modeling; D) Software Systems, Architectures, Applications, and Tools; E) Multimedia Systems and Applications; F) Computer Networks, Mobility, and Pervasive Systems; G) Intelligent and Decision Support Systems; H) Big Data Analytics and Applications; I) Human-Computer Interaction; J) Ethics, Computers & Security; K) Health Informatics; L) Information Technologies in Education; and M) Media, Applied Technology and Communication.

ICITS'24 received 389 contributions from 34 countries around the world. The papers accepted for presentation and discussion at the Conference are published by Springer (this book) and by RISTI and will be submitted for indexing by WoS, SCOPUS, EI-Compendex, and/or Google Scholar, among others.

We acknowledge all of those who contributed to the staging of ICITS'24 (authors, committees, workshop organizers, and sponsors). We deeply appreciate their involvement and support which was crucial for the success of ICITS'24.

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Contents

Information Technologies in Education

Basic Education Professionals' Perceptions of Digital Literacy

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Abstract. It is recognized that it is important to develop activities that involve children in the use of different digital resources. However, this involvement must be gone with, mediated, and supervised by a responsible and knowledgeable adult, thus making digital resources helpful and beneficial for the progress of children's different skills. The research we have carried out has focused, among other things, on the following goal: To understand the beliefs of kindergarten teachers and 1st cycle elementary school (1st CEB) teachers about the strengths and weaknesses of their digital literacy, to assess the different stages or levels of digital skills development. Data collection, using a questionnaire survey, was carried out in a school grouping in a city in the north-east of mainland Portugal. Considering the results obtained, it should be noted that some steps are being taken to implement digital literacy in educational contexts. However, we believe that some aspects can be worked on and developed to promote the use of digital technologies, to prepare children for a more digital, innovative, and creative age, without neglecting their safety and preferences. There are sometimes difficulties experienced by professionals that cause them to put off using digital technologies in their educational practices, either because of the age group they work with or because they are unwilling to invest more in their training.

Keywords: Digital Literacy · Professionals' Perceptions · Digital Resources

1 Introduction

We are facing the transformation of industrial society into a more technological society, i.e., a society that is informed, communicative, reflective, participative, and more digitally savvy. Fernandes [1] states that these transformations have brought with them "new political, economic and cultural scenarios", thus challenging the education system (p.35). In this vein, schools must be available, flexible, and linked to digital technologies, adjusting to significant advances in information and communication, since technologies are part of children's daily lives, thus recognizing the potential of digital resources in their teaching-learning process [1].

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ICT promotes innovation in teaching, creating a break with existing traditional practices that promote monotony [2]. In this way, "teachers move from being mere teachers of specific subjects to mediators and feedback providers for their students' learning" [3, p. 1095]. Children benefit in the sense that they have more inclusive and diverse teaching and learning practices, encouraging them throughout the teaching process [2]. Children prefer "interactivity, speed, color, movement, [rather than] having a monotone adult transmitting information", allowing them to feel more motivated to develop their learning [4, p. 11)]. It is therefore necessary for education professionals to learn, develop, and gather a set of digital skills and to be familiar with various digital learning strategies, in the short, medium, and long term, so that the child's success and progress in school is helpful, effective, and consistent [5].

Digital literacy has brought many advantages for training and developing digital skills, both for educators/teachers and for children. The use of digital resources influences the way children think, play, and learn, as well as developing essential skills in reading, writing, communication, and mathematical reasoning. Through these skills, children actively engage "with the digital environment, developing multiple skills, including their ability to participate, their expression and identity" [6, p. 112].

Educators/teachers must invest in their digital training to develop new skills and deepen those they have already bought. As such, the European Digital Competence Framework for Educators (DigCompEdu) makes it possible to assess and certify the digital competencies of each educator/teacher, with the main purpose of understanding and characterizing them [7]. These competencies are essential and relevant for significant changes to take place in educational practices and, at the same time, for there to be an improvement in the performance of educators/teachers in terms of the digital age, i.e., the proper use of technologies [8].

