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Chapter XXIX

# FACTORS RELATING TO THE DEVELOPMENT OF ICT COMPETENCES OF PRESERVICE PRESCHOOL TEACHERS

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**Abstract:** The aim of this study is to investigate factors correlated with the development of ICT competencies of future preschool teachers. There are a lot of factors that can be in correlation with the level of ICT competencies of preschool teachers and their intentions to use ICT in education. Based on different research, we extracted some of these factors, such as perceived usefulness, subjective norm, perceived ease of use, self-efficacy, and attitudes towards computer use. Data were collected from 48 students from the Faculty of Education in Jagodina, using a survey questionnaire during the school year of 2018/2019, from which 15 students were master pre-service preschool teachers (5th year), and others were in the first year of study. Results indicated that there was a significant correlation between the mentioned factors. Also, from the results, the master preschool teacher level of ICT competencies are higher than bachelor preschool teachers' level of ICT competencies, although not significantly. On the other hand, master students' intentions to use ICT in education, perceived usefulness, perceived ease of use, self-efficacy, and attitudes towards computer use were on a significantly higher level, compared with bachelor students. The results of the research can be useful in the development of curriculum at the faculties for future preschool teachers. Improving preschool teachers ICT competencies could be achieved with new elective ICT courses for preschool teacher students, practice in preschool institutions and personal professional development.

**Keywords:** ICT *competencies, preschool teacher, preschool teachers' education, preschool teachers' competences.*

## Introduction

New scientific and technological achievements and the tendency of people towards a better, richer and more humane society, led to the fact that during the second half of the 20th-century society start changing from an industrial to a digital society (Milutinović 2016). Thus, it is important for students to develop learning skills, often called the capacity of "learning to learn" (Anderson

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2008). For learning these skills, appropriate use of technology by teachers in education is important (Teo, Milutinović 2015), and this could also be applied to preschool teachers. Therefore, faculties for preschool teachers are expected to prepare preschool teachers to adequately use technology in education (Brun, Hinostroza 2014).

Studies have shown that despite increasing access, and a potential advantage in teaching information and communication technology (ICT) abilities to strengthen or transform teaching, preschool teachers seldom use computers in education (Barak 2014; Russell, Bebell, O'Dwyer, Duffany 2003). Consequently, faculties for preschool teachers have engaged in various efforts to re-shape their curriculum (Ottenbreit-Leftwich, Glazewski, Newby, Ertmer 2010). More precisely, they are incorporating technology into every aspect of the curriculum, allowing preschool teachers to understand the pedagogical reasons for using technology (Polly, Mims, Shepherd, Inan 2010). Previous research identified various approaches that may develop the ICT competencies that future preschool teachers will require (Chien, Chang, Yeh, Chang 2012). Sill, promoting ICT competencies for preschool teachers in an integrated and cross-curricular manner requires multiple strategies (Kay 2006).

The intention of preschool teachers to use computers is directly correlated to the real use of computers by preschool teachers, as shown by several studies (Milutinović 2009; Tondeur, Aesaert, Prestridge, Consuegra 2018). Some studies have aimed at preschool teachers characteristic correlated with their ICT competencies, such as "ease of use" or "subjective norm" (Tondeur, Aesaert, Prestridge, Consuegra 2018; Holland Piper 2016). These correlations are especially important as it has been discovered that preschool teachers' individual ICT characteristic (attitudes, ease of use, subjective norm) have a great effect on their use of technology in education (Teo, Milutinović 2015).

Preschool teachers are faced with numerous problems, from deficiency of resources and time to deficiency of necessary knowledge and experiences for successful integration of computers in education. The extent to which students develop their ICT competencies will depend on how much teachers and preschool teachers use computers and in which way (Milutinović 2016). Because of the reasons mentioned above, research is continuously trying to give an answer to the question of what the variables that have influence in the usage of computers in education are.

The main aim of this study is to explore factors correlated with the development of ICT competencies of future preschool teachers. Based on different research (Teo, Milutinović 2015; Tondeur, Aesaert, Prestridge, Consuegra 2018; Sanchez-Prieto, Olmos-Miguelanez, Garcia-Penalvo 2016), we extracted some of these factors, such as perceived usefulness, subjective norm, perceived ease of use, self-efficacy, and attitudes towards computer use. Research should also explore if there is a difference between the master preschool

teacher level of ICT competencies and bachelor preschool teachers' level of ICT competencies.

