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Modeling Pre-Service Teachers' Perception of Future Internet Usage for Professional Educational Purposes

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Abstract

This study sought to consider whether there are correlations between pre-service teachers' attitudes towards the Internet, web pedagogical content knowledge, and the perception of future Internet usage for professional educational purposes. Using the stratified sampling method, 503 university students were selected to participate in the study. For the statistical analyses, structural equation modeling was utilized. Research results indicated that pre-service teachers' attitudes towards the Internet were a positive predictor of their web pedagogical content knowledge. Also, the perception of future Internet use for professional educational purposes was explained by web pedagogical content knowledge and the attitudes towards the Internet. In conclusion, pre-service teachers' attitudes towards the Internet use were found to positively affect the transfer of their web pedagogical content knowledge into the classes. In addition, results indicated that pre-service teachers' web pedagogical content knowledge positively affects their Internet use for professional purposes.

Key words: *Internet attitude; Internet usage; web pedagogical content knowledge.*

Introduction

In the contemporary education system, where the constructivist approach is in the foreground, the objective is to educate individuals who are able to access information, use it consistently and produce new information. The aim of the constructivist approach, which is in the foreground, is effective construction of information, in other words the construction of meaning by individuals themselves, rather than the flow of information directly to the brain (Brooks & Brooks, 1993; Duffy & Jonassen, 1991; Knobloch, 2003).

In order to fulfill their tasks, students should be utilizing new technologies both in and out of their school environment, either individually or with their peers (Heinich, Molenda, Russell, & Smaldino, 2006). Information technologies add value to learning by reaching parts of the curriculum that other teaching methods cannot (Wellington, 2005). It has been found that some teachers could not use technology in their classes because of the lack of time and access as well as the lack of knowledge pertaining to the teaching technology (Ng & Gunstone, 2003). However, nowadays most of the technological advances are available for teachers. Among these technologies, the Internet is in the foreground.

According to the 2011 Internet usage statistics, 28.7% of the world and 45% of the Turkish population use the Internet (Internet World Stats, 2011). In our contemporary times, the Internet is being utilized in every sphere of human life. It is, in that sense, an essential technology which should also be applied in the education field. The Internet presents an unlimited source of information, and from this aspect, it has the necessary prerequisites to support learning at all levels of education (Poole, 1997). The Internet provides the instructors with opportunities to take the role of guidance. Besides the Internet usage ability, instructors have to be specialists in the related area (Anderson & Reed, 1998). In order for the in-service or pre-service teachers to successfully utilize the Internet, they should be open to and accept this technology (Luan, Fung, Nawawi, & Hong, 2005; Martinez -Torres et al., 2006).

Internet Attitude (IA)

According to Fishbein and Azjen (1975), attitude is the precondition of behavior, that is the tendency to act positively or negatively. Davis (1989), moving from this point, developed the Technology Acceptance Model (TAM) to explain individuals' intention to adopt new technologies, such as computers and the Internet. TAM explains the causative connections between the acceptance of information technologies with the perceptions, inclinations, intentions and behaviors. It also suggests six fundamental elements explaining acceptance or denial of the new technologies as actual usage. These are behavioral intentions, perceived usefulness, the tendency towards usage, perceived ease of use and external factors (Davis, 1989). Tsai, Lin and Tsai (2001) examined the importance of behavior (B), perceived control (PC), affection (A) and perceived usefulness (PU) in IA.

Many studies have found that pre-service teachers have positive IA towards using the Internet (Luan, Fung, & Atan, 2008; Rehman, Hunjra, Safwan, & Ahmad, 2010; Wong, Kamariah, Ramlah, Rohani, & Tang, 2003). However, Rehman et al. (2010) state that the participants in their study mentioned the difficulties of Internet usage in school. Luan et al. (2008) found that pre-service teachers' Internet usefulness perceptions were rather low. They explain these results as the outcome of the pre-service teachers' lacking abilities in the Internet usage. Teachers' skills in using the Internet and their attitudes towards it should be appropriate for their students and guide them in selecting relevant information (Sharp, 2001; Luan et al., 2005). In that

sense, the question of whether the pre-service teachers' IA affects their instructional Internet usage knowledge should be clarified.

Web Pedagogical Content Knowledge (TPCK-W)

Today teachers may integrate technology into learning environments through different knowledge and skills. The integration of digital resources is made easier by opportunities for professional development linking teachers' pedagogic expertise, content knowledge and ICT skills (Van Rooy, 2012). The framework for the integration of technology in the classroom by teachers or pre-service teachers is defined as technological pedagogical content knowledge. This framework involves a complex 3-dimensional fundamental knowledge, namely content, pedagogy and pedagogical content. This interaction leads to four more forms, resulting in a 7-dimensional model (Harris, Mishra, & Koehler, 2007; Koehler, & Mishra, 2005, 2008, 2009; Mishra, & Koehler, 2006). When the literature is examined, it may be observed that teachers' TPCK increased students' motivation and knowledge (Rohaan, Taconis, & Jochems, 2009). TPCK model refers to the use and integration of technology by teachers and pre-service teachers involved in various disciplines. Nevertheless, the model has begun to be adapted to particular technologies rather than to cover all technologies. For instance, Lee and Tsai (2010) adapted the model to TPCK-W for the Internet, a more specific type of technology, whereas Liaw (2002), and Archambault and Crippen (2009) adapted it to the technological pedagogical content knowledge for online learning. According to Shelly, Cashman, Gunter and Gunter (2004), teachers are required to possess knowledge of technology integration, the Internet in particular, in order to be able to ensure active and authentic learning.