Lucas and Moreira [7] state that DigCompEdu has become "a widely accepted tool for the assessment and certification of Digital Competence and has been used as a basis for teacher training and professional development in Europe and beyond" (p. 15). DigCompEdu proposed a progression model based on six different levels, in which "proficiency statements were provided for self-assessment" [7, p. 27]. The main aim of this progression model was to support/help educators/teachers in showing their strengths and weaknesses in terms of their digital development. The 6 levels of competence range from level A1 to level C2 and are related "to the six levels of proficiency used by the Common European Framework of Reference for Languages (CEFRL)" [7, p. 28]. DigCompEdu decided to include the six levels of the CEFRL as motivating performance descriptors, with the main functions of stimulating and encouraging education professionals to deepen their knowledge and develop their skills in the digital world [7]. The six levels of competence developed and characterized by DigCompEdu were called newcomer (A1), explorer (A2), integrator (B1), expert (B2), leader (C1), and pioneer (C2). The first two levels (A1 and A2) mean that educators/teachers recognize the potential and efficiency of digital technologies. The newcomer is aware of the importance of digital technologies in pedagogical and professional practice, but has little knowledge in this area, thus requiring greater guidance and encouragement to develop/apply their digital skills. In the case of the explorer, it should be noted that they already understand the potential of technologies in the teaching-learning process of children and can carry out

some activities involving technologies, but in a very restricted and limited way. At this level, it is essential to share practices with other colleagues to inspire and encourage educators/teachers to further explore their digital competence [7]. At the next two levels of ability (B1 and B2), education professionals can apply, extend, and reflect on their digital interventions. Both already use digital resources with some frequency in their pedagogical and professional practices, in a creative way. It should only be noted that the integrator is not yet as confident in implementing digital technologies in their practices and is looking to broaden their knowledge and learn about new digital tools, as well as strategies and methods for properly preparing digital technologies throughout their practices. In this way, they need more time to experiment, reflect, and dialog with other colleagues. The specialist can select the most proper digital technologies for their practice, so they are more confident and have more critical thinking to improve their teaching activities. According to [7], specialist educators/teachers "use experimentation as a means of expanding, structuring, and consolidating their repertoire of strategies" (p.30). Thus, the specialist is an innovator in their digital practices. At the last two levels of competence (C1 and C2), educators/teachers use digital technologies in their practices, both pedagogical and professional, more comprehensively and consistently. Both the leader and the pioneer have a wide range of strategies and techniques to apply in their practice. The leader knows how to select the most pertinent strategies for each pedagogical intervention, regularly reflects on and develops their digital practices, and constantly updates and dialogues with other colleagues to exchange opinions. The authors state that leading educators/teachers are considered "a source of inspiration for others, to whom they pass on their knowledge" [7, p. 30]. Pioneers question "the suitability of contemporary digital and pedagogical practices, of which they are Leaders" and, in this way, education professionals become aware of the barriers or disadvantages of these practices, to improve and innovate. Pioneers use highly complex and innovative digital technologies for their pedagogical practices. They are recognized for being innovators, for leading innovation, and for being a role model for other education professionals [7, p. 30]. In a nutshell, educators/teachers at the first two levels of competence developed by DigCompEdu, newcomer (A1) and explorer (A2), learn new information and develop basic digital pedagogical practices, at the next two levels, integrator (B1) and expert (B2), they use, expand and consider their technological practices, at the next two levels, integrator (B1) and expert (B2), they use, expand and consider their technological practices and, at the other levels, considered higher, leader (C1) and pioneer (C2), they share their knowledge with other colleagues, analyze and question their current practices, always taking into account innovation and the improvement of future practices [7]. Thus, we can see the development and progression of an educator/teacher's digital competence through the progression model outlined by DigCompEdu (see Fig. 1).

In 2022, after we had carried out our study in context, the document DigComp 2.2: The Digital Competence Framework for Citizens by Vuori-kari, Kluzer, and Punie [9] came out. This document presents DigComp 2.2 in an integrated way, highlighting new examples of knowledge, skills, and attitudes.

