Factors Influencing Future Teachers' Adoption of Educational Software Use in Classroom

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Abstract

The purpose of this research is to discover factors that significantly affect the future teachers' decisions regarding the use of educational software in teaching. The study involved nine factors and obtained 112 valid questionnaires. The results revealed that the decision of future teachers on the use of educational software in teaching was affected by six factors: the required effort, personal innovativeness, perceived ease of use, perceived usefulness, previous technical training and enjoyment in helping others (altruism). Although there are no major gender differences in attitudes towards the use of educational software, the research has shown that there are significant differences in some items associated with the opinion of their own abilities.

Key words: *future teacher attitudes; gender studies; information technology adoption; teacher education.*

Introduction

Although educational software has been available to students and teachers for some time, today there is a possibility that students have at all times appropriate educational software (ES) in the classroom, instead of books (Wrench, 2001). Earlier, the ES was simply one option for updating students' knowledge, or another way of presenting the material by the teacher, but today there are conditions for the appropriate educational software to be an integral part of learning in the classroom (Hinostroza & Mellar, 2001). In the mid eighties, there were approximately 8,000 different educational software programmes (Mattas, 1985), and this number consistently increased in the following years (Maslowski & Visshcher, 1999).

Besides a wide variety of educational software that provide opportunities for teachers to present their lessons (Niederhauser & Stoddart, 2001) and increase student motivation (Lambić, 2011), development of information technology has enabled teachers to create their own (simple) educational software to meet their personal and their students' needs. Today, the programming software is so easy to use that students can use it with a little help (Lambić, 2011). Teachers with minimal programming skills are able to make (simple) educational software by themselves based on their ideas (Devedzic, 2004; Pollard & Duke, 2005).

As there are almost unlimited opportunities for teachers when it comes to the selection of educational software, one of the most important problems is whether they want to use them and what factors influence their decision. In their study, Venkatesh and Balla (2008) examined factors on which the employee agrees to use information technology in the workplace. Perceived usefulness and perceived ease of use was included as technology acceptance factors. Knowledge sharing factors include altruism and reputation. Social influence factors include community identification (Hsu & Lin, 2008). Lai and Chen (2010) presented a model for IT adoption which includes four dimensions (individual, innovation technology, school and environmental characteristics) and 14 factors. Among these factors are personal innovativeness, knowledge self-efficacy, loss of knowledge power and effort required to use IT. A factor that can greatly influence the decision of teachers on the use of educational software is training prior to the use of information technologies (Koc & Bakir, 2010).

Relationships between teachers' views of the supporting and inhibiting factors of technology use and their educational beliefs and practices are complex (Levin & Wadmany, 2006). The research was conducted with prospective teachers, because most teachers form their views on the process of teaching and the use of technology in teaching during their education (Richardson, 1996; Zeichner & Tabachnick, 1981; Raths, 2001), regardless of the subsequent development of technology. In addition, this period is most suitable for the possible positive impact on future teachers and incentives for greater use of educational software. In the process of education, teachers often have to answer students' questions and to offer appropriate information sources from which they could find answers. Educational software of the new generation can, to some extent, replace a teacher when it comes to providing information, and by using educational software a positive side effect appears, and that is increased students' motivation for their use and thus for learning (Binshan & Chang-tseh, 2001). Teachers play an important role in the implementation of educational software in teaching because they have to fully understand the software that they will recommend to students and must possess sufficient knowledge to be able to provide students with all the information needed to use the educational software. This study is focused on discovering factors that influence future teachers to adopt the use of educational software in teaching.

This research builds on Rogers' (1995) innovation-diffusion theory (IDT) which includes the important factors of individual IT adoption literature, the literature on

the implementation of educational software in teaching and the literature on the determinants of the acceptance of IT in teacher education and the impact of these attitudes on their future work. Understanding factors that significantly influence the acceptance of the application of educational software in teaching by the future teachers can influence the approach used in the education of future teachers.