TCPK-W by Lee and Tsai (2010), on the other hand, is comprised of four dimensions. These components are web general (WG), web communicative (WC), web content knowledge (WCK) and web pedagogical content knowledge (WPCK). This four-dimensional model makes mention of the knowledge structure for teachers to carry out Internet applications during the process of teaching. The study by Madden, Ford, Miller and Levy (2005) found that 85% of teachers acquire Internet related knowledge on their own or from friends. On the other hand, some researchers have established that teachers gain such knowledge structures at university (Niess, 2008).

Perception of Future Professional Educational Internet Usage

During the educational process, teachers use the Internet for a number of purposes, and one of these is teaching. Other purposes are seeking for information, conducting research, downloading electronic resources and communication through e-mails. (Cheung & Huang, 2005; Duggan, Hess, Morgan, Kim, & Wilson, 2001; Luan et al., 2008; Sam, Othman, & Nordin, 2005). As stated by Madden et al. (2005), students have much more Internet usage skills and knowledge than teachers. The future professional educational use of the Internet (FPEIUP) and its objectives are influenced by attitudes towards, perceptions and knowledge about, and the perceived complexity of the

Internet, also the skills in and experiences of the Internet usage (Cheung & Huang, 2005; Peng, Tsai, & Wu, 2006; Hong, Ridzuan, & Kuek, 2003; Mitra & Steffensmeier, 2000). Pre-service teachers' attitude towards the Internet can influence FPEIUP in their teaching (Johnson & Hignite, 2000; Luan et al., 2005; Liaw, 2002; Moon & Kim, 2001; Molebash, 2004).

Research Model and Hypotheses

Despite these findings, no study has yet investigated the relationships between IA, TPCK-W and FPEIUP. Hence this research sought to investigate this relationship. The study draws on the one conducted by Mazman & Usluel (2010). The research hypotheses are:

Pre-service teachers' IA will be associated positively with TPCK-W.

Pre-service teachers' TPCK-W will be associated positively with FPEIUP.

Pre-service teachers' IA and TPCK-W will be associated positively with FPEIUP.

Method

Participants

From the total of 1,545 third and fourth year pre-service teachers at Sakarya University Faculty of Education, 515 (i.e. 1/3 of the pre-service teachers) were selected as participants using the stratified sampling method. The department was designated as the first stratum, year of studies as the second stratum, instruction type as the third stratum and gender as the fourth stratum in the method. The scale was administered randomly to the specified number of pre-service teachers in each gender, instruction

Table 1

Descriptive statistics

		F	%
Gender	Female	290	57.7
	Male	213	42.3
Instruction Type	First	274	54.5
	Second	229	45.5
Grade	3rd Year	285	56.7
	4th Year	218	43.3
Department	Social studies	60	11.9
	Turkish education	61	12.1
	Special Education	18	3.6
	Psychological Counseling	73	14.5
	Computer and Instructional Technology	75	14.9
	Science Education	56	11.1
	Primary Education	66	13.1
	Mathematical Education	44	8.7
	Preschool Education	50	9.9
Daily Internet Usage	0 – 5 Hours	450	89.5
	6 – 10 Hours	47	9.3
	More than 10	6	1.2

type, year of studies and department. About 503 scales were completed by the pre-service teachers, and they were included in the research data. As seen in percentage rates given in Table 1, variables indicating number of females, first instruction type, third year and 0-5 hour daily Internet users are higher compared to the other variables.

Instruments

The Internet Attitude Scale (IAS): IA was measured using the IAS. This scale contains four sub-dimensions (PU, A, PC and B) which are defined through eighteen items on a 5-point Likert scale. The IAS was developed by Tsai et al. (2001). Reliability coefficient of IAS was .83. Confirmatory factor analysis results and reliability coefficient sub-dimensions are presented in the Appendix.

Web Technological Pedagogical Content Knowledge Scale (TPCK-W S): TCPK-W scale contains five sub-dimensions, defined through thirty items on a five-point Likert scale. It was developed by Lee and Tsai (2010) and adapted to Turkish by Horzum (2011). In this research four sub-dimensions (WG, WC, WCK, and WPCK) and 24 items were used. The internal consistency of the scale was .94.

The Future Professional Educational Internet Usage Perception Scale (FPEIUPs): The FPEIUP was developed by the researcher. Preliminary scale was created on the basis of literature review and was used in the interviews with teachers. The validity results revealed that the scale consisted of 17 items and four sub-dimensions: information acquisition (IAc), communication and collaboration (CC), occupational development (OD) and instruction (I). Reliability coefficient for the scale was .936. Confirmatory factor analysis results and reliability coefficient sub-dimensions are presented in the Appendix.

Procedure

Permission to conduct the research was obtained from the Sakarya University Faculty of Education. Participation was anonymous and voluntary. In the statistical analyses, structural equation modeling was utilized to evaluate model fit. These analyses were performed via Lisrel 8.54.

Results

While structuring the equation model to explain pre-service teacher's IA when they are the instructors, three latent variables, namely IA, TPCK-W, and FPEIUP perception were examined. The perfect fit, accepted values (based on Schermelleh-Engel, Moosbrugger, & Müller, 2003) and model's indexes are presented in Table 2.

It can be seen in Table 2 that SRMR, CFI, NFI, IFI and AGFI are a perfect fit and χ^2/df, RMSEA, NNFI and GFI are accepted levels. These results indicate that model display is accepted. Model's path diagram and standardized solution between latent and observed variables are presented in Figure 1.

