Characteristics of Kindergarten Teacher in the Information and Communication Technologies Environment: A Path Analysis

Noga Magen-Nagar, Esther Firstater & Nitza Schwasbky
Gordon College of Education, Israel

This study examines the extent to which kindergarten teachers' attitudes towards the ICT affects their skills and as a result the level of assimilating ICT in their teaching. The study involved 141 teachers, who responded to anonymous self-reporting online questionnaires. The path analysis test (SEM) results indicate that the attitudes of the kindergarten teachers towards ICT have a positive impact on the levels of skill needed for utilizing computers for internet use and for managing personal knowledge. In addition, it was found that the higher the level of the teachers' internet and communication skill was, the more they used internet websites of specialized content. However, as the level of using Office applications was higher, teachers used less internet websites of specialized content. This study concludes that positive attitudes of teachers towards the internet and computer literacy have crucial influence on the effective implementation of computer usage in the kindergarten.

Keywords: attitudes ICT, internet and communication, Office tools, the use of the computer, content websites, kindergarten teacher

INTRODUCTION

Education, like many other areas, has been reforming to accommodate technology revolution and the changing needs of the 21st century's new generation. In order to adjust to the changing needs of the society, kindergartens in Israel have incorporated the information and communication technologies (ICT) into their activities (Brito, 2010; Maskit, 2011; Nir-Gal & Klein, 1999, 2004). Furthermore, the need to prepare graduates of the education system with contemporary skills brings up the issue of whether it is appropriate to start children at early age with ICT education, and whether it is proper to integrate computer technologies into kindergarten education. One of the issues which arose while designing curriculum for children at early age is the implementation of ICT. It seems that computers can be an important tool to encourage young children to explore and discover, when they are mentored by caring and knowledgeable kindergarten teachers who

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Noga Magen-Nagar is a Senior Lecturer, Esther Firstater is a Lecturer, and Nitza Schwasbky is a Senior Lecturer. They are all at the Gordon College of Education, Israel. Noga Magen-Nagar can be reached at nogamagen@gmail.com

are capable of choosing software appropriate to the development stage of the children, of placing the computers in a comfortable position for the children, and of encouraging the children to interact with each other (Mohammed & Mohammed, 2012).

The research on ICT integration in pre-school education has not received wide attention, and little is known about the potential of technological innovation at this age (Arroz, Figueiredo, & Sousa, 2009). Kindergarten teachers need to acquire the skills relevant for the 21st century in order to teach in an ICT environment. These skills include literacy of information, media and information technologies, mastery of ICT tools and the use of various software and applications (Spector-Levy, 2012). The implementation of these novel technologies is related to the kindergarten teachers' attitudes and beliefs about the role of the technology in their teaching (Anderson & Maninger, 2007; Bitner & Bitner, 2002; Brinkerhoff, 2006; Eyadat & Alodiedat, 2010). The aim of current study is to examine the effect of kindergarten teachers' attitudes towards ICT on their skills and as a result the extent of ICT integration in their kindergarten teaching.

LITERATURE REVIEW

ICT IN EARLY CHILDHOOD EDUCATION

The technological environment in kindergartens has significant positive impact on the play and learning experience of young children, since it develops creativity, and stimulates curiosity, exploration, sharing and problem solving (Brito, 2010; UNESCO, 2010). Judge, Puckett, and Bell (2006) argue that in a rapidly changing society, the knowledge about the use of ICT becomes more relevant, and can cause faster cognitive development in children, especially in reading.

Although computer-use in the kindergartens is different from its use in schools, due to the reading limitations of children and their learning manner which is based on visual and audio representations, it was found that the computer improves cognitive functions such as memory, visual and analogue thinking skills, abstract reasoning, logical and mathematical thinking, creative thinking, literacy development, development of visual-motor coordination, vocabulary improvement and meta-cognition (Saharon & Kerlitz, 2011). An additional study, which involved children aged two to eight years old, from a low socio-economic status, who participated in an intervention program for increasing preparedness for learning, revealed that educational videos and interactive games had a positive impact on the children's literacy (Nagel, 2009). Another study (Nir-Gal & Nur, 2001) indicated that computer technologies contributed to the communication and interactions among children, and improved their conversation skills mediated by teachers. Through the use of computers the learning of new tasks can be assisted and supported, fine motor skills and hand-eye coordination can be cultivated, reaction speed and concentration improved, audio visual and spatial skills developed, as well as planning, organization and operation sequencing skills. All of these characteristics also allow assisting children with learning disabilities and ADHD, and children from disadvantaged populations (Judge, Puckett, & Cabuk, 2004; Kebritchi, 2010).