Portugal has also recently launched the Digital Teacher Training Program, proposed in Council of Ministers Resolution 30/2020 of April 21 [9], to integrate information and communication technologies (ICT) and other digital tools into teachers' professional

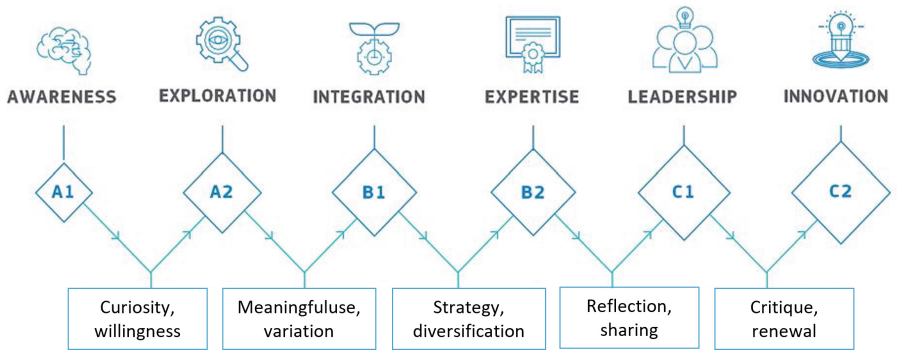

Fig. 1. DigCompEdu progress model.

and teaching practices. In addition to other aspects, the program also includes a strong commitment to training teachers, trainers from the National Qualifications System, and information technology technicians in each school, through a digital training plan for teachers, which guarantees the acquisition of the skills needed to teach in this new digital context.

2 Methodology

Data collection instruments help the process of gathering information. The questionnaire survey was the instrument that allowed us to collect important data for our research. Its main goal was to find out what educators/teachers think about the digital skills that children develop in the classroom, under adult mediation. It was divided into three parts: personal data, professional data (professional development), and data on practice (digital resources as tools to promote digital literacy). In the context of our study, it allowed us to obtain quantitative data and carry out a descriptive statistical analysis. It should be noted that in the analysis presented in this text, we have focused more on professional data. When analyzing the professional data (the second part of the questionnaire), we tried to understand how the respondents assessed themselves in terms of their digital competence when it came to using ICT; what they associated with digital literacy; whether they used ICT in an educational/school context; whether collaborative work between colleagues (if any) was carried out inside and/or outside the institution; what they thought about developing skills in this area; and what kind of participation in ICT training they had done.

3 Data Analysis

In view of the data analyzed, we note that we obtained 13 responses (3 male and 10 female respondents). Seven kindergarten teachers (53.8%) and six elementary school teachers (46.2%) took part in the questionnaire. If we look at the age range of the respondents, we can see that the majority were aged 56 or over (9 respondents - 69.2%), with the rest aged between 36 and 50 (4 respondents - 30.8%). Of the total, we would point out that

9 respondents had been teaching for more than 20 years (69.2%), while the rest chose between 5 and 10 years and between 11 and 15 years, i.e., 7.7% and 23.1% respectively.

As can be seen in Fig. 2, the professionals who took part in this questionnaire assessed their digital competence at 5 of the 6 levels of ICT use. The levels that stood out the most were B2: Specialist, with 38.5% (5 respondents), and B1: Integrator, with 30.8% (4 respondents). Next, with the same percentage of 15.4%, were level A2: Explorer and level C1: Leader, with 2 people each (see Fig. 2).

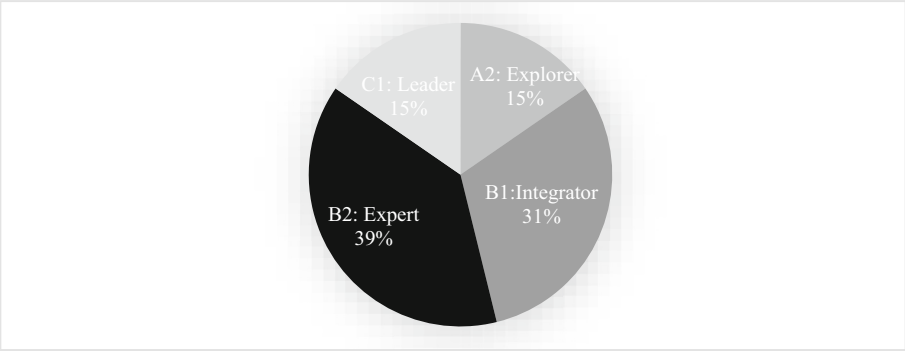

Fig. 2. Respondents' assessment of their digital competence in the use of ICT.