Table 2
Model indexes

Model fit Indexes	Good fit	Acceptable values	Model results
χ^2/df	χ^2/df <3	3< χ^2/df < 5	3.45
RMSEA	0 < RMSEA < 0.05	0.05 < RMSEA < 0.08	0.070
SRMR	*SRMR* < .05	.05 <*SRMR* ≤ .10	0.049
CFI	0.97 < CFI < 1	0.95 < CFI < 0.97	0.97
NFI	0.95 < NFI < 1	0.090 < NFI < 0.95	0.96
NNFI	0.97 < NNFI < 1	0.095 < NNFI < 0.97	0.96
IFI	0.95 < IFI < 1	0.090 < IFI < 0.95	0.97
GFI	0.95 < GFI < 1	0.90 < GFI < 0.95	0.95
AGFI	0.90 < AGFI < 1	0.85 < AGFI < 0.90	0.92

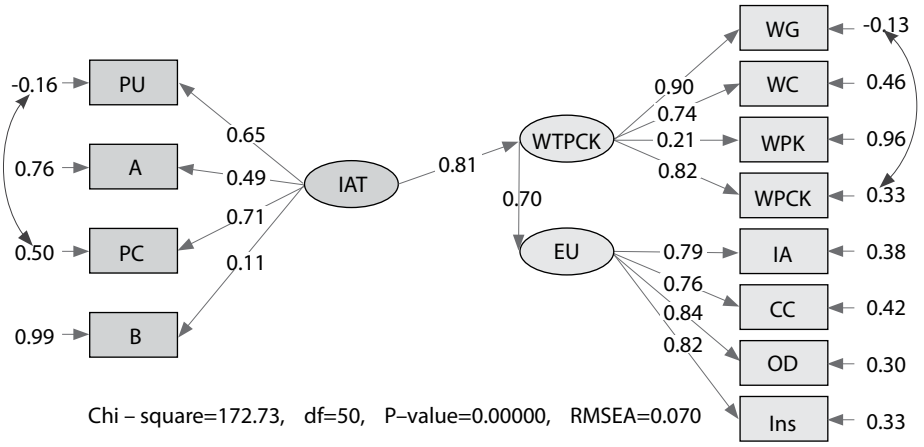

Figure 1. Standardized solution values between latent and observed variables

When the t values for IA, TPCK-W and FPEIUP latent variables and their observed variables were examined, it was found that t values ranged from 2.30 and 13.81 in IA, from 4.56 to 19.25 in TPCK-W and from 17.70 to 19.84 in FPEIUP. It may also be observed that all t and standardized solutions were significant and all the observed variables had a positive impact on their latent variables ($p<.005, \beta>0.10, t>1.96$). Latent variables' covariance matrix is presented in Table 3 and estimated structural equation is presented in Table 4.

Table 3
Latent Variables' Covariance Matrix

	FPEIUP	TPCK-W	IA
FPEIUP	1.00		
TPCK-W	0.73	1.00	
IA	0.57	0.85	1.00

Table 4

Latent Variables' estimated structural equation

Latent variables	Structural equation
TPCK-W - IA	TPCK-W = 0.82*IA, Error var.= 0.42, R^2 = 0.62 (0.056) (0.074) 14.75 5.63
FPEIUP – TPCK-W	FPEIUP = 0.67*TPCK-W, Error var.= 0.51, R^2 = 0.48 (0.048) (0.058) 13.95 8.88
FPEIUP - IA	FPEIUP = 0.55*IA, Error var.= 0.70, R^2 = 0.32 (0.052) 10.56

When t and standardized solution values between IA and TPCK-W were examined, a significant positive effect of IA on TPCK-W ($p<.05$) was found, with the t value 15.18 and standardized solution 0.81. IA accounted for 62% (R^2) of the TPCK-W variance. When t and standardized solution values between TPCK-W and FPEIUP were examined, a significant positive effect of TPCK-W on FPEIUP ($p<.05$) was found with the t value 13.78 and standardized solution 0.70. It was also found that TPCK-W determinants accounted for approximately 48% (R2) of the FPEIUP variance by IA. In addition, the effect between IA and FPEIUP was examined and it was found that direct effect of IA on FPEIUP is significant and positive ($p<.05$). IA directly accounted for approximately 32% (R^2) of the FPEIUP variance.

Discussion

In the research, pre-service teachers' FPEIUP was tested using a structural equation model. While testing the model, FPEIUP was explained directly by TPCK-W and indirectly by IA.

The obtained results indicate that PU, A, PC and B sub-dimensions are positively related with pre-service teachers' IA. IA's most significant predictor for pre-service teachers is PC. IA finding is consistent with Luan et al. (2005), and Luan et al. (2008) but inconsistent with Wu and Tsai (2006), Tsai et al. (2001), and Peng et al.'s (2006) research on IA. PC sub-dimension is related with the Internet usage control. In this regard PC includes confidence towards independent control. PC was found to increase with grade (Tsai et al., 2001). The difference may be derived from the population of this study which is comprised of 3rd and 4th year pre-service teachers. The reason for this is that the studies which yielded different findings were conducted on students in different grades and on university students at different faculties. Therefore, pre-service teachers' PC perception is one of the major reasons for the positive IA.

The findings also revealed that WG, WC, WCK and WPCK sub-dimensions are positively related with pre-service teachers' TPCK-W. This finding is consistent with Lee and Tsai (2010), and Horzum (2011). WG was found to be the most significant

predictor of pre-service teachers' TPCK-W. The finding is supported by studies on university students (Wu & Tsai, 2006; Tsai & Tsai, 2010; Peng et al., 2006; Liang & Tsai, 2008). The results can be explained by the findings of the study carried out by Madden et al. (2005) which found that teachers acquire knowledge about the Internet through informal ways. Pre-service teachers often acquire general knowledge about the Internet. However, they are in fact experts who have the required knowledge about teaching using the Internet in areas such as WCK and WPCK.

