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Digitalization Tools Challenges for Students in Post-Pandemic Era

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Abstract. The rationale and the survey goal were to identify factors that represent significant impact on use of digital tools in future pedagogical work in kindergartens.
The sample included 170 answered surveys, which were analysed descriptively and using statistical methods of t-test, correlation analysis and regression analysis.
Analysis findings pointed to variables of the frequency of computer use and the frequency of future use of digital tools. It seems that most influential factors in this context are professional digital competence (PDC) and professional attitude (PA) to digital tools.
The main findings show that the sample of students is a relatively young generation that, regardless of the frequency of computer and digital tools, uses and will use digital tools when working with children in kindergartens.
The main contribution of the paper is in the identification of influential factors that outline the necessity of implementing digital tools in pedagogical work.

Keywords: digital competence, digital tools, early childhood education, knowledge management, professional attitude

1. Introduction

The COVID-19 pandemic forced universities to engage in an agile adaptation of pedagogical processes to a "new normal". But with diminishing pandemic circumstances another adaptation is needed. That is education being pushed in a new direction regarding digital technology and use of digital tools. In this paper, we present the findings on the basis of a preliminary survey conducted among students of the Faculty of Education, the field of study of early childhood education (ECE). The rationale of preliminary research is considering identification of factors that represent significant impact on use of digital tools in future pedagogical work in kindergartens.
In recent years, researchers have focused on investigating factors that influence preservice teachers' use of digital technologies in their classrooms. Findings indicate that preservice teachers' attitudes toward technology are important determinants of the success of future technology integration (Blackwell et. All, 2014; Yusop, 2015). The authors also point out that openness and positive attitudes towards digital technology use in education appear to be important dimensions of teachers digital competence (Dumford and Miller, 2018; Madsen et al., 2021; Madsen and Thorvaldsen, 2022; Štemberger and Čotar Konrad, 2021). Therefore, the survey goal was to identify most influential factors for future use of digital tools in pedagogical work.
In the research we were interested in the opinions of ECE students of the Faculty of Education, University of Primorska on their digital competencies, professional attitude and professional use of digital tools. Beside that we were interested in whether there is a relation between computer use and digital competencies of ECE students, their future use of digital tools, and attitudes towards the use of digital tools.
The sample included 170 answered surveys, which were analysed descriptively and using statistical methods of t-test, correlation analysis and regression analysis.

Analysis findings pointed to variables of the frequency of computer use and the frequency of future use of digital tools. It seems that most influential factors in this context are professional digital competence and professional attitude to digital tools.
The main findings show that the analysed sample of students is a relatively young generation that, regardless of the frequency of computer and digital tools, uses and will use digital tools when working with children in kindergartens.