We considered it pertinent to understand the respondents' perception of the concept of digital literacy (see Fig. 3), associating it with the context of each of them, through 3 options to choose from: Advanced skills and knowledge (1 respondent); Instrumental skills and knowledge (7 respondents); and Attitudes towards the application of knowledge (8 respondents).

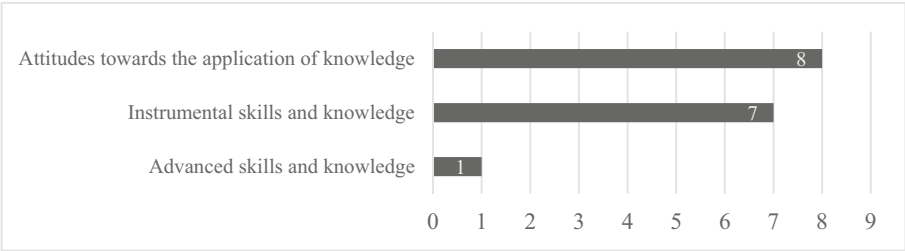

Fig. 3. Respondents' perception of the concept of digital literacy.

Bearing in mind what was said in the theoretical framework, we believe that digital literacy makes it possible to develop a set of ICT oriented skills so that they can be used and applied in various contexts, be they educational, professional, or social.

Question 3 presented five options to choose from to understand the daily use of ICT in the respondents' practice (see Fig. 4).

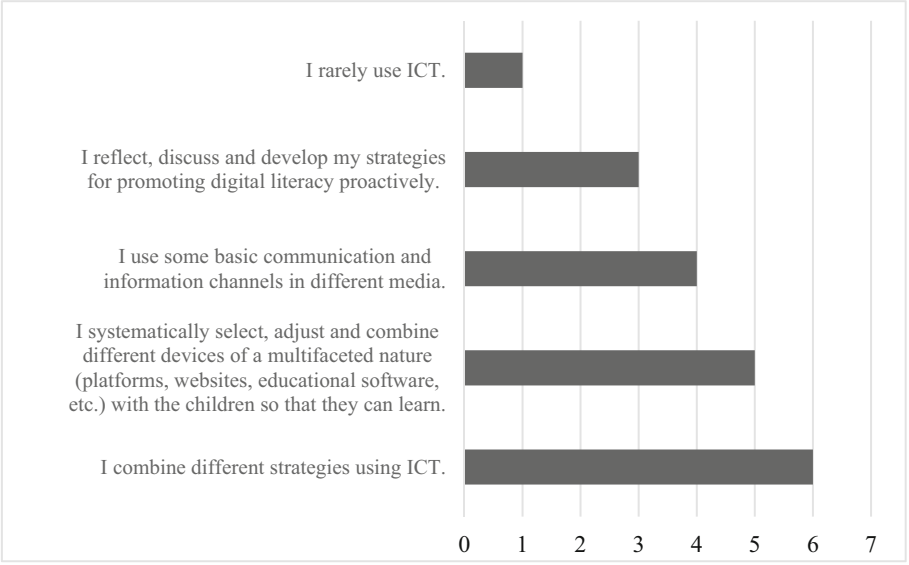

Fig. 4. Level of proficiency in the use of ICT in different educational contexts.

Given that participants could select several options, it was possible to obtain more information about the work they do in an educational/school context. Most respondents believe that they combine different strategies using ICT (46.2%). Next, the most selected option shows that respondents systematically select, adjust, and combine different devices of a multifaceted nature (platforms, websites, educational software, etc.) with children so that they can learn (38.5%). Of those surveyed, 23.1% proactively reflect on, discuss, and develop their strategies for promoting digital literacy. These three options reflect positively on the promotion of digital literacy in educational/school contexts. Even so, some respondents rarely use ICT (7.7%) or who use it only as basic communication and information channels in different media (30.8%). For these two options, it would be essential to carry out a more detailed analysis to try to understand what reason(s) led the respondents to select these two options.

The respondent who rarely used ICT in his teaching practices was in the 5 to 10 years of service bracket and considers himself to be at level B2: Specialist. When we looked at this profile, we wondered why this respondent rarely used ICT, since he rated himself as an expert, i.e., at this level of digital competence he would be expected to use ICT more often in an educational context. As we don't know the age group of the children this respondent worked with, we can say that it may be difficult to implement these practices, probably for various reasons.