It was found that IAc, CC, OD and I sub-dimensions are positively related with pre-service teachers' FPEIUP, though the most significant predictor of FPEIUP is OD. Pre-service teachers' TPCK-W was found to be positively related with IA. In other words, as one's positive attitudes towards the Internet increase, so does his/her knowledge about using it for educational purposes. This finding is supported by many other studies which suggest that attitudes towards the Internet have an influence on teachers' efficient use of the Internet, knowledge about, and skills in using it (Liaw, 2002; Luan et al., 2005). The most important factor of the IA is PC and of TPCK-W is WG. With these findings, general web information for pre-service teachers is seen as the most important component. WG knowledge has a positive effect on the development of other components of TPCK-W model. TPCK-W was found to be positively related with IA and IA affects the pre-service teachers' TPCK-W and WG. For this reason PC, the important component of IA, is also related indirectly with TPCK-W and WG component. Therefore, it is important for pre-service teachers' PC to be developed by universities.

IA, mediated by TPCK-W, is positively related with FPEIUP. This finding suggests that pre-service teachers hold that they might use the Internet, either directly or indirectly, in their future profession. Pre-service teachers' FPEIUP was found to be related with I, OD, CC. This finding is consistent with literature (Cheung & Huang, 2005; Duggan et al., 2001; Luan et al., 2008; Sam et al., 2005). Similarly, it was found that pre-service teachers who have WG knowledge used the Internet largely to develop their teaching profession.

IA directly explained 32% of FPEIUP variance, while mediated TPCK-W explained 48% of the overall variance. Pre-service teachers' IA was found to positively affect their TPCK-W and TPCK-W positively affects FPEIUP. In addition, pre-service teachers' FPEIUP was affected by IA and TPCK-W.

According to the survey results, their forthcoming education and WCK are formed on the basis of the percentage of Internet usage. These findings are consistent with other research studies which already investigated variables one by one (Cheung & Huang, 2005; Duggan et al., 2001; Hong et al., 2003; Johnson & Hignite, 2000; Liaw, 2002; Luan et al., 2005; Mitra & Steffensmeier, 2000; Molebash, 2004; Moon & Kim, 2001; Peng et al., 2006).

This research has some limitations. The first of these are the data collection tool and the manner in which the data was collected. In this research a questionnaire was

used for data collection. Pre-service teachers' TPCK-W and the data about Internet use in their future profession was collected as a self-report, although research data collection of this type could also be achieved by using a rubric or observation. The second limitation refers to the students' voluntary participation in the research. Some students who were expected to participate chose to leave the study, which is why the number, due to their absence, was decreased.

Conclusion and Recommendations

The Internet is a very important technology in the current education system. It is a technology whose application is crucial in the education system as well as in many other fields. In order to have students who will use the Internet in an active way, it is necessary for all the teachers to be qualified in using it. These teachers should have good knowledge of the Internet, and they should be willing to use the Internet when they teach. Consequently, research results illustrate that pre-service teachers' IA positively affects their TPCK-W transfer into the classes. It was also found that pre-service teachers' TPCK-W positively affects their Internet use in profession. These findings prove that pre-service teachers' TPCK-W and IA must be developed by their faculties in order for them to use the Internet actively in their profession when they graduate.

In this study pre-service teachers' IA towards using the Internet and their TPCK-W was examined. In addition to these variables, pre-service teachers' capability to use the Internet, their readiness to use the Internet and different Internet tools in teaching can also be examined. In the study, the Internet was examined as a technology. Moreover, using 2.0 tools further research can be done with reference to the changes related to the Internet. Future research about different instructional technologies can also be carried out. Similar research can be conducted on teachers as well. Since a relatively small group of participants was used in this research, further studies can be conducted using a larger group of participants. The obtained study results are crucial for the heads of the institutions which provide education for teachers as well as for the experts who develop university programs, and lecturers.

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Appendix

Reliability coefficients and confirmatory factor results.

Scale	Sub-Dimension	Reliability	Fit measure	Model value
IA	PU	0.86	χ^2/df	2.20
			RMSEA	0.049
	A	0.80	SRMR	0.05
			CFI	0.98
	PC	0.88	NFI	0.96
			NNFI	0.97
	B	0.92	GFI	0.95
			AGFI	0.92
TPCK-W	WG	0.88	χ^2/df	2.80
			RMSEA	0.07
	WC	0.91	SRMR	0.10
			CFI	0.91
	WCK	0.95	NFI	0.89
			NNFI	0.91
	WPCK	0.90	GFI	0.86
			AGFI	0.80
FPEIUP	IAc	0.90	χ^2/df	3.33
			RMSEA	0.068
	CC	0.85	SRMR	0.04
			CFI	0.98
	OD	0.83	NFI	0.98
			NNFI	0.98
	I	0.86	GFI	0.92
			AGFI	0.89

Modeliranje percepcije buduće stručne obrazovne uporabe interneta predavača početnika

Sažetak

Ova studija razmatra tvrdnju da su stav inicijalnog predavača prema Internetu, pedagoško i predmetno tehnološko znanje i percepcija buduće stručne obrazovne uporabe interneta povezani. Sudionike istraživanja činila su 503 sveučilišna studenta. Primijenjeno je stratificirano uzorkovanje. Za statističke analize koristilo se modeliranje strukturalnim jednadžbama. Kao rezultat utvrđeno je da je pedagoško i predmetno tehnološko znanje inicijalnog predavača pozitivno predviđeno stavom prema Internetu. Štoviše, percepcija buduće stručne obrazovne uporabe interneta objašnjena je pedagoškim i predmetnim tehnološkim znanjem i stavom prema internetu. Ustanovljeno je da stav inicijalnog predavača prema korištenju interneta ima pozitivan utjecaj na prijenos pedagoškog i predmetnog tehnološkog znanja na predavanju. Također je ustanovljeno da pedagoško i predmetno tehnološko znanje inicijalnog predavača pozitivno utječe na njihovo korištenje interneta u zanimanju.

