From Perception to Action: The Adoption and use of Digital Technologies by Pre-School and Primary School

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Abstract – **The data that will be presented in this article is part of an international project involving Portugal, Denmark, Norway, Poland, United Kingdom and Slovakia. In this article, only Portuguese data are presented. Research has shown that digital technologies (DT) can be a valuable educational tool for children's learning and development, including the youngest. However, its integration into the educational practices of kindergarten and primary teachers has not been widely found in many countries. Thus, this project aims to know the attitudes and intentions of future kindergarten teachers and primary teachers in initial training, regarding the use of digital technologies (DT) in their future professional practice. To this end, a questionnaire constructed by the research teams of the mentioned countries was elaborated. In Portugal, the questionnaire was distributed to 93 students from a private university, future kindergarten teachers, and 95 students, future primary school teachers. Data was analyzed using SPSS software. The results show that future teachers see DT as relevant to children's development, enhancing their learning. However, especially future primary teachers seem not so sure that DT leads to more effective learning. By reading the data there are also doubts whether the DT really add some value to the professional practice of teachers. Are DTs losing their initial charm? As teachers, are the very positive reflections on the use of DTs in pedagogical practice changing their course?**

Keywords – **Digital Technologies, Perceptions, Attitudes, Preschool Teachers, Primary School Teachers.**

I. INTRODUCTION

Children grow up familiar with technologies such as computers, the Internet, video games, tablets and mobile phones, using them to play, learn and communicate. Digital language is part of the lives of these digital natives, and may even change their thinking patterns and the way they learn [1]. Consequently, teachers in initial training are expected to support the use of digital technologies (DT) by children, with the aim of their learning and holistic development. It will be the teacher's role to provide activities with materials adapted to the children's interests, such as digital games, support, intervening in some tasks, and gradually let the child be more autonomous in the use of technologies. You can also prepare questions, encourage critical thinking, reflection and experimentation, and observe the child, to understand their learning process and the development of their thinking when using technology [2].

If pre-service teachers do not perceive digital technologies as beneficial to younger children, they will not be motivated to use them in educational settings. Thus, this article aims to know the attitudes and intentions of a group of future kindergarten and primary teachers in initial training, regarding their intentions in using DT with children. To this end, a questionnaire was distributed to these students at a private higher education institution in

the Lisbon region. In this article we will analyze and discuss the data collected through the questionnaire, as well as present some conclusions.

II. THEORETICAL FRAMEWORK

2.1. *The Pedagogical Value of Digital Technologies*

There are several studies that reveal that digital technologies (DT) prove to be a valuable educational tool for the learning and development of children, including the youngest [3] [4]. Research has also shown that teachers' ability to use DT can improve children's learning [5], promote motivation and their use by children [6]. Consequently, research and scientific literature have focused on the factors that determine and hinder the integration of DT by teachers in initial training [7] [8]. Among these factors, attitudes, self-efficacy, experience in DT and skills in the use of DT were identified as significant and relevant elements [9] [10]. As a result, many education policies have come to emphasize the importance of integrating them into early childhood settings and primary school (e.g. [11]).

However, despite the use of DT by younger children is of growing interest to policy makers, pre-school and primary teachers, its effective integration into educational practices has not been widely found in many countries [12] [13] [14] [15] [16]. Although considerable efforts have been made to identify the determinants and barriers to the integration of DTs and thus support teachers in their integration into practice in a pedagogical environment [17], research shows that the teachers still use DT infrequently [18]. It was also revealed that teachers use DT mainly for administrative purposes, not to promote learning [19]. In addition, future initial training teachers report feeling insufficiently prepared to effectively integrate DT into their practice [20].

2.2. *Factors that Influence the Integration of DT with Younger Children*

The factors that influence the integration of DT with children can be varied and complex. More recent research has shown that the key to the effective use of DTs in education depends a lot on the success with which teachers integrate them into teaching and learning [21] [22]. In particular, their attitudes towards DT use and practices strongly influence the outcome of DT integration in the early years [23] [24]. Teachers in initial training are expected to support the use of DT by younger children for meaningful learning in educational environments. However, if future teachers do not believe in the potential of DT for learning taking into account the development of children, they will not be motivated or will be unable to encourage and support the use of DT by younger children. Teachers' positive attitudes towards DT use by younger children and their strong intentions to support children's DT activities are essential for DT to be successfully incorporated into an educational environment [24].