2. Literature review

2.1 Digital competence

Digital competence is a key transversal competence that means being able to use digital technologies in a critical, collaborative and creative way to achieve goals related to work, employability, learning, leisure, inclusion and/or participation in society (Redecker, 2017).
The European Digital Competence Framework for Educators (DigCompEdu), (Ghomi and Redecker, 2019; Kluzer and Pujol Priego, 2018) is a set of digital competences specific to educators that enables them to exploit the potential of digital technologies for improvements and innovation in education.
There has been relative agreement in different domains that critically discuss digital literacy and digital competence, on the basis that these involve not only technology mastery, i.e., the abilities, competencies, capabilities and skills required for using digital technology, media and tools, but also a digital mindset, which consists of attitudes and behaviours necessary to develop as a critical, reflective and lifelong twenty-first century learner. Digital competence is grouped into five areas which denote both technical and behavioural/attitudinal aspects, involving critical thinking, reflection and lifelong learning, information and data literacy, communication and collaboration, digital content creation, innovation, safety and problem solving (Martzoukou et al., 2020).
Educational institutions can have the DigcompEdu model as a reference since it contemplates the professional and pedagogical competencies of educators, as well as the development of students' digital competencies. Teachers should overcome the digital divide and play the role of guide in the learning construction process, taking advantage of mobile digital resources to promote the development of career-specific competencies and generic and transversal competencies, such as digital competence, which is becoming increasingly relevant in all professional fields (Ghomi and Redecker, 2019 as cited in Agila-Palacios et al., 2021; Kluzer and Pujol Priego, 2018; Marino et al., 2019).
Savaya and Gardner (2012) pointed that the call for awareness rests in the understanding that people are often unaware of the values that underlie and guide their behaviours. This understanding was elaborated by Argyris and Schön (1974) who maintained that people's deliberated actions are not happenstance but guided by the theories of action they hold. The authors named and discussed two types of theory: espoused theory and theory-in-use. *Espoused theory refers to the worldview and values that people believe guide their behaviours. Theory-in-use refers to the worldview and values reflected in the behaviours that actually drive their actions*. As the authors pointed out, few people are aware of their theories-in-use or that these are not always the same as the theories they espouse. Argyris and Schön (1974) further argued that if people are unaware of the theories-in-use that drive their actions, they cannot effectively manage their behaviours, which may, as a result, have unintended and undesired consequences. Argyris (1974) claimed that changes that are restricted to strategies and do not include the values that drive them are usually ineffective. Therefore, the most effective way of making informed decisions is to examine and change one's governing (as cited in Savaya and Gardner, 2012).
The findings of Argirys and others are related to research which shows that there is still a gap between access to digital technologies, guidelines for their use and the actual use of digital technologies in teaching and learning (Madsen, Thorvaldsen and Archard, 2018).
According to Martzoukou et al. (2020), students are considered to be digital competent when entering higher education studies, whether that is for undergraduate study or further learning. Current debates in this area do not offer a conclusive answer with many complex demographics and other factors playing

a role in determining whether and when students master essential digital competencies (Martzoukou et al., 2020). Agila-Palacios et al. (2021) pointed to self-perception for the evaluation of digital competence which should be performed as a longitudinal study and complemented with qualitative analysis, to present a better validation of the active methodologies contribution to the digital competences development. Further, five attitudes towards digital tools were organised by American scholars to study worker shortages and gender differences in IT programs and workplaces. The foundation for this model is Allport's definition of attitudes as mental states of readiness developed over time, which influence an individual's response to related objects and situations (Allport, 1935; Gokhale et al., 2013 as cited in Blayone et al., 2021). A survey on published research on the use of Information and Communication Technology (ICT) in higher education showed that most innovation and research is being undertaken in the faculties of education. These innovations look at the way ICT, such as social networks or collaboration tools, can improve teaching and learning (Marino et al., 2019).
Štemberger and Čotar Konrad (2021) argued that Slovenian student teachers predominantly hold positive attitudes towards using digital technologies in education, but they assess themselves as low-level users. Also, the student teachers' attitudes towards using digital technologies in education were proved as an important predictor of their level of proficiency in using digital technologies.
Madsen, Thorvaldsen, and Archard (2018) investigated the interplay between digital competencies, professional attitudes, and professional use of digital tools by teachers in Norway and New Zealand. The findings are not the same for both countries. They found that in New Zealand, the professional use of digital tools is linked to the level of digital competence of teachers. In Norway, however, the professional use of digital tools is more strongly linked to teachers' attitudes towards the use of digital tools in education. The relationship has a stronger impact on the extent to which digital tools are used in education in Norway, while the use of digital tools in education in New Zealand has a greater impact on teachers' digital competence. It seems that most influential factors in this context are professional digital competence and professional attitude to use of digital tools. Madsen and Thorvaldsen (2022) further investigated how the early childhood education program students teachers' use of technology, attitudes and digital competence may have been affected into this COVD-19 educational transformation. The findings of authors listed above was also the reason for the survey of opinions on the use of digital tools in kindergartens education among students of preschool education at the Faculty of Education, University of Primorska.
Based on literature review and research rationale the following Research question (RQ) was formulated: How do early childhood education students perceive the need for future use of digital tools in their work?