Most of the respondents who reported using some basic communication and information channels in different media were aged 56 or over, and most of them had been teaching for more than 20 years. This contradicts the idea that age and years of experience impede moving from traditional to innovative teaching, as we have some examples that allow us to conclude that this is not always the case, given that these respondents

expressed a willingness to improve professionally about digital, as we will see in later analyses.

As far as collaborative work is concerned, whether it takes place outside or inside the educational institution, we can see that there is a certain amount of work going on since everyone, within the various options to choose from, collaborates and/or shares information and resources via distance means (see Fig. 5).

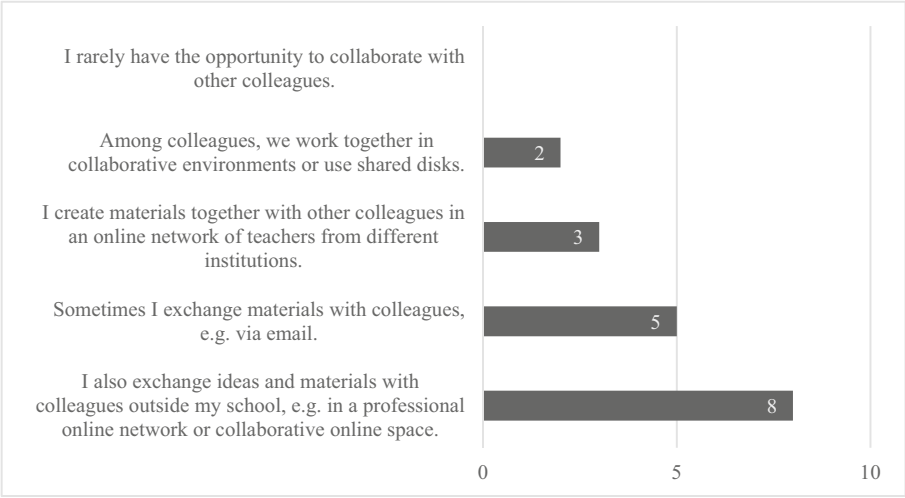

Fig. 5. Collaborative work inside and outside the educational institution.

Information enables professionals to develop and improve their teaching practices, using the ease of distance communication offered by digital technologies. Thus, through the exchange of ideas/materials and sharing networks, information becomes more accessible to everyone and more enriching, to build new digital materials to be put into practice in different educational/school contexts. In short, this peer support also allows educators/teachers to develop their digital literacy.

Another question in the questionnaire concerned the skills developed by professionals, in an active and involved way, in the field of ICT, and was related to the question previously analyzed (see Fig. 6).

Figure 6 shows that 61.5% of respondents, equally, improved their skills through reflection and experimentation, as well as developing a set of resources that enabled them to improve their ICT skills. Although the number of respondents is the same for these two options, it does not mean that they are the same, although some selected both options. Some respondents also selected the option that they discuss with their colleagues to innovate and improve their educational practice with ICT, while also noting that they help each other intending to develop their digital strategies (23.1% and 15.4% respectively).

Educators/teachers have looked to develop their digital skills, intending to improve and invest in learning and/or developing new skills with other colleagues, thus trying to ensure more challenging, active, and innovative practices.

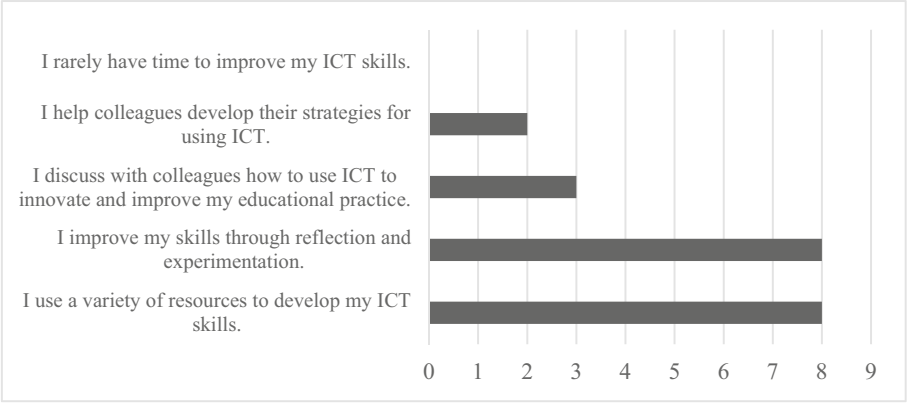

Fig. 6. Development of ICT skills in an active and involved way.