Attitudes can be defined as "a learned predisposition or tendency to respond positively or negatively to a specific object, situation, institution, concept, idea or person" [25]. Attitudes towards the use of DT by younger children, in this article, refer to the perceptions of teachers in initial training about the role of DT for children's learning and development.

Research on the attitudes of teachers in initial training towards DT reveals that they have generally positive opinions about this use and recognize the important role that DT play in their personal lives [26] [22], as well as in an educational environment [23]. However, they show some reticence in this use by younger children, as they

are of the opinion that it can be a threat to real communication or other traditional practices, such as play-based learning [12] [26]. As a consequence, there is some reluctance to encourage the use of DT by younger children, not using pedagogical strategies to encourage this use.

A comparative research focusing on Norway, Portugal, Greece, United Kingdom and Japan confirmed the existence of a close relationship between kindergarten teachers' perceptions regarding TD and their use in a nursery or kindergarten context. Teachers intend to make a positive contribution to the healthy development and well-being of the children they care for. If they believe that DTs can bring more benefits than risks, they tend to integrate them into their pedagogical practices, and the opposite also occurs [27]. It is also interesting the holistic view expressed by some kindergarten teachers in the specific case of Portugal, in which they explain that they avoid using DT, although they recognize that these have an enormous potential for learning, because they observe that children already use them excessively in context household, and therefore feel responsible for preventing excessive use [28].

On the other hand, negative views regarding DT use by younger children have raised many responses and disagreements over the most recent decades, which has also led to more empirical investigations in this field [3] [4]. Consequently, researchers have demonstrated investigations that highlight the potential of DT in the areas of language and communication, creativity, mathematical thinking and problem solving, cooperation and literacy to refute opposition criticisms [29] [30] [31].

It appears that research has focused more on the integration of teachers' DTs [32], presenting limited evidence on the attitudes and intentions of early childhood educators in relation to the use of DT by younger children, despite of their important role in harnessing the potential of DT for early learning and development as future teachers.

III. METHODOLOGY

The research presented here is part of a larger European project, involving Portugal, Denmark, Norway, Poland, the United Kingdom and Slovenia. In this article, only Portuguese data are presented.

The objective of the project is to know the attitudes and intentions of future kindergarten teachers and future teachers of the 1st CEB, in initial training, regarding the use of digital technologies (DT) in their future professional practice. To this end, research teams from different countries constructed a questionnaire. This presents three construct variables, composed of a five-point Likert scale (1 - Strongly Disagree to 5 - Strongly Agree). The construct variables are: (1) Attitude - comprising 8 variables, (2) Digital skills and knowledge - comprising 8 variables, and (3) Expected future use of digital technology by kindergarten teachers and teachers - comprising 17 variables. In this article we will explore the variables related to attitudes and expected future use.

The questionnaire was extensively tested by research teams from the countries participating in the study, proving to be a valid tool for constructing these variables. An English version of the questionnaire was used as a common framework for translation into the different languages required. The translations were done by the researchers in each country, ensuring a high level of accuracy.

To prepare the questionnaire in Portuguese, the Portuguese research team used the "translation-retroversion" [33]. This process is divided into three steps: initially, the questionnaire was translated from English into Portuguese by two people, one of whom was Portuguese and knew English and the other person was English

and knew Portuguese; then this translation was verified, and a third person was asked, in this case an English person who knew the Portuguese language well, to translate the Portuguese version into English; finally, the original version of the protocols (in English) was compared with the third-person version (also in English), verifying that these were very similar, therefore the Portuguese version being adequate [33].

The Portuguese team's questionnaires were distributed to kindergarten teachers and primary school teachers at a private university in Lisbon, Portugal. The groups of students invited to participate were in the first year of the master's degree. One of the researchers in the Portuguese team is a professor at that institution. The questionnaire was completed by students during their classes, in November 2021. Data was collected through the use of online research tools, mainly through Nettskjema. Nettskjema is a Norwegian origin tool for research design and implementation and secure online data collection, designed to be used at all levels of compulsory education and for higher education.

All participants were informed about the content of the study, this being voluntary and the data collected anonymous. The groups of students invited to participate were in the first year of the master's degree.

The measurement model was evaluated by confirmatory factor analysis [34]. Convergent and divergent validity and overall fit of the measurement model were examined.

IV. PARTICIPANTS

Ninety-three students, pre-service pre-school teachers, and 95 students, pre-service primary teachers, participated in this research. From the group of 93 pre-service kindergarten teachers, 90 respondents are female and 3 are male. Of the group of 95 pre-service teachers, 33 are male and 62 are female.