2.2 Guidelines for the use of digital technologies in kindergarten

By meaningfully integrating digital technologies into the implementation curriculum of the kindergarten, professionals consider the world we live in and enable the child to gradually develop their competences in accordance with the needs of the future. With the meaningful integration of digital technologies into kindergarten activities, the child should begin to acquire the ability to learn about and critically use digital resources, as well as the ability to search, collect, process, critically assess data, information and concepts, the ability to creatively use digital technologies to produce various products, the ability to communicate and cooperate at a distance, the ability to safely use digital resources and to observe legal and ethical principles of use and publication of information (Usar and Jerše 2021).
Play is central to a child's development and learning. A child's interactions with digital technologies and media mirror his interactions with other play materials. Children need opportunities to explore technology and interactive media in a playful and creative way. Appropriate experiences with digital technologies and media allow children to control the medium and the outcome of the experience, to explore the functionality of these tools, and to imagine how they might be used in real life. An example of the latter was studied by Fleer (2020), who observed the use of digital technologies by children in kindergarten. He noticed that the children used digital technology in different ways in different activities

and spaces in the nursery and incorporated it into their play. However, when the use of digital technologies became a common practice in kindergarten, more complex practices of using digital technologies appeared, for example, children began to record each other's play, which they relived when watching. In this way, digital equipment supported children's play, while at the same time providing insight into the rules, roles and actions of children (Fleer 2020).
The importance of the integration of digital technologies in kindergarten and the factors affecting the future use of digital technologies in kindergarten encouraged the implementation of a survey of opinions on the use of digital technologies in preschool education among preschool education students at the University of Primorska, Faculty of Education.

3. Methodology

Descriptive, t-test, correlation and linear regression statistical methods were used in the research analysis. The sample consists of 170 full-time and part-time students of the higher professional program of the 1st level ECE of the University of Primorska, Faculty of Education, of which 8 men (5%) and 162 women (95%). Data were collected between June 2021 and February 2022 and processed using IBM SPSS Statistics 28.
For the purpose of the research, an online questionnaire was used, which contained open-ended questions, optional questions and five-point Likert-type scales (from 1: Strongly disagree, to 5: Strongly agree). The questionnaire was developed and tested by Madsen et al., 2021; Madsen and Thorvaldsen, 2022 at UiT the Arctic University of Norway.
We used closed-ended questions to obtain demographic and computer use frequency data, the question of past digital tools use was an open-ended question, and the remaining questions were answered using a five-point Likert-type scale of views. These issues were thematically divided into three constructs: application of tools in future (AT), professional digital competences (PDC), and professional attitude (PA).
Cronbach's Alpha was used as a measure of the internal consistency or validity (Table 1).

4. Empirical findings and discussion

Cronbach's Alpha (Table 1) was used as a measure of the internal consistency and comprehensibility of the questionnaire.

Table 1: Cronbach's Alpha for constructs

Construct	Year 2021
Future use of various DT (var7 to var23)	0,84
Professional digital competence PDC	0,69
Professional attitude PA	0,64

Note: USE of various tools (var7 to var23); is a construct that holds 17 Digital Tools (DT) which the ECE students will use. There are different reports about the acceptable values of alpha, ranging from 0,70 to 0,95. A low value of alpha could be due to a low number of questions, poor inter-relatedness between items or heterogeneous constructs.

Reversed items in the survey have been used to correct for agreement bias. According to Weijters and Baumgartner (2012, p. 737) reversed items implicitly correct for agreement bias, particularly if the scale is balanced, reversed items may act as cognitive "speed bumps" (Podsakoff et al., 2003) and disrupt non-substantive response behaviour. Besides that, reversed items can improve scale validity by eliminating mindless and mechanical repetition of responses. Reversing some of the items has been shown to be related to lower reliability but removing the reversal would merely create a false sense of security (Weijters and Baumgartner, 2012 as cited in Madsen and Thorvaldsen, 2022).