However, some argue that preschoolers cannot use many of the computer programs without the mediation of an adult (Nir-Gal & Drory, 2004). According to this opinion, preschoolers do not possess the necessary skills for enjoying the benefits of computers which create competition rather than cooperation (Yogev, 1999). Exposing the children too early to the ICT world may cause damage. According to this approach, the children have to be exposed to the internet at their personally appropriate time and pace. These researchers warn that the internet contains a great deal of content that is not recommended

for children at all. They argue that the computer can damage the intellectual, social and emotional development of the preschoolers (Cordes & Miller, 2000).

INFORMATION AND COMMUNICATION TECHNOLOGIES IN THE KINDERGARTEN

The countries included in the Organization for Economic Co-operation and Development (OECD) encourage the use of information technology in the education systems in order to promote the development of children at early age (Bakia, Murphy, Anderson, & Trinidad, 2011). Over the years, the evolving digital environment and the recognition of its contribution to child development, led in practice to the introduction of computers in the kindergarten and their use as a teaching aid, although research suggests that the process of assimilating computers in the kindergarten is not yet complete (Zelicha, 2011).

Studies have found linkage and effect between constructive concepts in teaching and successful integration of ICT in education (Higgins & Moseley, 2001; Overbay, Patterson, Vasu, & Grable, 2010). The digital environment may promote, assist and support the learning process in the kindergarten. The use of computers as an integral part of the curriculum is supported by both research and practice, as they complement the curriculum but do not replace and should not be used instead of other educational activities which are valuable to this age such as games, experiencing materials and exploration (Clements & Sarama, 2002; Haugland, 2000; Mohammed & Mohammed, 2012).

The intelligent integration of computers in the kindergarten requires clear goals, placing the content at the core, and designing tasks that allow exploration activities and collaborative work of the children (Spector-Levy, 2012). Yet, research found that in Israel only 10% of the 150 kindergartens studied had a new computer which was connected to the internet, and the policy of the Ministry of Education was implemented in 15% of the kindergartens. 70% of the kindergartens examined had old computers, and many of them were not used due to unattended technical problems (65%). In many of the kindergartens there was only one computer per 35 children (Zelicha, 2011). Children who do not have any other access to a computer suffer the most from this situation since they rarely have access to a computer, and thus the educational gap between the population sectors is deepening (Saharon & Kerlitz, 2011). Difficulties reported by kindergarten teachers were: difficulty in organizing the kindergarten, freeing time for each child or a group of children, and lack of solutions for technical problems and non-serviceability of the computers (Zelicha, 2011).

Due to the unique organizational structure of kindergartens in Israel, in which most teachers also function as the unit director, even with children aged 5-6, it is important to classify the teachers' role, qualifications, and skills in the computer field.

THE ROLE OF THE TEACHER IN THE ICT ERA

The Israeli kindergartens, which are used as an educational framework for children aged 3-6, are independent organizational units, each managed by a teacher. The teacher, who also functions as the unit educator, is responsible for organizing content, providing knowledge and values, organizing the children's activities and building educational continuum (Adam, 2008; Haddad Ma-Yafit & Sverdlow, 2010). Her responsibilities include the translation of educational policies of the Ministry of Education and executing them (Bigger, 2003; Firstater 2005). Kass (2012) argues that the teacher determines the quality of the educational process which takes place in the kindergarten, while bringing her strengths and weaknesses into the daily schedule. The changes in the teacher's work practice are aimed at the implementation of teaching techniques tailored for the 21st

century (Paz & Salant, 2010; Salant & Paz, 2011). Therefore, the teacher is responsible for the implementation of the 21st century skills plan, for developing teaching methods, for the mediation of computer applications and for running the kindergarten activities (Saharon & Kerlitz, 2011).

The mediation and skills involved in the use of computers are the two main roles of a kindergarten teacher in the digital environment (Spector-Levy, 2012). A study by Nir-Gal and Klein (1999) suggests that a more meaningful learning occurs when the digital environment is mediated by an adult. Children who were guided by an adult during the exposure to computer activities improved their functional level in various measures of thinking and visual-motor coordination, as compared to children who used the computer without or with a little adult mediation. The mediation by the teacher includes guidance and training in operating and using the computer, nurturing and encouraging thinking, motivating children by encouraging dialogue, encouraging social sharing among the children, as well as monitoring the progress of the children in the digital environment (Mohammed & Mohammed, 2012; Nir-Gal & Klein, 1999; Van Scoter, Ellis, & Railsback, 2001; Zelicha, 2011). In order to assist in significant learning, the teacher is required to select specialized websites and appropriate software that will allow for the children's exploration and discovery, and integrate these tools with the curriculum.

The ability of a kindergarten teacher to assimilate teaching in a digital environment is in direct correlation with her level of skill. The extent to which computers are assimilated in the kindergarten efficiently and in an optimized way depends on the comfort level of the teachers who use them (Joshi, Pan, Murakami, & Naranayan, 2010). The skills required include: familiarity with tools such as editing, data analysis, presenting knowledge (Spector-Levy, 2012), evaluating and choosing software that is adjusted to the developmental level of the child, content and pedagogic knowledge about children learning theories, integrating computers into the curriculum and adapting them to the needs of the preschoolers (Mohammed & Mohammed, 2012). The main criteria that the teacher should consider when choosing software are: suitability to age level, clarity of operating instructions, level of complexity, the ability of the child to independently control and operate the software, and the lack of violence (Haugland & Ruiz, 2002).