Ključne riječi: *korištenje interneta; pedagoško i predmetno tehnološko znanje; stav prema internetu.*

Uvod

U suvremenom obrazovnom sustavu u kojem je konstruktivistički pristup u prvom planu naš je cilj je podučiti pojedince kako da dođu do informacija, da se njima dosljedno koriste i da oblikuju nove informacije. U prvom je planu učinkovita gradnja informacija kao cilj konstruktivističkog pristupa, odnosno mogućnost da pojedinac sam konstruira značenje, a naszprot tome je tok informacija izravno u mozak (Brooks i Brooks, 1993; Duffy i Jonassen, 1991; Knobloch, 2003).

Da bi ispunili svoje zadatke, studenti se trebaju koristiti novom tehnologijom unutar i izvan svog nastavnog okruženja, bilo samostalno ili s vršnjacima (Heinich, Molenda, Russell i Smaldino, 2006). Informacijske tehnologije daju važnost učenju tako što dostižu dijelove nastavnog plana u odnosu na druge metode podučavanja (Wellington, 2005). Otkriveno je da se neki predavači nisu mogli koristiti tehnologijom na predavanju zbog nedostatka vremena, pristupa i poznavanja nastavne tehnologije

(Ng i Gunstone, 2003). No danas je većina tehnoloških dostignuća predavačima dostupna. Među tim je tehnologijama internet u prvom planu.

Prema statistici upotrebe interneta u 2011. godini, 28,7% svjetske i 45% turske populacije upotrebljava internet (Internet World Stats, 2011). Danas se internet koristi u svim sferama ljudskog života. S tim u vezi, internet je osnovna tehnologija kojom bi se trebalo služiti i u području obrazovanja. Internet predstavlja neograničen izvor informacija i može podržavati učenje na svim razinama obrazovanja (Poole, 1997). Internet pruža mogućnosti predavačima da provode autoritet. Osim mogućnosti upotrebe interneta predavači moraju biti stručnjaci u srodnom području (Anderson i Reed, 1998). Da bi se inicijalni predavači i predavači u struci uspješno koristili internetom, oni tu tehnologiju trebaju prihvatiti (Luan, Fung, Nawawi, i Hong, 2005; Martinez -Torres i sur., 2006).

Stav prema internetu (IA)

Prema Fishbeinu i Azjenu (1975), stav je preduvjet ponašanja, tj. tendencija pozitivnog ili negativnog ponašanja. Davis (1989) je, krećući se iz te točke, razvio model prihvaćanja tehnologije (TAM) da bi objasnio cilj pojedinaca kod usvajanja nove tehnologije, kao što su računalo i internet. TAM objašnjava uzročne veze između prihvaćanja informacijskih tehnologija s percepcijama, sklonostima, namjerama i ponašanjima. TAM predlaže šest osnovnih elemenata objašnjavajući prihvaćanje ili odbacivanje novih tehnologija kao stvarno korištenje. To su namjere u ponašanju, procjena korisnosti, tendencija prema korištenju, predviđena jednostavnost u korištenju i vanjski čimbenici (Davis, 1989). Tsai, Lin i Tsai (2001) razmatraju važnost ponašanja (B), predviđenu kontrolu (PC), afekciju (A) i predviđenu korisnost (PU) u IA-u.

Mnoge studije pokazuju da inicijalni predavači imaju pozitivan stav prema uporabi interneta (Luan, Fung i Atan, 2008; Rehman, Hunjra, Safwan i Ahmad, 2010; Wong, Kamariah, Ramlah, Rohani i Tang, 2003). Međutim, Rehman i sur. (2010) navode da su sudionici u njihovoj studiji spomenuli teškoće u služenju internetom u školi. Luan i sur. (2008) utvrdili su da su predviđanja korisnosti interneta inicijalnih predavača bila prilično niska. Oni taj rezultat objašnjavaju kao ishod nedostatka sposobnosti inicijalnih predavača u korištenju internetom. Vještine predavača u korištenju internetom i njihovi stavovi u vezi s tim trebali bi biti prikladni za njihove studente i vodilja u odabiru važnih informacija (Sharp, 2001; Luan i sur., 2005). U tom smislu treba razjasniti pitanje utjecaja stava prema internetu inicijalnih predavača na njihovo poznavanje korištenja internetom u nastavnom procesu.