4.1 Descriptive analysis of constructs

When asked about the frequency of computer use, 136 (80%) respondents answered that they use a computer frequently (on a daily basis), while the remaining 34 (20%) participants use a computer less often (several times a week or less).

Application of tools in future (AT)
In general, students estimate that in the future they will often use digital technologies in pedagogical work in kindergartens (i.e., Application of tools in future (AT) alias "var24-I will often use digital tools in my future pedagogical work in kindergartens."), 57,1% of respondents chose the value 4, 30% of participants chose the value 3, the average value of M = 3,54, SD = 0,807.

Professional digital competence (PDC)
As part of the questions on professional digital competencies, students chose the highest value in the statement "I can easily get acquainted with new digital tools." Where the highest proportion of students (64,7%) chose the value 4, 22,9% of students chose the value 3; the average value M = 3,77, SD = 1,003.
The lowest rating agreed with the statement "I do not have a clear idea of the learning outcomes in the use of digital tools in pedagogical work with children.", where most students (35,9%) chose the value 3, 29,4% of students chose the value 2 and 28,8% of students chose the value 4. Average value M = 2,95 and SD = 0,915.

Professional attitude (PA)
As part of the questions about the professional attitude towards the use of digital tools, students chose the highest values in the statement "Digital tools can attract children more to the planned activity.", where 19,2% students chose value 2, and 60,6% chose value 3 and 14,1% students chose 4; M = 3,83, SD = 0,738.
The lowest rating was about agreement with the statement "Society's expectations about the impact of digital tools are exaggerated.", was following; 39,4% of students chose a value of 2, 38,2% of students chose a value of 3, and 12,4% of students chose a value of 4; average value of construct was M = 3,19, SD = 0,472.

4.2 T-test of two independent samples of computer use frequency

The t-test was used to check whether there were statistically significant differences between the independent samples in terms of the frequency of computer use and the future use of digital tools (Table 2).
Two groups were formed i.e., a group of users who frequently use computer (4 and 5 in dataset) and group who use computer less frequently (1, 2 and 3 in dataset).
To this end, we formulated a null hypothesis:
H0a: The frequency of computer use is not statistically significantly related to the future use of digital tools.

An alternative or research hypothesis, however, is:
H1a: The frequency of computer use is statistically significantly related to the future use of digital tools.

Table 2: t-test between groups on computer frequency and future use of digital tools

	Frequent computer use	N	Average	Diff.	Std. Dev.	Sig.
Future use of various DT (var7 to var23)	Yes	136	3,04	0,1	0,494	0,655
	No	34	2,94		0,491	

Note: the magnitude of the effect of Cohen's d = 0.494 is low. Likert scale from 1 to 5. Digital Tools (DT).

From the results in Table 2, we can conclude that there is no statistical difference between the independent samples in terms of computer use frequency and future use of digital tools.

The t-test also examined whether there were statistically significant differences between the independent samples in terms of computer use frequency and professional attitude towards the use of digital tools (Table 3).
In the continuation of the analysis, we set a null and alternative hypothesis regarding the relationship between the frequency of computer use and professional attitudes towards digital tools.
We formulated a null hypothesis:
H0b: The frequency of computer use is not statistically significantly related to the professional attitude towards digital tools.

An alternative hypothesis is:
H1b: The frequency of computer use is statistically significantly related to the professional attitude towards digital tools.

The results of hypothesis testing are shown in Table 3.

Table 3: t-test between groups on computer use frequency and professional attitude towards the use of digital tools

	Frequent computer use	N	Average	Diff.	Std. Dev.	Sig.
professional attitude (PAreverse)	Yes	136	3,19	0,02	0,490	0,209
	No	34	3,17		0,396	

Note: the magnitude of the effect of Cohen's d= 0,473 is low. Likert scale from 1 to 5. Reverse means that we adjusted all average variables in the same direction.