Therefore, in order to use computers in the kindergarten, it is imperative to develop dedicated websites and digital content that will promote the cognitive, social and emotional behavior of the children, and will assist the teacher in her work. In this way, the computer will become an instrument for developing cognitive thinking (Nir-Gal, 1995). The assimilation and implementation of teaching in a digital environment is also linked to the attitudes of the kindergarten teachers.

TEACHERS' ATTITUDES TOWARDS ICT

The kindergarten teacher is considered to be a central figure in the education process of the children, and her teaching methods are affected by her personality variables, such as: beliefs, perceptions and self-image. The teacher's beliefs, perceptions, skills and attitudes towards the digital environment affect the implementation of computerized pedagogy and her performance in such environments (Magen-Nagar & Peled, 2013). The teacher's attitude towards the computer is one of the variables that affect its actual use. Attitude is defined as an acquired tendency in responding in favor of or against a particular object, and the behavior of a certain teacher can be predicted by her positions (Fishbein & Ajzen, 1975). Teaching is affected by the teachers' attitudes, their choices of teaching strategies, and the implementation of innovative technologies. Positive attitudes contribute to successful implementation and the development of positive attitudes towards the personal teaching abilities (Magen-Nagar & Peled, 2013).

Upon examining the attitudes of Israeli kindergarten teachers toward the integration of computers in the kindergarten, it was found that there is a positive correlation with their implementation. It was also found that positive attitudes towards the integration of computers in the kindergarten led to their upgrade, software purchasing and freeing time for working in the computer corner (Zelicha, 2011). Negative attitudes toward the computer, and the objection to its incorporation in the kindergarten stemmed from the teachers' opinion that the preschool period in the child's life is intended for fun and games (ibid.). In another study that examined 54 early childhood educators (3-K) for their comprehension of development compatible ICT and the extent of its assimilation in their classes, it was found that while most of the teachers understood the components and function of the technology, there was no rendering into use and effective integration of the technology. They supported the concept of teaching by using this technology and perceived it as encouraging children to participate in involved and independent learning, and to see the ease of use, user-friendliness, suitability to educational goals, enjoyment and price and accessibility as criteria for developing suitable measures (Ntuli & Kyei-Blankson, 2010).

Additional studies that examined attitudes and perceptions of early childhood educators in the United States and Japan, found that US educators had more positive attitudes towards the role of computers in early childhood education, and perceived it as a promoter of normal development, learning and exploration. The educators in Japan were less confident about the computer contribution to early childhood development (Joshi et al., 2010).

Adjusting computer games to education goals for kindergarteners is directly correlated with the teachers' attitudes towards games-oriented learning. A negative attitude will affect their decision about whether to use computers in the classroom and a positive attitude will help in including them in their teaching. The study of Manessis (2011) which examined the views and intentions of 50 early childhood teachers after a 19 week course of ICT, found positive opinions, intentions and agreement that computers are an effective educational tool which contributes to the learning processes and skills of children, and also improves the quality of life in children with special needs. There was a link between teachers who teach for a few years only and those who had a lot of experience in using computers, experience in the course, the existence of a computer in the teacher's home, self-efficacy in playing computer games and positive attitudes.

In summary, the implementation of computers in the kindergarten is not a subject for debate any more, but rather it focuses on the issue of finding the optimum conditions for the implementation. Adult mediation is essential to the success of computer integration and to the promotion of teaching goals in the kindergarten. Kindergarten teachers have also had a central role in this issue. Therefore, their attitudes, knowledge, and skills in this area have implications for their success in fulfilling the role of assimilating the computer in the kindergarten.

RESEARCH QUESTIONS AND HYPOTHESES

The research question examined in this study is: To what extent does the attitude of the kindergarten teacher towards ICT affect her computer using skills and as a result the level of ICT integration in her teaching? It is hypothesized that:
1. The more positive the attitude of the kindergarten teacher towards assimilating ICT in the kindergarten is, the higher will be her mastery of internet and online communication skills (information and communication retrieval), personal knowledge management, and her skills of using Office tools (word processor, presentation and spreadsheet).

2. The more positive the attitude of the kindergarten teacher towards assimilating ICT in the kindergarten is, the higher will be her use of specialized content websites and the more she will integrate ICT in her pedagogy.

3. The higher the kindergarten teacher's mastery of internet and online communication skills (Information retrieval and communication), of personal knowledge management, and of the use of Office tools, the more she will utilize specialized content websites and the more she will assimilate ICT in teaching and learning in the kindergarten.