Pedagoško i predmetno tehnološko znanje (TPCK-W)

Predavači danas mogu integrirati tehnologiju u nastavnim okruženjima putem različitih znanja i vještina. Mogućnosti za razvoj pedagoške stručnosti predavača, poznavanje sadržaja i ICT vještine olakšavaju integraciju digitalnih resursa (Van Rooy, 2012). Okvir za integraciju tehnologije na predavanju inicijalnih predavača i predavača u struci definiran je kao pedagoško i predmetno tehnološko znanje. Taj okvir uključuje

kompleksno trokomponentno znanje, odnosno sadržaj, pedagogiju i pedagoški sadržaj. Ova interakcija vodi ka još četiri forme, što rezultira 7-dimenzionalnim modelom (Harris, Mishra, i Koehler, 2007; Koehler i Mishra, 2005, 2008, 2009; Mishra, & Koehler, 2006). Nakon pregleda literature, utvrđeno je da je predavačevo TPCK povećalo motivaciju i znanje studenata (Rohaan, Taconis, i Jochems, 2009). TPCK model odnosi se na korištenje i integraciju tehnologije inicijalnih predavača i predavača u struci uključenih u razne discipline. Ipak, model se počeo prilagođavati određenoj tehnologiji. Na primjer, Lee i Tsai (2010) su prilagodili model TPCK-W-a za nešto više određenu tehnologiju, internet, a Liaw (2002), Archambault i Crippen (2009) prilagodili su ga prema pedagoškom i predmetnom tehnološkom znanju za *online* učenje. Prema Shelly, Cashman, Gunter i Gunter (2004), predavači zahtijevaju znanje integriranja tehnologije, posebno interneta, kako bi se moglo osigurati aktivno i autentično učenje.

S druge strane, Lee-vo&Tsai-evo (2010) TCPK-W sastoji se od četiri dimenzije. Te su komponente opća tehnologija (RS), komunikacijska tehnologija (WC), predmetno tehnološko znanje (WCK) i pedagoško tehnološko znanje (WPCK). Taj 4-dimenzionalni model spominje strukturu znanja da bi predavači proveli internetske aplikacije tijekom procesa podučavanja. Studija Madden, Forda, Millera i Levy (2005) je utvrdila da 85% predavača stekne znanje vezano uz internet samo ili od prijatelja, a predavači steknu takve strukture znanja na sveučilištu (Niess, 2008).

Percepcija buduće stručne obrazovne uporabe interneta

Tijekom obrazovnog procesa predavači se koriste internetom u razne svrhe, a osobito u nastavne. Druge namjene uključuju potragu za informacijama, istraživanje, preuzimanje elektroničkih sredstava i komunikaciju putem *e-maila* (Cheung i Huang, 2005; Duggan, Hess, Morgan, Kim i Wilson, 2001; Luan i sur., 2008; Sam, Othman, i Nordin, 2005). Kao što su naveli Madden i sur. (2005), studenti imaju mnogo više znanja i vještine o korištenju interneta od predavača. Stavovi prema internetu, kao i vještine i iskustva u korištenju internetom utječu na buduću stručnu obrazovnu uporabu interneta (FPEIUP) (Cheung i Huang, 2005; Peng, Tsai i Wu, 2006; Hong i sur., 2003; Mitra i Steffensmeier, 2000). Odnos inicijalnih predavača prema internetu može utjecati na FPEIUP-u u nastavnom procesu (Johnson i Hignite, 2000; Luan i sur., 2005; Liaw, 2002; Moon i Kim, 2001; Molebash, 2004).

Istraživački model i hipoteze

Unatoč navedenim nalazima nijedna studija nije istražila odnose između IA-a, TPCK-W-a i FPEIUP-e. Ovo istraživanje je nastojalo ispitati odnose između IA-a, TPCK-W-a i FPEIUP-e. Studija se oslanja na one koje su proveli Mazman i Usluel (2010). Hipoteze istraživanja su:

IA inicijalnih predavača bit će pozitivno povezan s TPCK-W-om.

TPCK-W inicijalnih predavača bit će pozitivno povezan s FPEIUP-om.

IA i TPCK-W inicijalnih predavača bit će pozitivno povezani s FPEIUP-om.

Metoda

Ispitanici

Od 1545 inicijalnih predavača trećeg i četvrtog stupnja na Edukacijskom fakultetu Sakarya sveučilišta 515 su osabrani kao sudionici. Uzorak se sastojao od 1/3 inicijalnih predavača. Upotrijebljeno je stratificirano uzorkovanje. Odjel je bio određen kao prvi stratum, stupanj kao drugi stratum, tip poduke kao treći i spol kao četvrti stratum u metodi. Ljestvica je nasumično podijeljena određenom broju inicijalnih predavača svakog spola, tipa poduke, stupnja i odjela. Inicijalni predavači popunili su oko 503 ljestvice koje su potom bile uključene u podatke istraživanja. Kao što se može vidjeti u Tabeli 1, postotne stope, broj žena, prvi tip poduke, treći stupanj i 0 – 5 sati dnevnog korištenja interneta korisnika veće su u odnosu na druge predmete.

Tablica 1.

Instrumenti

Ljestvica Stava prema internetu (IAS): IA je mjeren s pomoću IAS-e. U ovoj studiji koristilo se osamnaest stavki Likertova tipa od 5 točaka i četiri poddimenzije (PU, A, PC i B). Razvili su je Tsai i sur. (2001). Koeficijent pouzdanosti IAS-e bio je 0.83. Analizirani rezultati konfirmatornog čimbenika i poddimenzije koeficijenta pouzdanosti prikazani su u apendiksu.

Ljestvica pedagoškog i predmetnog tehnološkog znanja (TPCK-W S): TCPK-W ljestvica sadrži pet poddimenzija, trideset stavki Likertova tipa od 5 točaka. Razvili su je Lee i Tsai (2010), a turskom ju je jeziku prilagodio Horzum (2011). U ovom istraživanju korištene su četiri poddimenzije (RG, WC, WCK i WPCK) i 24 stavke. Unutarnja konzistencija skale iznosila je 0.94.