Table 3 shows the results of comparing the averages between the independent samples of frequent and infrequent computer use and the professional attitude towards the use of digital tools, from which we can conclude that there are no statistically significant differences between the compared samples.

4.3 Correlations between constructs

Calculation of the Pearson correlation coefficient confirmed whether there was a correlation between the future use of digital tools- application of tools in future (AT) and professional digital competencies (PDC), and between the future use of digital tools and the professional attitude (PA) to the use of digital tools. For this purpose, we adjusted all variables averages in the same direction in the PDC and PA constructs (Table 4).

Table 4: Pearson Correlation between constructs

Pearson Correlation	PDCreverse	Sig. PDCreverse	PAreverse	Sig. PAreverse
var24 I will often use DT in my future pedagogical work in kindergartens (AT)	0,526**	<0,001	0,532**	<0,001
PDCreverse	1	-	0,585**	<0,001

Note: **. Correlation is significant at the 0,001 level (2-tailed). N=170. Digital Tools (DT). Reverse means that we adjusted all average variables in the same direction.

Among the constructs, In the future I will often use DT- application of tools in future (AT), professional digital competences (PDC) and professional attitude (PA) in the use of digital tools in pedagogical work in kindergartens, the correlation analysis showed a relatively strong positive correlations, above the value of 0,5, all of which are statistically significant at the level of 0,01 (Table 4).

4.4 Regression analysis between constructs

In the next step of analysis (Table 5), we attempted to predict the future use of digital tools in pedagogical work-application of tools in future (AT). The regression model (Table 5) between constructs, application of tools in future (AT) as dependent variable, and professional digital competence (PDC) and professional attitude (PA) to the use of digital tools as independent variables. Analysis showed that the model explains 34,5% of the construct of future use of digital tools in pedagogical work-application of tools in future (AT), with predictors of professional digital competence (PDC) and professional attitude (PA) to the use of digital tools. But there is still 65.5% of the unexplained share, which depends on other factors that are not included in the model.

Table 5: Explanatory power of the predictors

R	R2	Adjusted R2	Sig. F Change
0,594[a]	0,353	0,345	<0,001

Note: a. Predictors: (Constant), Reverse Coding-Average PA, Reverse Coding-Average PDC. Reverse means that we adjusted all average variables in the same direction.
b. Dependent Variable: Application of tools in future (AT) alias "var24-I will often use digital tools in my future pedagogical work in kindergartens."

Standardised linear regression coefficients predict the construct of future use of digital tools in pedagogical work-application of tools in future (AT), with Beta = 0,34 for professional attitude (PA) and with Beta = 0,327 for professional digital competence (PDC). That explains that the best predictor to the use of digital tools is professional attitude (PA) (Table 6).

Table 6: Regression coefficients

Model	B (Unstandardized Coefficients)	Std. Error	Standardized Coefficients Beta	t	Sig.
(Constant)	-0,118	0,387		-0,305	0,761
Reverse coding-Average PDC	0,549	0,129	0,327	4,257	<0,001
Reverse coding-Average PA	0,582	0,131	0,340	4,435	<0,001

Note: Dependent Variable: Application of tools in future (AT) alias "var24-I will often use digital tools in my future pedagogical work in kindergartens." Reverse means that we adjusted all average variables in the same direction.