METHOD

PARTICIPANTS

This study included 141 Israeli kindergarten teachers, all of them are females (100%). The kindergarten teachers are professionals who work individually and in separate units from the primary schools. They serve as both educators and leaders. All of the participants held Bachelor's degrees at the time of data collection.

INSTRUMENTS

Teachers were asked to fill in a questionnaire that was composed of five topics: management of personal knowledge, use of Office tools, internet and online communication, pedagogy in a technology environment and attitudes towards ICT. In addition, data were collected about education and years of experience in teaching. The questionnaire was based on a teacher's knowledge questionnaire that was developed by experts of the Division of Information Technology and the Department for Education in Primary Schools - Learning Environments, the Ministry of Education in Israel (Ministry of Education, 2011). The present questionnaire consisted of 41 items, of which 34 items tested the level of mastery in collection and management of information, proficiency in Office tools and internet and communications tools, the degree of use of specialized content websites and the quality of the pedagogy in the technological environment. The kindergarten teachers were asked to answer the questions using a Likert scale that ranged from 1 - "do not master" to 4 - "master to a large extent." The higher the score, the better were the ICT skills of the teacher. In addition, the kindergarten teachers were asked to refer to seven items which dealt with their attitudes toward ICT and examined the level of their agreement with the propositions of a Likert scale that ranged from 1 - "strongly disagree" to 4 - "agree to a great extent." The higher the score, the more positive the attitude of the teacher to ICT was. The analysis of the questionnaire revealed reliability and internal consistency with a coefficient of $\alpha = 0.95$. Table 1 below presents the distribution of items according to the Alpha Cronbach's internal consistency, for all the technological-pedagogical knowledge components of the kindergarten teacher.

PROCEDURES

In recent years, the Ministry of Education has equipped every kindergarten teacher with a personal laptop to be used as a work tool for improving her teaching. At the same time, each kindergarten teacher is required to participate in and pass a continuing education and training program for three years in order to professionally progress in the ICT field. As part of this continued education program the teachers were asked to voluntarily complete the online anonymous questionnaire of the current study (using Google Docs

application). The teachers received the link of the questionnaire to their personal email addresses. In order to answer the questions they connected the questions online and sent it off upon completion. The data was instantly saved on an excel database, with all of the identifying details removed. The completion of the questionnaire took about 30 minutes each.

Table 1. Technological-pedagogical knowledge components of the kindergarten teacher and the Alpha Cronbach's internal consistency.

Component	Sub-component	Items	Item example	Reliability Alpha Cronbach's
Personal knowledge management		1-5	"Mark the degree of your mastery…: "Saving information in directories on a disk"	0.91
Office tools		6-18		0.95
	Word processor	6-12	"Mark the degree of your control… : adding pictures, changing size, choosing a part of it");	0.92
	Presentation	13-15	"Mark the degree of your control… : creating links from within the presentation: for a site, for a file, for a slide"	0.86
	Spreadsheet	16-18	"Mark the degree of your control… : using simple operators: average, sum"	0.86
Internet and communication		19-26		0.87
	Information retrieval from the net	19-21	"Mark the degree of your control… : downloading/ saving files and pictures from the internet"	0.81
	Online communication	22-26	"Mark the degree of your control… : Writing responses in a forum"	0.8
The use of the computer by the kindergarten teacher		27-32	"Indicate how often you perform the following activities: There is a computer in my kindergarten and I use it for teaching:	0.71
Content websites		33-35	"Indicate the degree of your use of the following websites: the website of the preschool education, the Gan-Net website and Busta-net, Da-Gan website"	0.87
Attitude towards ICT		36-42	"I try to convince others to oppose the assimilation of the computerized system"	0.90

DATA ANALYSIS

The database was transferred to the statistical software SPSS for Windows version 18.0. The study hypotheses were examined by using a path analysis – according to the SEM (Structural Equation Modeling) methodology, using the statistical software AMOS 18.0 (Analysis of Moment Structures) (Arbuckle, 2009; Blunch, 2008). The SEM model consists of two components: the measurement model and the structural model. From a methodological viewpoint it expresses the necessary integration of all research as such. It is based on two characteristics of the definitions of the variables: the first is the operator (the measurement model) and the other, the conceptual (structural model) (Hoyle & Panter, 1995). When the measurement and the structural elements integrate into one step, the result is a comprehensive statistical model that can be used to assess the relationship between variables that are free from the measurement error (Hoyle, 1995).

The measurement model classifies the factorial component of the latent variables in terms of anticipated and measured variables. The model which is based on calculating the correlation matrix between the measured variables reflects the convergence-discriminative validity of the measured variables. If the correlations between items that specify the same latent factor are higher than the correlations between items that indicate other factors in the model, then the measurement model has construct validity. The construct validity is involved with linking the measurement model to the general theoretical framework, in order to determine whether the model is related to the theoretical concepts and assumptions used, and this is the structural model. The structural model classifies the relationships and effects between the latent variables. The relationship effects between the latent variables are expressed as regression coefficient (β), and joint covariance (Byrne, 2001; 2009).