Ljestvica percepcije buduće stručne obrazovne uporabe interneta (FPEIUPs): istraživač je razvio FPEIUP. Preliminarna je ljestvica izrađena prema pregledu literature i korištena je u intervjuu s predavačima. Rezultat valjanosti je otkrio da se ljestvica sastoji od 17 stavki i četiri poddimenzije: stjecanje informacija (IAc), komunikacija i suradnja (CC), profesionalni razvoj (OD) i poduka (I). Koeficijent pouzdanosti ljestvice iznosio je 0.936. Analizirani rezultati konfirmatornog čimbenika i poddimenzije koeficijenta pouzdanosti prikazani su u Prilogu.

Procedura

Dopuštenje za provođenje istraživanja dobiveno je od Edukacijskog fakulteta Sakarya sveučilišta. Sudjelovanje je bilo anonimno i dobrovoljno. Za statističke analize korišteno je modeliranje strukturalnim jednadžbama da bi se procijenilo je li odgovarajuć. Te analize izvedene su s pomoću Lisrel 8.54.

Rezultati

Dok se strukturirao model jednadžbe za objašnjenje IA-a inicijalnog predavača u ulozi instruktora, ispitane su tri latentne varijable, naime IA, TPCK-W i percepcija

FPEIUP-e. Odgovaranje modela, prihvaćene vrijednosti (utemeljene na Schermelleh-Engel, Moosbrugger, i Müller, 2003) i indeksi modela istaknuti su u Tablici 2.

Tablica 2.

U Tablici 2 možemo uočiti da SRMR, CFI, NFI, IFI i AGFI savršeno odgovaraju i da su χ^2/df, RMSEA, NNFI i GFI prihvaćene razine. Ti su rezultati pokazali da je model zaslona prihvaćen. Modelov dijagram puta i standardizirano rješenje između latentnih i promatranih varijabli prikazani su na Slici 1.

Slika 1.

Kada su latentne varijable IA-a, TPCK-W-a i FPEIUP-e i t vrijednosti njihovih promatranih varijabli ispitane, otkriveno je da su t vrijednosti u rasponu od 2,30 i 13,81 u IA-u, od 4,56 do 19,25 u TPCK-W-u i od 17,70 do 19,84 u FPEIUP-i. Također je uočeno da su svi t i standardizirano rješenje bili značajni i da sve promatrane varijable imaju pozitivan utjecaj na svoje latentne varijable ($p < ,005$, $\beta > 0,10$, $t > 1,96$). Kovarijanca matrice latentnih varijabli prikazana je u Tablici 3, a procijenjena strukturalna jednadžba u Tablici 4.

Tablica 3. i 4.

Kada su ispitani t i vrijednosti standardiziranih rješenja između IA-a i TPCK-W-a, utvrđen je značajan pozitivan učinak IA-a na TPCK-W ($p < ,05$), t vrijednost je 15,18 i standardizirano rješenje je 0,81. IA je opravdao 62% (R^2) varijance TPCK-W-a. Kada su ispitani t i vrijednosti standardiziranih rješenja između TPCK-W i FPEIUP-e, utvrđen je značajan pozitivan učinak TPCK-W na FPEIUP-u ($p < ,05$), t vrijednost je 13,78 i standardizirano je rješenje 0,70. Također je utvrđeno da TPCK-W determinante po IA-u opravdavaju približno 48% (R2) varijance FPEIUP-e. Štoviše, ispitan je odnos između IA-a i FPEIUP-e i utvrđeno je da je izravni učinak IA-a na FPEIUP-u značajan i pozitivan ($p < ,05$). IA izravno opravdava oko 32% (R^2) varijance FPEIUP-e.

Rasprava

U istraživanju je FPEIUP-a inicijalnih predavača testirana modeliranjem strukturalnim jednadžbama. Dok se model testirao, FPEIUP-a je izravno objašnjena TPCK-W-om, a posredno IA-om.

U istraživanju je otkriveno da su poddimenzije PU, A, PC i B pozitivno povezane s IA-om inicijalnih predavača. Najznačajniji prediktor za IA je PC za inicijalne predavače. IA nalaz je u skladu s istraživanjima o IA od Luan i sur. (2005) i Luan i sur. (2008), ali nije konzistentan s istraživanjima o IA od Wu i Tsai (2006), Tsai i sur. (2001) i Peng i sur. (2006). Poddimenzija PC je povezana s kontrolom korištenja interneta. S tim u vezi PC uključuje povjerenje prema neovisnoj kontroli. PC se povećava sa stupnjem (Tsai i sur., 2001). Razlika se može izvesti iz populacije ovog istraživanja koje se sastoji od 3. i 4. stupnja inicijalnih predavača. Razlog tome jest da su studije

koje donose različite zaključke provedene na različitim stupnjevima studenata na različitim fakultetima. Dakle, PC percepcija inicijalnih predavača jedan je od glavnih razloga za pozitivan IA.

Rezultati su također otkrili da su poddimenzije WG, WC, WCK i WPCK pozitivno povezane s TPCK-W-om inicijalnih predavača. Taj je pokazatelj u skladu s istraživanjima Lee i Tsai (2010) i Horzum-a (2011). WG je najznačajniji prediktor TPCK-W-a inicijalnih predavača. Nalaz je potvrđen studijom o studentima (Wu i Tsai, 2006; Tsai i Tsai, 2010; Peng i sur., 2006; Liang i Tsai, 2008). To može objasniti nalaz studije od Madden i sur. (2005), koji tvrdi da predavači stječu znanja o internetu na neformalne načine. Inicijalni predavači često stječu opće znanje o internetu. Međutim, to su zapravo stručnjaci koji imaju potrebno znanje o podučavanju putem interneta u područjima kao što su WCK i WPCK.