## Literature review

In the literature, many studies have been conducted to quantitatively measure pre- or in-service teachers' technology competency (Chien, Chang, Yeh, Chang 2012; Sang, Tondeur, Ching, Dong 2015). Due to the increasing importance of ICTs in all human activities, acceptance of technology by an individual is constantly studied and developed with many accepted models (Sanchez-Prieto, Olmos-Miguelanez, Garcia-Penalvo 2016). Some of these models are Theory of Reasoned Action – TRA, Theory of Planned Behavior – TPB, Technology Acceptance Model – TAM and Unified Theory of Acceptance and Use of Technology – UTAUT. Among all of these most commonly used model is TAM (Davis, Bagozzi, Warshaw 1989). However, in this research a model of correlation will be used, due to the small sample.

According to Julie Pallant (2007), correlation describes the strength and direction between two variables. Depending on the level of measurements of variables and nature of the data, there are different statistical indicators. Correlation between variables can be measured by Pearson's coefficient (**r**) and Spearman's rho coefficient ($\mathbf{r}_s$). Pearson's coefficient is compatible with unitary variables, while Spearman's rho coefficient is compatible with ordinal variable or when variables do not meet the requirements of Pearson's coefficient (Pallant, 2007).

Perceived usefulness, perceived ease of use, attitude towards computer use, subjective norm and self-efficiency are given by using hypotheses and are empirically supported as basic predictors for accepting the given informational system or technology by the user. Perceived usefulness is "defined as the prospective user's subjective probability that using a specific application system will increase his or her job performance within an organizational context", perceived ease of use "refers to the degree to which the prospective user expects the target system to be free of effort" and attitude towards computer use designates "an individual's positive or negative feelings (evaluative affect) about performing the target behavior" (Davis, Bagozzi, Warshaw 1989). Subjective norm is the conviction "the perceived social pressure to perform or not to perform the behavior" in question (Ajzen 1991). In studies about accepting technology, the subjective norm is one person conviction that people important to them think that they should or shouldn't accept technology. In another word, that is the extent to which pre-service teachers and pre-service preschool teachers experience demanding "important" or reference other individuals to use technology, which can relate to their colleagues, professors, and

headmasters university institutions (Milutinović 2016; Wong 2015; Teo, Milutinović 2015). Self-efficacy is a concept from Bandura's social cognitive theory (Bandura 1978). Albert Bandura (1978) defines it as a personal judgment of "how well one can execute courses of action required to deal with prospective situations". This definition of self-efficacy has been adopted as the assessment of one's own ability to use an information system (Compeau, Higgins 1995; Allan, Will 2008). Thus said, self-efficacy could be defined as the preschool teachers' belief in their own skills to produce an improvement in their students' learning (Van Dinther, Dochy, Segers, Braeken 2013).

PU, PEU, and ATCU are variables that were investigated in many studies that showed their correlations (Cheung, Vogel 2013; Motaghian, Hassanzadeh, Moghadam 2013; Teo, Milutinović 2015). Other studies have proven that subjective norm has a direct impact on perceived usefulness and perceived ease of use, and therefore, is correlated with these two variables (Schepers, Wetzels 2007; Venkatesh, Davis 2000; Teo, Milutinović 2015; Wong 2015). The effect that self-efficacy has on technology acceptance has been explored with good results both with teachers and students (Nam, Bahn, Lee 2013; Tarhini, Hone, Liu 2014; Wong, Teo, Russo 2012).

From the above-mentioned literature review, the next research tasks were formulated.

The first task is to investigate the level of pre-service preschool teachers' ICT competence, perceived usefulness, perceived ease of use, attitude towards computer use, subjective norm, self-efficacy and intention to use ICT in their future preschool practice.

The second task is to determine if there is a correlation between pre-service preschool teachers' ICT competence and intentions to use ICT with their perceived usefulness, perceived ease of use, attitude towards computer use, subjective norm and self-efficacy. Also, it should be determined is it positive or negative correlation, a strong or weak one.

The third task is to find if there is a difference between first-year and master students' intentions to use ICT in the future, ICT competence, perceived usefulness, perceived ease of use, attitude towards computer use, subjective norm and self-efficacy.