4.5 Discussion

The rationale of preliminary research was considering identification of factors that represent significant impact on use of digital tools in future pedagogical work in kindergartens.
Analysis findings pointed to variables of the frequency of computer use and the frequency of future use of digital tools. It seems that most influential factors in this context are professional digital competence

and professional attitude versus digital tools. Analysis pointed that the best predictor to the use of digital tools is professional attitude.
In recent years, several researchers have focused on investigating factors that influence ECE teachers' use of digital tools in their classrooms. Findings indicate that ECE teachers' attitudes toward technology are important determinants of the success of future technology integration (Blackwell et al., 2014; Yusop, 2015).
As an answer to the RQ: " How do early childhood education students perceive the need for future use of digital tools in their work?" the following findings can be emphasised:

- The main findings show that the sample of students is a relatively young generation that, regardless of the frequency of computer and digital tools, uses and will use digital tools when working with children in preschool education.
- It was established that students have no problems getting acquainted with new digital tools, a bigger problem is the goal-oriented and didactically meaningful use of digital tools in the process of learning and teaching.
- Students show a positive attitude towards the use of digital tools in education, where they emphasize the motivational role of the use of digital tools.

The findings of the preliminary research can be linked to the findings of many authors, which point out that openness and positive attitudes towards digital technology use in education appear to be important dimensions of teachers and students' digital competence (Dumford and Miller, 2018; Madsen et al., 2021; Madsen and Thorvaldsen, 2022; Štemberger and Čotar Konrad, 2021).
The main contribution of the paper is in the identification of influential factors (Janeš and Novak, 2019), i.e., AT, PDC, PA, that outline the necessity of implementing digital tools in ECE's pedagogical work.

5 Conclusion

Surveyed students feel confident in getting acquainted with new digital tools, a challenge is the goal-oriented and didactically meaningful use of digital tools in the process of learning and teaching. They also show a positive attitude towards the use of digital tools in education, where they emphasize the motivational role of the use of digital tools.
The research revealed that there is a strong positive correlation between students' professional digital competencies, their future use of digital tools and their attitude towards the use of digital tools. Therefore, it makes sense to pay special attention to the development of digital competencies of students and supporting activities for their positive attitude towards the use of digital tools. Attention should be focused also on planning and implementation of activities for the development of digital competencies of preschool children and the acquisition and transfer of knowledge in computer science and informatics, which are key to living and working in digital society.
The limitations of the research are mainly that only one measurement was performed on the population of all years of undergraduate study of ECE program at the Faculty of Education, University of Primorska. In the continuation of the research, it is necessary to perform further measurements and comparisons between years of study, as well as measurements and comparisons between study programs at the Faculty of Education. The next possibility for research is the inclusion of additional constructs in the questionnaire and thereby improving the explanatory power of the used regression model.

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Appendix: Reversed scales of variables denoted as REV

Application of tools in future (AT)
Var24 I will often use digital tools in my future pedagogical work in kindergartens.

Professional digital competence (PDC)
Var25 I am familiar with digital tools that can help diversify activities when working with children's play, learning, and development.
Var26 I am, in general, confident when using digital tools.
Var30 I find it easy to become familiar with new digital tools.
Var31 I can use digital tools according to premises in early childhood education when working pedagogically with children.
Var33 It is difficult to use digital tools as a pedagogical resource in kindergartens. REV.
Var37 When I am using digital tools, it is difficult to adjust the content to the individual child's needs. REV.
Var38 I have no clear idea of learning outcomes when using digital tools in my pedagogical work with children. REV.
Var39 I use digital tools when assessing the child's development.

Professional attitude (PA)
Var29 When I use digital tools in the kindergarten, I find it adds value to the pedagogical work.
Var32 The use of digital tools is essential for good pedagogical programs in kindergartens.
Var34 Society's expectations regarding the impact of digital tools are exaggerated. REV.
Var35 Expectations related to the use of digital tools in kindergartens frustrate me. REV.

Var36 In professional debates at my university, the expectations for the impact of digital tools are exaggerated. REV.
Var40 The use of digital tools disrupts the relationship between the child and the early childhood teacher. REV.
Var41 Digital tools can make children more interested in the planned activity.
Var42 I like testing new digital tools in my pedagogical work in kindergartens.