Utvrđeno je da su poddimenzije IAc, CC, OD i I pozitivno povezane s FPEIUP-om inicijalnih predavača iako je OD FPEIUP-in najznačajniji prediktor. TPCK-W inicijalnih predavača pozitivno je povezano s IA-om. Drugim riječima, povećanje pozitivnih stavova prema internetu dovodi do povećanja znanja o njegovoj upotrebi u obrazovne svrhe. To je potvrđeno u mnogim drugim studijama koje sugeriraju da stavovi prema internetu imaju utjecaj na predavačevo učinkovito korištenje interneta, na znanje o njegovu korištenju i vještinu njegova korištenja (Liaw, 2002; Luan i sur., 2005). Najvažniji faktor IA-a je PC, a TPCK-W-a je RG. S tim rezultatima opća tehnološka informacija za inicijalne predavače smatra se najvažnijim sastojkom. WG znanje ima pozitivan učinak na razvoj ostalih komponenti TPCK-W modela. TPCK-W je pozitivno povezano s IA-om i učinkom IA-a na TPCK-W i RG inicijalnog predavača. Zbog toga je PC, važna komponenta IA-a, također povezana posredno s TPCK-W i WG komponentama. Zato, prije svega, sveučilište mora razviti PC inicijalnog predavača.

IA, posredovan TPCK-W-om, pozitivno je povezan s FPEIUP-om. To sugerira da inicijalni predavači smatraju da bi se mogli koristiti internetom, izravno ili neizravno, u svom budućem zanimanju. FPEIUP inicijalnih predavača povezana je s I, OD, CC. To je u skladu s literaturom (Cheung i Huang, 2005; Duggan i sur., 2001; Luan i sur., 2008; Sam i sur., 2005). Slično tome utvrđeno je da su se inicijalni predavači, koji imaju WG znanje, koristili internetom uglavnom kako bi razvili svoju struku.

IA je izravno objasnio 32% varijance FPEIUP-a, a posredovani je TPCK-W objasnio 48% ukupnog odstupanja. IA inicijalnih predavača utječe na njihovo TPCK-W pozitivno i TPCK-W utječe također pozitivno na FPEIUP-u. Štoviše, FPEIUP-a inicijalnih predavača pogođena je IA-om i TPCK-W-om.

Prema anketi, njihovo predstojeće obrazovanje i WCK oblikovani su postotkom korištenja interneta. Ti su rezultati u skladu s drugim istraživanjima koja su već tražili određene varijable jednu po jednu (Cheung i Huang, 2005; Duggan i sur., 2001; Hong i sur., 2003; Johnson i Hignite, 2000; Liaw, 2002; Luan i sur., 2005; Mitra i Steffensmeier, 2000; Molebash, 2004; Moon i Kim, 2001; Peng i sur., 2006).

Ovo istraživanje ima neka ograničenja. Prvo je ograničenje alat i tip prikupljanja podataka. Za prikupljanje podataka u ovom istraživanju korišten je upitnik. TPCK-W inicijalnih predavača i podatci o njihovu korištenju interneta u budućem zanimanju prikupljeni su u obliku samoizvještaja. Međutim, prikupljanje podataka istraživanja može se postići korištenjem rubrike ili promatranja. Sudjelovanje u upitniku bilo je dobrovoljno. Neki sudionici, za koje se mislilo da sudjeluju, na kraju nisu željeli sudjelovati, pa je broj sudionika, zbog njihove odsutnosti, bio smanjen.

Zaključak i preporuka

Internet je vrlo važan u sadašnjem sustavu obrazovanja. Internet je tehnologija čije je korištenje krucijalno u sustavu obrazovanja, kao i u mnogim drugim područjima. Kako bismo imali studente koji se internetom aktivno koriste, potrebno je da svi predavači budu kvalificirani za njegovo korištenje. Predavači trebaju dobro poznavati internet i trebali bi biti spremni njime se koristiti kada podučavaju. Kao posljedica toga istraživanje pokazuje da IA inicijalnih predavača utječe pozitivno na prijenos TPCK-W-a na predavanjima. Također je utvrđeno da TPCK-W inicijalnih predavača pozitivno utječe na njihovo korištenje internetom u struci. Ti rezultati dokazuju da fakulteti moraju razviti TPCK-W i IA inicijalnih predavača kako bi se oni, kada diplomiraju, u svom zanimanju aktivno koristili internetom.

U ovom istraživanju ispitan je IA inicijalnog predavača prema korištenju i TPCK-W. Poput navedenih varijabli moguće je ispitati mogućnost korištenja internetom kod inicijalnih predavača, njihovu spremnost u podučavanju s pomoću interneta i različitih internetskih alata za podučavanje. Internet je u ovoj studiji ispitan kao tehnologija. Štoviše, daljnja se istraživanja mogu provesti s pomoću 2.0 alata vezanih uz promjene u internetu. Buduća istraživanja mogu se ticati različitih obrazovnih tehnologija. Slično se istraživanje može provesti s predavačima. U istraživanju je korištena mala grupa sudionika, stoga se druga istraživanja mogu provesti s velikom skupinom sudionika. Rezultati studije ključni su za šefove institucija koji pružaju obrazovanje za predavače. Oni su također važni za stručnjake koji razvijaju sveučilišne programe, kao i za predavače.