## Method

*Purpose of the study*

Given the fact that preschool teachers seldom use computers in education, there are already many instruments available to quantitatively measure pre- or in-service teachers' technology competency (Chiena, Changabc, Yehc, Chang

2012; Sang, Tondeur, Ching, Dong 2015) that could be applied on measuring ICT competencies of pre-service preschool teachers. Therefore, the present study aims to investigate variables that are correlated with the development of ICT competencies of future preschool teachers.

*Aim of the study*

The aim of this study is to research variables that could be correlated with ICT competencies and the intention of future preschool teachers in using computers in education. Based on the literature review, factors that could be correlated with the intention to use computers are extracted. Also, the aim of this study is to compare and to determine if there are any differences between the ICT competencies of master pre-service preschool teachers and the ICT competencies of the first year of pre-service preschool teachers.

*Sample*

This research is focused on pre-service preschool teachers. Participants were students from the Faculty of Education in Jagodina using a survey questionnaire during the school year of 2018/2019. There was 45 students in total , from whom 15 students were master pre-service preschool teachers, and others were in the first year of study. Undergraduate students had studied and passed the obligatory ICT subject in the first year, while master students had studied and passed one more obligatory ICT subject.

Participants had the right to stand down from the survey at any time, and they were informed of the purpose of the survey. Participation was voluntary, and students did not gain any material benefits from the survey.

*Measure*

For the purposes of this study, the questionnaire was constructed to measure students' intentions of using computers in education. The entire scale comprised 24 items (see Appendix). Variables PU, PEU, ACTU, SN, SE, and BI that were used in the questionnaire were taken and adapted (translated to the Serbian language) from various sources cited in the Appendix. Respondents were asked to rate each statement on a five-point Likert scale with meaning 1 – totally disagree to 5 – totally agree. Cronbach's Alpha (α) was used as estimates for scale reliability. It is recommended that the value is equal to or greater than 0,70 (Schumacker, Lomax 2010). Composite reliability of the proposed constructs is between 0,71 and 0,95, as shown in Table 1.

*Data analysis*

The data was analyzed using correlation model in SPSS, consistent with how hypotheses are conceptually and statistically expressed and this is useful for analyzing the relationship between latent and observed variables. This analysis involves testing the first data normality.

The non-parametric Mann–Whitney test was used for determinating differences between ICT competencies of bachelor and master students. This test has the great advantage of being used for small samples of subjects (five to 20 participants). It can also be used when the measured variables are of an ordinal type and were recorded with an arbitrary scale (Nachar 2008). The Mann–Whitney U test is one of the most commonly used non-parametric tests in behavioral sciences (Kasuya 2001).

## Results

*Descriptive analysis*

Using SPSS software, we determined descriptive statistics if items. Aiming to facilitate the evaluation of the intention of the Preschool Education Teacher Bachelor's Degree students towards ICT use and their ICT competencies, below we present the descriptive analysis, organized by constructs, in Table 1.

As we can see in Table 1, the scores obtained show the students' inclination towards the use of ICT in their future educational practice and all other measured items, with scores above 4, out of a maximum of 5, for most of the items.

ICTCOMP = ICT Competence (ICTC-PU = the ability to use ICT for facilitating student learning competencies in using ICT; ICTCID = the ability to manage ICT for their own teaching purposes (ICTCID))