The last question was used to find out about the training courses they had taken part in, as well as their interest in attending them (see Fig. 7).

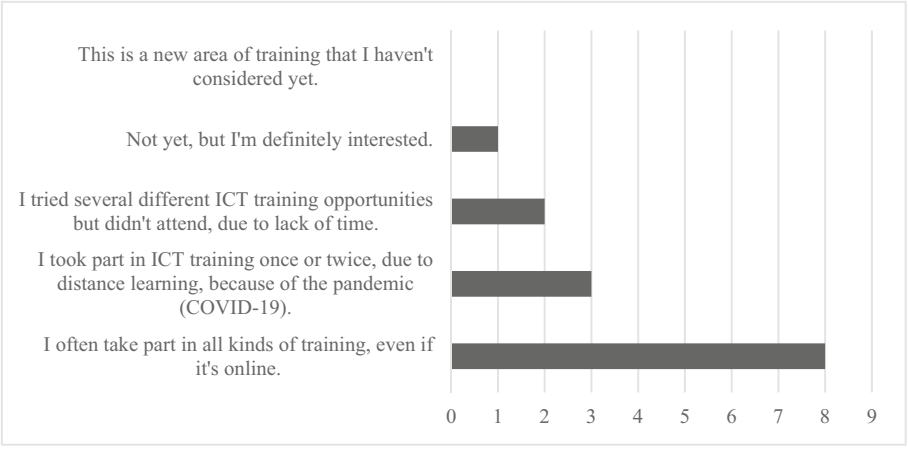

Fig. 7. Respondents' participation in ICT training.

61.5% of respondents actively taken part in all types of training, even in online format, thus showing their desire to broaden their digital knowledge. Some respondents pointed out that, due to lack of time, they were unable to attend this type of training regularly (15.4%). The pandemic caused by COVID-19, despite the constraints it has presented to educational institutions, has also led to greater adherence to digital technologies, thus requiring these professionals to (re)adapt to this new context. In this way, 23.1% of those surveyed had undergone some training to be able to respond to emergency remote teaching. Even so, some had never taken part in ICT training (7.7%), but who showed an interest in doing so, given that, when analyzing the remaining answers, we noticed that one of the respondents rated himself as an explorer (A2 level) and sought to improve his

skills through reflection and experimentation, as well as exchanging ideas and materials with other colleagues.

Compared to the earlier question, the respondents are involved in the development of their professional training, more specifically in the construction of their digital knowledge.

4 Conclusions

We believe that digital competence is one of the most important skills for lifelong learning, since digital technologies are increasingly intrinsic to human life, thus considering these digital skills and digital literacy indispensable for all citizens, according to the Official Journal of the European Union [5]. Since key competencies are related to the needs of citizens in the development of the various stages of life, such as employability and participation in society, it makes sense to list digital competencies as a basic competence, since it is becoming increasingly important to develop them.

The use of digital technologies should be included and developed in children from an early age, considering an intentional and targeted learning perspective, i.e., it should be proper and adjusted to their age group. This perspective should be explained and guided by a responsible adult (informed mediator) who aims for the child's healthy development and safety. In this vein, we highlight the importance of digital technologies for the entire educational community, in different contexts, as they enable children to learn more inclusively and innovatively, allowing them to become more entrepreneurial, critical, reflective, and curious throughout their lives, and should therefore not limit educators/teachers in their choice of strategies, techniques, and methods to reduce costs. However, although the use of these technologies is beneficial to children's teaching-learning process, it does not replace the role of the educator/teacher or the relationship between them [5].

It is becoming increasingly important to adopt digital skills that enable us to keep up with developments in the world, bringing us closer to the reality in which we find ourselves. As such, it is crucial to build/improve the knowledge, skills, and attitudes needed for everyone's personal development, as well as for inclusion in the community, with the school playing an important role in developing these skills. It is clear from the above that everyone needs to develop essential skills for their personal fulfillment and development.

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