Regarding the ages of pre-service pre-school teachers, 43 were between 21-23 years old, 32 were between 24-27 years old, 12 between 28-30 years old and 6 over 31 years old. With regard to pre-service primary teachers, 49 were between 21-23 years old, 30 between 24-27 years old, 6 aged between 28-30 years old and 1 over 31 years old.

V. DATA ANALYSIS

All statistical analyses were carried out in AMOS [35]. Incomplete records were removed from the dataset. Convergent validity was assessed using the composite reliability (CR) and average variance extracted (AVE). Both the CR and AVE are deemed to be adequate since they equal or exceed .50 [36].

All items were examined for their mean, standard deviation, skewness, and kurtosis. The standard deviations reflect a moderate to high spread of participants' responses. Skewness and kurtosis indices were within the recommended value of |3.00| and |10.00| respectively.

VI. DISCUSSION

With regard to the effective use of DT, both pre-service teachers refer that they use DT in internships because they conceive it to be an asset for children, they manage to use DT appropriate to the subjects they are teaching, and this use corresponded to their expectations. Research also moves in this direction, in which it states that DT can be a valuable educational tool in the learning and development of younger children [4] [37], promoting their learning [5].

Regarding the perceptions of the two groups of pre-service teachers about the use of DT in their professional practice, they are of the opinion, namely the pre-service pre-school teachers, that society's expectations regarding the impact of DT are positive. Furthermore, studies show that teachers intend to use DT with children [27].

Both also agree that this use is essential for good professional practice, not interfering in the pedagogical relationship between child and teacher, and intend to frequently use digital technologies in their future professional practice with children.

This idea contradicts some of the data revealed in this research, in which pre-service teachers, especially primary teachers, seem not to be so sure that the use of DT leads to better learning and greater interest in children.

With regard to their confidence in using DT, both groups of pre-service teacher's report being familiar with DT that can help to diversify their future professional practice, they feel confident when using them and it is easy for them to learn to use them. This confident attitude in the use of DT with children is also mentioned in several other research [26] [22], where future professionals show considerable levels of confidence in the use of DT, recognizing its important role in the environment educational, but safeguarding the importance of playing outdoors [12] [26].

However, when asked whether they like to try out new DTs in practice, the answers are mixed, particularly in the pre-service pre-school group. There are also some uncertainties regarding the value that DT add in professional practice, namely on the part of pre-service primary teachers.

Pre-service primary teachers seem to have an easier time using DT than pre-service pre-school teachers. Regarding the purchase of digital equipment, pre-service- pre-school teachers refer more difficulty in this purchase to use in kindergartens than future pre-service primary teachers.

VII. CONCLUSIONS

The pedagogical integration of DT can support learning processes and improve the quality of education [37] [38], depending on how it is implemented with children [39]. Thus, teachers play a crucial role in the effective incorporation of DT with children [40].

Our findings highlight contradictions in Portuguese Pre-School and Primary teachers' perceptions about DT. On the one hand, our respondents confirm that they have experienced using DT during their internships, and express positive perceptions regarding their value for learning and for the development of young children. In addition, they believe that older colleagues, teachers, parents and society in general expects them to integrate DT in their professional practice, in the same way that they are integrated in daily life. Thus, they manifest intentions to do so, and claim feeling confident about their competences with DT and their ability to apply them for pedagogical purposes. However, some express doubts about to what extent DT can actually contribute to better learning and enhance the interest and focus of young children, and also express concern about how DT may act as a barrier in their relationship with the children. Pre-school teachers are slightly more reluctant regarding the integration of DT in their professional practices, expressing resistance in adopting new digital solutions or activities.

One important barrier that must be mentioned when considering the Portuguese context in particular is the lack of adequate equipment in kindergartens and Primary schools, in spite of several efforts from the Portuguese government to implement digital transformation in schools, these initiatives reach different parts of the country at diverse times and with varied intensity.

Our study contributes to reinforce the strand of research that attests the weight of perceptions about DT on the actual adoption and use of DT on the part of Pre-school and Primary teachers. In addition, it clarifies that, although the perceptions of these professionals are generally positive, there is a gap between the perceptions they express and what they do, as DT are far from being integrated in kindergartens and Primary schools in a seamless way. When we dig deeper on such perceptions, we uncover concerns underneath the generally positive view expressed, concerns that stem from doubts about the real effectiveness and value of DT as pedagogical assets. The best way to clear doubts is by experience, so our research points to the importance of reinforcing this topic during the initial training of these professionals, and particularly in their practical experiences, namely the internships.

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