*Table 1: Descriptive statistics of the items*

| Item | Minimum | Maximum | Median | Mean | Std. Deviation |
|---|---|---|---|---|---|
| ICTC-PU1 | 2.0 | 5.0 | 4.5 | 4.29 | 0.85 |
| ICTC-PU2 | 2.0 | 5.0 | 4.0 | 3.98 | 0.91 |
| ICTC-PU3 | 2.0 | 5.0 | 4.0 | 4.21 | 0.85 |
| ICTC-PU4 | 2.0 | 5.0 | 4.0 | 4.17 | 0.78 |
| ICTC-PU5 | 3.0 | 5.0 | 4.0 | 4.33 | 0.66 |
| ICTC-PU6 | 2.0 | 5.0 | 4.0 | 4.21 | 0.77 |
| ICTC-PU7 | 2.0 | 5.0 | 4.0 | 4.10 | 0.78 |
| ICTC-PU8 | 2.0 | 5.0 | 4.5 | 4.35 | 0.76 |
| ICTC-PU9 | 3.0 | 5.0 | 4.0 | 4.29 | 0.71 |
| ICTC-PU10 | 3.0 | 5.0 | 5.0 | 4.46 | 0.71 |
| ICTC-PU11 | 1.0 | 5.0 | 4.5 | 4.13 | 1.10 |
| ICTCID1 | 2.0 | 5.0 | 4.0 | 4.13 | 0.91 |
| ICTCID2 | .0 | 5.0 | 4.0 | 3.69 | 1.13 |
| ICTCID3 | .0 | 5.0 | 4.0 | 4.06 | 1.02 |
| ICTCID4 | .0 | 5.0 | 4.0 | 3.98 | 1.00 |
| ICTCID5 | .0 | 5.0 | 4.0 | 3.90 | 1.02 |
| ICTCID6 | .0 | 5.0 | 4.0 | 4.02 | 0.96 |
| ICTCID7 | .0 | 5.0 | 4.0 | 3.98 | 1.06 |
| ICTCID8 | 1.0 | 5.0 | 4.0 | 4.04 | 1.01 |
| PU1 | 1.0 | 5.0 | 5.0 | 4.42 | 0.92 |
| PU2 | 2.0 | 5.0 | 5.0 | 4.40 | 0.79 |
| PU3 | 2.0 | 5.0 | 5.0 | 4.56 | 0.68 |
| PU4 | 2.0 | 5.0 | 5.0 | 4.52 | 0.71 |
| SN1 | 1.0 | 5.0 | 4.5 | 4.19 | 1.00 |
| SN2 | 1.0 | 5.0 | 4.0 | 4.15 | 1.07 |
| SN3 | 2.0 | 5.0 | 4.0 | 4.31 | 0.80 |
| PEU1 | 2.0 | 5.0 | 5.0 | 4.38 | 0.76 |
| PEU2 | 2.0 | 5.0 | 4.0 | 4.23 | 0.75 |
| PEU3 | 3.0 | 5.0 | 4.5 | 4.35 | 0.73 |
| PEU4 | 2.0 | 5.0 | 5.0 | 4.35 | 0.84 |
| PEU5 | 2.0 | 5.0 | 5.0 | 4.31 | 0.83 |
| SE1 | 1.0 | 5.0 | 4.0 | 4.08 | 1.07 |
| SE2 | 1.0 | 5.0 | 4.0 | 4.21 | 0.90 |
| SE3 | 2.0 | 5.0 | 4.0 | 4.33 | 0.75 |
| ATCU1 | 2.0 | 5.0 | 5.0 | 4.42 | 0.74 |
| ATCU2 | 3.0 | 5.0 | 5.0 | 4.56 | 0.58 |
| ATCU3 | 3.0 | 5.0 | 5.0 | 4.54 | 0.58 |
| ATCU4 | 3.0 | 5.0 | 4.5 | 4.40 | 0.68 |
| BI1 | 2.0 | 5.0 | 4.0 | 4.19 | 0.89 |
| BI2 | 2.0 | 5.0 | 4.0 | 4.17 | 0.78 |
| BI3 | 2.0 | 5.0 | 4.0 | 4.31 | 0.78 |

Descriptive statistics of the variables are given in Table 2. All mean scores were above the midpoint of 2.5, indicating positive responses to the constructs.

*Table 2: Descriptive statistics of the constructs and composite reliability.*

| Variable | Mean | Std. Deviation | Skewness | Kurtosis | Cronbach's Alpha (a) |
|---|---|---|---|---|---|
| **SN** | 4.22 | 0.83 | -1.37 | 2.05 | 0.82 |
| **PU** | 4.47 | 0.63 | -0.9 | -0.39 | 0.81 |
| **PEU** | 4.32 | 0.59 | -0.52 | -0.71 | 0.82 |
| **ATCU** | 4.48 | 0.47 | -0.55 | -0.58 | 0.71 |
| **SE** | 4.21 | 0.79 | -1.47 | 2.84 | 0.84 |
| **ICTCOMP** | 4.12 | 0.67 | -0.88 | 0.92 | 0.95 |
| **BI** | 4.22 | 0.70 | -0.86 | 0.28 | 0.83 |

*Note.* SN = Subjective norm; PU = perceived usefulness; PEU = perceived ease of use; ATCU = attitude toward computer use; SE = Self-efficacy; ICTCOMP = ICT Competence; BI = behavioural intention.