RESULTS

To test the associations among the study variables, we performed an examination of the bi-variate correlations. Table 2 shows the intercorrelation matrix for the study variables.

Table 2 indicates that significant positive and robust correlations were found between management of personal knowledge, use of Office tools, internet and online communication and pedagogy in a technological environment. This means that the higher the mastery of the teacher over the management of personal information in the computer, the higher are her Office tools skills, her mastery of internet use and online communications and her mastery of pedagogy in a technological environment, and vice versa. It was also found that there were significant and positive correlations, with moderate to weak strength between the attitude towards ICT and the components of the technological-pedagogical knowledge of the kindergarten teacher. This means that as the teacher's attitude toward ICT is more positive, her mastery of pedagogical ICT resources, her management of personal knowledge in the computer, her mastery of the internet and online communication skills and her mastery of the Office tools are higher, and vice versa.

In order to examine the impact of the teacher's attitude towards ICT on her personal knowledge management and mastery of utilizing pedagogical ICT tools, we performed a path analysis test using the Structural Equation Modeling analysis (SEM) with the statistical software AMOS 18.0 (Arbuckle, 2009; Blunch, 2008). This analysis is a multivariate data analysis in a graphical environment, used whenever examining complex causal model that contains a variety of variable or a variety of dependent relationships between the variables (Byrne, 2010).

The SEM model consists of two parts: the measurement model and the structural model. An analysis of the fit indices of the measurement model indicated high fit indices, and showed that the model is highly appropriate for analyzing the data of the current

research: χ^2 (*df* = 22) is statistically significant (*p* = 0.017); The RMSEA (0.72) measure was lower than 0.05; The NFI measure was (0.957), which is very high and the CFI approached 1 (0.981).

Table 2. Matrix of Pearson's correlations between personal knowledge management, use of Office tools, internet and online communication, pedagogy in a technological environment and attitude towards ICT (*N* = 141)

	Use of Office tools	Internet and online communication	Pedagogy in a technological environment	Attitude towards ICT
Personal knowledge management	0.80**	0.77**	0.58**	0.26**
Use of Office tools	–	0.80**	0.55**	0.17*
Internet and online communication	–	–	0.63**	0.24**
Pedagogy in a technological environment	–	–	–	0.30**

** *p* < 0.01; * *p* < 0.05

An analysis of the structural model, classified the relationships between the exogenous and the endogenous variables. The exogenous variable is the independent variable, *attitude towards ICT*, which includes two measures: *behavioral* and *cognitive* aspects. The mediating endogenous variables are internet, Office tools and management of personal knowledge skills. The dependent endogenous variables are the use of *specialized content websites*, and *computer use* in the kindergarten by the teacher. The endogenous variable *Office tools* includes three measures: *knowledge of word processing*, *knowledge in constructing presentation* and *spreadsheet knowledge*, and the endogenous variable *internet* includes two measures: *information retrieval from the internet* and *network communication*.

We examined the residual contribution of the exogenous variables and each of the endogenous variables for predicting the level of computer use in the kindergarten by the teacher. Figure 1 displays the path analysis and the standardized effect coefficients (*β*) between the exogenous variables and the endogenous variables and the explained variance (R^2) of the endogenous variables.

According to Figure 1, it appears that the variable *attitude towards ICT* explains 94% of the variance of the variable *internet*, 61% of the variance of the variable *Office tools* and 66% of the variance of *personal knowledge management*. Moreover, the variables *attitude toward ICT, internet, Office tools* and *personal knowledge management*, together explain 44% of the variable *content websites* variance, and 35% of the variable *computer usage by the kindergarten teacher* variance.

Regarding the first hypothesis, the coefficients paths examined between the exogenous variables and the mediating variables indicate that the kindergarten teacher's *attitude towards ICT* has a significant, positive effect on her level of skills in information retrieval from the internet and in online communication (*β* = 0.97; *p* < 0.001). This means that the more positive the attitude of the kindergarten teacher towards ICT the higher is her mastery