The standard deviations ranged from 0,47 to 0,86, reflecting a fairly narrow spread in participants' responses around the mean. In order for the reliability of the applied measuring scale, ie, the Cronbach Alpha (α) was adequate, value is recommended to be 0,70 or bigger (De Vellis 2003). All reliability (ie. internal consent) of all constructs were between 0,71 and 0,95 as shown in Table 1.

Correlations between variables were measured using Spearman's rank correlation coefficient because preconditions for Pearson's linear correlation were not met. Values are shown in Table 3. Obtained correlation coefficients mostly showed positive relations between seven variables in the study, and all of the relations were significant.

*Table 3: Correlations between constructs.*

| | PU | SN | PEU | SE | ATCU | BI |
|---|---|---|---|---|---|---|
| SN | 0.549** | | | | | |
| PEU | 0.636** | 0.389** | | | | |
| SE | 0.595** | 0.352* | 0.667** | | | |
| ATCU | 0.651** | 0.431** | 0.677** | 0.650** | | |
| BI | 0.446** | 0.424** | 0.450** | 0.390** | 0.562** | |
| ICTCOMP | 0.654** | 0.499** | 0.658** | 0.671** | 0.503** | 0.451** |

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

As testing variables PU, SN, PEU, SE, ACTU, BI has shown that they didn't have a normal distribution, the non-parametric Mann-Whitney test was used to determine differences between answers from the first year bachelor students and master students. All results of Mann–Whitney test are shown in Table 4. There were statistically significant differences between the responses of the first year student and master students at the level of significance $p < 0,05$ for all variables except for SN and ICTCOMP in favor of the master students.

*Table 4: Descriptive statistics for all variables and Mann–Whitney test.*

| | | | | | | **Mann-Whitney u тест** | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Group** | **N** | **Mean** | **Std. Dev.** | **Median** | **U** | **z** | **p** | **r** |
| **PU** | OAS | 33 | 4.36 | 0.65 | 4.50 | 151.50 | -2.25 | 0.024 | -0.32 |
| | MAS | 15 | 4.73 | 0.50 | 5.00 | | | | |
| | **Total** | **48** | **4.47** | **0.63** | **4.75** | | | | |
| **SN** | OAS | 33 | 4.19 | 0.83 | 4.33 | 231.00 | -0.37 | 0.708 | -0.053 |
| | MAS | 15 | 4.27 | 0.84 | 4.33 | | | | |
| | **Total** | **48** | **4.21** | **0.83** | **4.33** | | | | |
| **PEU** | OAS | 33 | 4.20 | 0.64 | 4.20 | 157.00 | -2.04 | 0.041 | -0.29 |
| | MAS | 15 | 4.60 | 0.36 | 4.60 | | | | |
| | **Total** | **48** | **4.32** | **0.59** | **4.40** | | | | |
| **SE** | OAS | 33 | 4.03 | 0.85 | 4.00 | 141.00 | -2.41 | 0.016 | -0.35 |
| | MAS | 15 | 4.60 | 0.42 | 4.67 | | | | |
| | **Total** | **48** | **4.21** | **0.79** | **4.33** | | | | |
| **ATCU** | OAS | 33 | 4.32 | 0.47 | 4.25 | 54.50 | -3.48 | 0.001 | -0.50 |
| | MAS | 15 | 4.82 | 0.26 | 5.00 | | | | |
| | **Total** | **48** | **4.48** | **0.47** | **4.50** | | | | |
| **BI** | OAS | 33 | 4.06 | 0.67 | 4.00 | 124.00 | -2.81 | 0.005 | -0.31 |
| | MAS | 15 | 4.58 | 0.65 | 5.00 | | | | |
| | **Total** | **48** | **4.22** | **0.70** | **4.33** | | | | |
| **ICTCOMP** | OAS | 33 | 40.4 | 0.60 | 40.5 | 167.50 | -1.78 | 0.075 | -0.26 |
| | MAS | 15 | 4.30 | 0.76 | 4.58 | | | | |
| | **Total** | **48** | **4.12** | **0.66** | **4.16** | | | | |

## Discussion

According to educational authorities, ICT is expected to be broadly organized for teaching and learning in schools (Tondeur, Aesaert, Prestridge, Consuegra 2018). Consequently, ICT competencies were implemented for students in school, and have only recently started implementing pre-service preschool teachers (Kennisnet 2012). Promoting ICT competencies is a challenge for most education institutions (Gao, Wong, Choy, Wu 2011; Ottenbreit-Leftwich, Glazewski, Newby, Ertmer 2010) because multiple strategies are demanded in order to be successful. The aim of this study was to investigate pre-service preschool teachers' ICT competencies and answers to three tasks from the literature review, ie, the level of pre-service preschool teachers' ICT competencies, factors that have an impact on pre-service preschool teachers' determination to use ICT in teaching, and also to determinate if there are differences between first-year pre-service preschool teachers' and master pre-service preschool teachers' ICT competencies.

The answers to the first research task are shown in Table 1 and Table 2. Pre-service preschool teachers would use technology in their teaching in the future since almost all scores are above 4. All variables' values were above mean value, which indicates that all answers were positive. However, (re)designing ICT-applications and evaluating pupils with the help of ICT are fields where teachers should work more so that students would be more confident about this.

As far as the second research task is concerned, the results of this study showed that all factors are in strong correlation between each other (see Table 3), except for subjective norm and self-efficacy which are in weaker correlation. Thus, this implyies that perceived usefulness, perceived ease of use, attitude toward computer use, subjective norm and self-efficacy are the factors that have an impact on pre-service preschool teachers' ICT competencies and intentions to use computers in education.

Based on the results, ICT competencies is mostly influenced by self-efficacy, which is in strong correlation with perceived ease of use and attitude toward computer use. The results are consistent with the fact that the main barrier for the integration of technology is considered to be lack of preschool teachers' self-confidence (Ertmer 2005; Hermans, Tondeur, van Braak, Valcke 2008).

On the other hand, for the third research task, the Mann-Whitey test (see Table 4) showed that master pre-service preschool teachers have higher ICT competencies than first-year pre-service preschool teachers, although not significantly. This indicates that with more ICT subject during pre-service preschool teachers' education, they would have higher ICT competencies. Although this does not mean that a bigger number of ICT subjects would necessarily be

better, future studies should focus on what is the optimal number of ICT subjects during someone's education. While the subjective norm and ICT competencies didn't show a significant difference between first-year and master students, perceived usefulness, perceived ease of use, self-efficacy, attitude toward computer use, and behavioral intention showed that there is a significant difference between first-year and master students in favor of master students. Since almost all variables are in strong correlation (see Table 3), it's expected that if one variable has a significant difference between first-year and master students, some other variables will have a significant difference. These results show that the people that are students' role modes should encourage them to use more technology, and educators should spend more time teaching students about integrating ICT in education.

## Implications for practice

The study's results contribute towards showing which factors have an impact on students' ICT competencies and intention of using computers and if there are differences in ICT competencies between first-year students and master students. The obtained results give guidelines and recommendations for further improvement of pre-service preschool teachers' education.

As the subjective norm and attitudes towards computer use have proven to be very important in shaping the intentions of using computers, and their actual application, it is most important that education faculties' curriculum should integrate ICT in all subjects where this is possible. The Univerity's practice should support future preschool teachers' ICT abilities and, with that in mind, various training courses and workshops should be developed. Only with a well-developed ICT application system in all segments of education and the corresponding influence of teachers as role models, can students develop positive attitudes and intentions towards computer use in education, and hence, gain ICT competencies.

Lastly, it should be said that a big factor in gaining higher ICT competencies is personal professional development. Various online courses are available and could help in raising preschool teachers' ICT competencies.

## Conclusion

It could be concluded that integration of ICT is an important and complex process and there are a lot of factors that could influence preschool teachers' ICT competencies and intentions to use computers in their teaching.

It's clear that even with good knowledge of using technology, psycho-social aspects of using technology will have a big impact on students. Integration

of ICT is planned in accordance with preschool institutions' needs and has a significant influence on the learning process. As today ICT is present in all spheres of life as well as for all age- groups, it is necessary to start with the correct and timely application and education of the youngest age group. For optimal effect, preschool teachers have to adapt to all changes in technology. Preschool teachers, in addition to making decisions on the use of adequate technology, depending on the type and subject being processed, cannot resist the use of ICT but must accept and apply them in a timely manner. From all of the above, students must be able to practice the use of ICT in the process of education, but also to be provided with good examples and practices in order to better develop the application of the learned in the future work of the preschool teachers. It is necessary to refer them to new achievements and understanding these achievements in order to properly use them in their work. Preschool teachers have an impact on intentions and behavior but that's not enough, given that the vast majority of pre-school institutions are not adequately supplied with appropriate ICT equipment. As a result, preschool teachers during their work are unable to apply and evaluate theoretically acquired knowledge related to the use of ICT in education.