of information retrieval from the internet and her online communication skills. In addition, the teacher's attitude towards ICT has a significant and positive effect on the personal knowledge management of the kindergarten teacher and her mastery of higher Office skills ($\beta = 0.78$ and $\beta = 0.83$, respectively; $p < 0.001$). This means that the more positive the attitude of the kindergarten teacher toward ICT, the higher is her mastery of personal information management and organization, and mastery of Office tools skills such as word processing, presentation and spreadsheet. Accordingly, the hypothesis is fully confirmed.
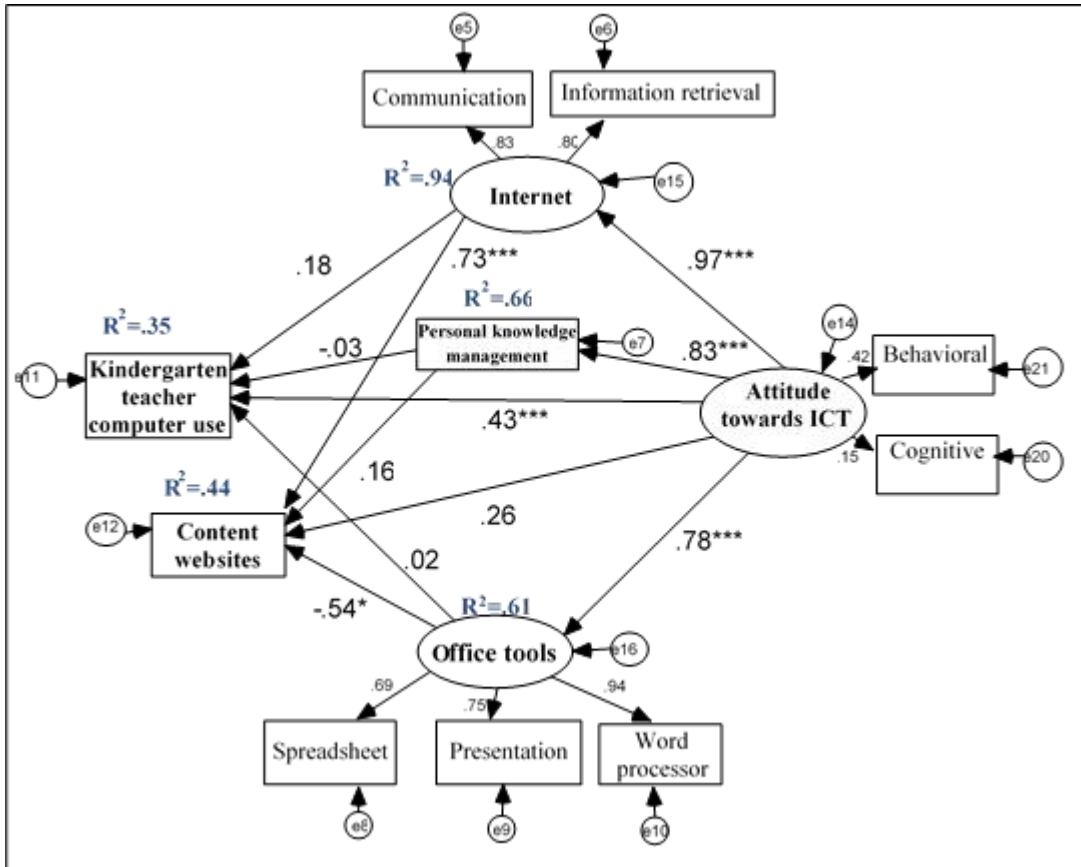

Figure 1. Results of the path analysis for predicting the level of computer use by the kindergarten teachers

Regarding the second hypothesis, the coefficients paths examined between the exogenous variable and the endogenous variables indicate that *attitude towards ICT* of the teacher had a significant, positive and robust effect on her computer use in the kindergarten ($\beta = 0.43$; $p < 0.001$). This means that the more positive the attitude of the kindergarten teacher towards ICT, the higher and more diverse is her computer use. However, the teacher's attitude towards ICT had no effect on the use of specialized content websites in the kindergarten technological environment ($\beta = 0.26$; $p < 0.05$). Accordingly, this hypothesis is partially confirmed

Regarding the third hypothesis, the coefficients paths examined between the mediating variables and the dependent variables indicate that the *internet* variable had a significant, positive and robust effect on using specialized content websites ($\beta = 0.73$; $p < 0.001$). This means that the more the teacher masters the skills of information retrieval from the internet and online communication, the more she uses specialized content websites in the kindergarten technological environment. However the *internet* variable had no effect on

using the computer in diversified ways ($\beta = 0.18$; $p > 0.05$). In addition, it was also found that the variable *Office tools* had a significant and robust negative impact on the use of specialized content websites ($\beta = 0.54$; $p > 0.05$). This means that the higher the Office tools skills of the teacher, such as word processing, creating presentations and spreadsheets, the less she uses specialized content websites in her work in the kindergarten's technological environment. However, no effect of the variable *Office tools* was found on using the computer in diversified ways ($\beta = 0.02$; $p > 0.05$). In addition, the variable *management of personal knowledge* does not affect the use of specialized content websites in the technological work environment of the kindergarten and the use of computers in diversified ways ($\beta = 0.16$ and $\beta = -0.03$, respectively; $p > 0.05$). This means that the knowledge of the kindergarten teacher on management and organization of personal information on the computer does not contribute to her work in terms of using the content of specialized websites and using the kindergarten's computer in diversified ways. Accordingly, this hypothesis is partial confirmed.

In summary, the results of the path analysis indicate that the variable *attitude of the teacher towards ICT* affects all the other mediating variables, *using Office tools*, *using the internet and communication media*, *managing personal knowledge*, as well as the *computer use in the kindergarten* in a direct, robust, powerful and prominent way. However, the mediating variables did not affect computer use, but only the use of websites with specialized content.

DISCUSSION

We are witnessing an extensive integration of information technology in schools' curricula in Israel and worldwide that have now also reached the kindergartens (UNESCO, 2010; Brito, 2010). The teachers play a central role in the introduction and implementation of these technologies into the activities of the kindergarten. The goal of this study was to examine the extent to which the teachers' attitudes towards ICT affect their computer and information technology skills and as a result the level of the computer assimilation in kindergarten teaching.

Recent studies clearly demonstrate the need for adopting a more holistic approach to describing and explaining the integration of ICT in teaching (Magen-Nagar & Peled, 2013; Sang, Valcke, Braak, & Tondeur, 2010; Teo, Lee, Chai, & Wong, 2009). Therefore, in the current research we have performed a path analysis using the SEM analysis technique which allows for reconstructing a complex, yet complete enough picture that can be assumed to be the closest to the reality in the kindergarten teacher's world. Our analysis indicates that the teacher's attitude is the key factor for predicting the extent of computer use in the kindergarten.

THE KINDERGARTEN TEACHER'S ATTITUDE TOWARDS ICT AND THE IMPLICATIONS FOR HER WORK

Our first research hypothesis was confirmed, which assumed that the more positive the attitude of the kindergarten teacher towards assimilating ICT in the kindergarten is, the higher will be her mastery of internet and online communication skills (information and communication retrieval), personal knowledge management, and her skills of using Office tools (word processor, presentation and spreadsheet).

Studies indicate that the main catalysts for the successful implementation of ICT in education are the teachers' positive attitudes towards the role of ICT in teaching-learning and the aptitude to implement ICT. It is possible that actions aimed at developing teachers' positive attitudes towards the integration of ICT in teaching, may contribute to the success

of its implementation. According to Fishbein and Ajzen's theory (1975), attitudes have implications on behavior. The more positive the attitude towards an object, the higher the tendency to act and experience with this object is. Therefore, teachers with positive attitudes perceive the computer as a tool for developing cognitive abilities, creativity, and language-communication skills in young children.

In the behavioral domain, the computer contributes to the ability to address the different learning styles of the children and their variety of information interests, and also promotes children's game competencies (Clements & Sarama, 2002; Haugland, 2000; Judge, et al., 2004; Kebritchi & Hirumi, 2008; Mohammed & Mohammed, 2012; Nagel, 2009; Saharon & Kerlitz, 2011). Our research results indicate that the more positive the attitudes reported by the teachers are, the higher are their skills in using Office tools. These findings complement the findings of a research conducted among elementary school teachers and ICT tutors (Magen-Nagar & Peled, 2013). The teachers' positive attitudes towards ICT contribute to their higher Office tools skills and higher assimilation of ICT in the classrooms.

These conclusions should be taken with caution as they were drawn upon self-reporting questionnaires and therefore cannot be stated with certainty regarding the extent to which the teachers were actually mastering Office tools and the internet. These data are subject to error due to "self-bias", the teacher's lack of objectivity and lack of knowledge of how to assess their own technical knowledge. Therefore, the conclusions drawn from the study should be limited. Still, these data are essential for confirming the proposed research model, and are consistent with the accepted research methods in the field.

The second research hypothesis has been partially confirmed, which assumed that the more positive the attitude of the kindergarten teacher towards assimilating ICT in the kindergarten is the higher will be her use of specialized content websites and the more she will integrate ICT in her pedagogy.

This hypothesis corresponds to two domains: teaching in the kindergarten (extent of use) and personal-professional use (databases that the teacher uses for teaching purposes). The research findings indicate that the positive attitude of the teacher significantly affects the degree of assimilating ICT in her teaching. This conclusion is supported by previous studies which indicate that there is a link between positive attitudes and the extent of the ICT assimilation in teaching (Anderson & Maninger, 2007; Bitner & Bitner, 2002; Brinkerhoff, 2006; Eyadat & Alodiedat, 2010; Sang, et al., 2010). Shamir & Kelly (2012) argue that the pedagogical knowledge of teachers with a positive attitude towards ICT affects their teaching strategies and their willingness to implement changes to their work. However, no significant correlation was found between a positive attitude towards ICT integration in the kindergarten and the use of content websites. In the current study, the teachers were asked about their use of websites that were specially developed for the kindergarten teacher by The Department for Preschool Education: "Gan-Net," "Bustan-Net," and "Da-Net" websites. The purpose of these sites is to provide an innovative environment for the professional development of the kindergarten teacher (Ministry of Education, 2013). These websites include information and materials about curriculum, teaching procedures, standards, experts' lectures, teachers' narratives, ideas and examples of learning activities. The websites were originally constructed for teaching planning in general, and not primarily for ICT activities. It is possible that the teacher does not perceive these websites as a tool for assimilating computers in the kindergarten activity. It may just be that these sites facilitate and simplify the way that the materials are introduced to the children, but they may fail to change the children's ways of thinking and learning. It seems that content websites may not serve and do not promote innovative pedagogical processes, but rather serve as a vehicle for delivering existing information. Therefore, content websites should be more practical and offer activities that suit the ICT environment, rather