Despite all measures and precautions in our methodology, there are some limits. First, the data is collected by self-reporting, which has its own advantages, but it can lead to a common-method variance, and thus falsely increases the values of the accurate relationships between variables. Second, choosing students, future preschool teachers, seemed like a good solution. On the other hand, the lack of practice in the integration of ICT in real-life educational process could lead to the representation of a false image.

From a theoretical perspective, the study investigated the research task to assess the situation at different levels of use for teaching. The results should be applied in practice and so contribute to the improvement of teaching and learning processes.

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## Appendix

## List of Constructs and Corresponding Items

**ICT competence items** (adapted from Davis 1989)
I am able to…
ICTC-PU1: motivate pupils to use ICT in a positive way
ICTC-PU2: stimulate pupils to use ICT in a critical manner
ICTC-PU3: provide pupils with activities to exercise knowledge/skills by means of ICT
ICTC-PU4: provide pupils with activities on subject matters to learn with ICT
ICTC-PU5: offer pupils opportunities to express ideas in a creative way by means of ICT
ICTC-PU6: support pupils in searching for information by means of ICT
ICTC-PU7: support pupils in processing and managing information by means of ICT
ICTC-PU8: support pupils to present information by means of ICT
ICTC-PU9: support pupils to communicate with ICT in a safe, responsible and effective way
ICTC-PU10: support pupils to work together with ICT
ICTC-PU11: educate pupils to use ICT in a conscious way (respecting ergonomics, intellectual property, etc)
ICTCID1: select ICT-applications in view of a specific educational setting
ICTCID2: (re)design ICT-applications in view of a specific educational setting
ICTCID3: use ICT to differentiate learning and instruction
ICTCID4: track the learning progress of pupils in a digital way
ICTCID5: evaluate pupils with the help of ICT
ICTCID6: use ICT appropriately to communicate with pupils
ICTCID7: design a learning environment with the available infrastructure
ICTCID8: select ICT-applications effectively in creating a learning environment (e.g. in view of the group size)

**Perceived usefulness** (adapted from Davis et al. 1989; Teo 2009a, 2008b, 2010)
PU1 The use of ICT improves the educational practice (PU_01);
PU2 The use of ICT makes the educational practice more effective (PU_02);
PU3 The use of ICT makes it easier to carry out educational tasks (PU_03);
PU4 In general, I consider that ICT is useful in education (PU_04).

**Subjective norm** (adapted from Taylor, Todd 1995: Venkatesh et al. 2003; Teo 2009a, 2009b, 2010)

SN1 People whose opinions I value will encourage me to use ICT in educational practice.
SN2 People who are important to me will support me to use ICT in educational practice.
SN3 People who influence my behavior think that I should use the ICT in educational practice.

**Perceived ease of use** (adapted from Davis et al. 1989; Teo 2009b)
PEU1 Learning how to use ICT in the educational practice would be easy for me;
PEU2 I find it easy to interact with ICT;
PEU3 I find it flexible to interact with mobile devices
PEU4 It would be easy for me to become skillful at using ICT in educational practice
PEU5 In general, I consider ICT to be easy to use (PEU_04).

**Self-efficacy** (adapted from Venkatesh, Bala 2008; Holden, Rada 2011; Van Dinther et al. 2013)
SE1 I know I can use ICT even if I have not used them in an educational setting;
SE2 I am able to design educational activities that make use of ICT;
SE3 I can use ICT in the classroom even if there is nobody to help me.

**Attitudes towards the use of ICT in educational practice** (adapted from Thompson et al. 1991; Venkatesh et al. 2003; Teo 2009b)
ATCU1 The use of ICT would make educational practice more interesting.
ATCU2 Working with ICT in education would be fun.
ATCU3 I would like to use ICT in educational practice.
ATCU4 I look forward to those aspects of my job that require me to use ICT.

**Behavioral Intention** (adapted from Teo 2009b)
BI1 I intend to use ICT frequently in my future educational practice.
BI2 I will probably use ICT in my educational practice as soon as I start working.
BI3 I will use ICT in my future educational practice.