than theoretical articles that are not applicable to the teacher's daily practice. In addition, it is possible that the kindergarten teacher will use specialized content websites if they are located in one appropriate and accessible site. For example, the kindergarten portal may serve as an online central workspace where the teacher could easily access specialized content websites and other resources. Likewise, similar websites in schools enable the teachers' planning and implementation of ICT lessons (Dayan & Magen-Nagar, 2011). The portal serves as a "gate" through which the full range of the teaching-learning experience and the organizational conduct in the kindergarten can be expressed and implemented (Raybould & Fauska, 2005; Rotem & Oster, 2006).

THE TEACHER KNOWLEDGE AND THE APPLICATION OF ICT IN THE KINDERGARTEN

The third hypothesis assumed that the higher the kindergarten teacher's mastery of internet and online communication skills (Information retrieval and communication), of personal knowledge management, and of the use of Office tools, the more she will utilize specialized content websites and the more she will assimilate ICT in teaching and learning in the kindergarten. This hypothesis was partially confirmed. The results show that the higher the teacher's skills in using the internet were (information retrieval and communication), the more she used specialized content websites. However, the higher her Office tools skills were, the less she used specialized content websites.

It appears that a kindergarten teacher, who knows how to search for information and how to write E-mails in order to communicate with parents, can also use the internet for personal needs and information finding and thus her competencies may lead her to use specialized content websites. However, it appears that the more the kindergarten teachers use Office tools, the less they use specialized content websites.

It is possible that they use their Office skills for creating their own teaching materials and presentations or other types of media, they may also utilize existing digital materials, which makes the specialized internet websites less significant for them. The teacher who tends to use Office tools may direct the children to create their own materials using these tools. Therefore, it is recommended that kindergarten teachers be familiar and proficient in using these tools during their training and professional development courses.

The study indicates that there was no effect of mastering internet skills (information retrieval and communication), Office tools, and computer based organization of personal information on the assimilation ICT in the teaching and learning in the kindergarten. This finding is different from the findings of Magen-Nagar and Peled (2013), where a significant association was found between the teachers' technological skill level and the assimilation of ICT in their classrooms. This finding can be explained by the fact that in Israel the implementation of ICT in the kindergarten began many years after its implementation in schools. Therefore, it is likely that school teachers are ahead of the kindergarten teachers, and that the latter might still be in the initial phase of the technological-pedagogical change. The teachers' attitudes towards change, and the way they accept it is the most influential factor in the assimilation of ICT in the classrooms. In order to integrate the technology into teaching, teachers should be trained in technological subjects (Rodríguez, Nussbaum, López, & Sepúlveda, 2010). Research indicates that teachers need to be familiar with computer literacy in order to use online tools in teaching. However, the training and professional development courses appear to be oriented towards pedagogical contexts and are less towards contributing to the technological literacy of the teachers (Halverson & Smith, 2010; Kalogiannakis, 2010; Silvernail & Harris, 2003; Vrma, Husic, & Linn, 2008). Kindergarten teachers' professional development has a crucial importance for promoting

their computer and information literacy as a powerful tool for assimilation and implementation of technological teaching environments in the kindergartens.

CONCLUSIONS

The scope of the kindergarten teacher knowledge in the digital era includes a positive attitude towards ICT, technological, pedagogy and online content knowledge. This knowledge plays a crucial role in the developing of teaching methods and processes (Collinson, et al., 2009). Similar to other studies, the results of the current study point to the complexity of the change in the kindergarten teacher's work in the ICT environment (Anderson & Maninger, 2007; Bitner & Bitner, 2002; Brinkerhoff, 2006; Magen-Nagar & Peled, 2013), which emphasizes the importance of the association between positive attitudes towards ICT, familiarity with computer and information literacy and teaching in ICT environment. The current study suggests that the level of the teacher's skill in computer and information literacy alone, without reinforcing her positive attitude towards ICT may reduce the level of the technological-pedagogical assimilation in the kindergarten. Therefore, promoting the teachers' positive attitudes towards technological pedagogy is recommended. In addition, the study introduces a tool for examining the attitudes of kindergarten teachers towards technological-pedagogical knowledge, which is similar to a questionnaire that was developed for school teachers. It is recommended that future research develops additional and unique tools to examine other factors involved in teaching in ICT environments.

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