Literature Review
Educational Software in Teaching

Educational software refers to computer programs for teaching which are used both for independent learning of students (Ng Lee, Kamariah, Samsilah, Wong, & Petri, 2005) and for teaching students in school (Buckleitner, 1999). There are different types of educational software such as children learning and home learning software, courseware, classroom aids, assessment software, edutainment, reference software, computer games with learning value, software in corporate training and software for specific educational purposes (Johnson, 2003). Some of the primary purposes of the use of educational software in teaching is to increase students' motivation and interest in learning the subject (Cordova & Lepper, 1996; Cox, 1997) and the constant and easy access to required information (Becker, 2001; Binshan & Chang-tseh, 2001).

The literature researched gives different views on the effects of application of computers and educational software in teaching. Cuban (2001) came to the conclusion that there is no relationship between changes in the educational system caused by the use of computers and greater efficiency of the teaching process, which means that computers are, at least at this time, overestimated. Russell (2001, p. 1) evaluated 355 research reports, summaries and papers involving different distance learning technologies and found "no significant difference (NSD) in student outcomes between alternate modes of education delivery".

However, many researchers disagree with the conclusions of Cuban and Russell. Data analysis methods used by Russell were brought into question (Ramage, 2001) with the assertion that he may have obtained NSD findings focused primarily on differences in the media rather than the methods employed *via* the medium. In a rebuttal to Cuban, Becker and Ravitz (2001) drew on their own research involving over 4,100 teachers in over 1,100 schools across the USA to conclude that it is more likely that computers will become central to academic education in K-12 settings. The effectiveness of teaching depends not only on the tools used but also on how the material is presented (Salomon, 2000). Computer usage in classrooms would lead to educational change and improvements in learning outcomes only if educational software is well-designed from a pedagogical and educational perspective (Osborne & Hennessy, 2003; Soong, 2008).

In any case, computers and computer games create great motivation for their use by students, so high-quality educational software designed as educational game can have a positive impact as a motivational factor in learning (Virvou, Katsonis, & Manos,

2005; Pelletier, 2009). Also, educational software (based on the Internet, reference software) enables easy and fast access to information (Binshan & Chang-tseh, 2001; Wrench, 2001) which makes it a useful tool in the teaching process.

There are a number of research studies that present the many advantages of educational software use in teaching, and the importance of teachers' willingness to adopt their use. However, little has been said about the specific factors that influence the attitudes of future teachers to use educational software in teaching. Discovering the reasons why some future teachers are reluctant to consider the possibility of using educational software in advance, without any practical experience, can be helpful in shaping the education of teachers.

Innovation Diffusion Theory (ITD)

For a better understanding of diffusion and acceptance of innovative technologies, Rogers (1995) proposed the Innovation Diffusion Theory (IDT). Diffusion is defined as "the process by which an innovation is communicated through certain channels over time among the members of a social system" (p. 10) and innovation as an object, process or idea that seems new to some person. According to IDT innovation has five significant characteristics: relative advantage, compatibility, complexity, trialability and observability. These characteristics have been used to explain the process of acceptance of innovations by users. However, it was discovered later that only relative advantage, complexity and compatibility is always associated with the acceptance of innovations (Agarwal & Prasad, 1998). IDT is used to examine the acceptance of information technology by individuals or organizations.

The Influence of Attitudes Acquired During the Education on the Future Job in Education

Students begin their education with an image of themselves as successful teachers in the future (Kennedy, 1997). Future teachers often use previously acquired beliefs about teaching and learning as a filter for the subsequent process of their own teacher training (Goodman, 1988; Kagan, 1990; Borko & Putnam, 1996; Richardson, 1996; Pederson & Liu, 2003). Despite the fact that it is difficult to change beliefs, experiences can lead to changes in thinking and evaluation (Richardson, 1996). In order for teachers to change their views (on information technology for example) it is usually necessary to repeat the presentation and practical situations (Nuthall & Alton-Lee, 1993). Due to the reasons mentioned, it is necessary to begin as early as possible with a positive impact on future teachers when it comes to accepting the use of educational software. It is best to start such a process at the beginning of the education of future teachers, with the presentation of new implementations of some technologies that already existed in the time of their previous education. By encouraging future teachers to find alternative approaches in their education, we can influence changes in their beliefs (Albion & Ertmer, 2002).

Future teachers do not automatically accept the technology they use every day as a teaching tool (Keren-Kolb & Fishman, 2006). Future teachers as well as those experienced ones are not sure about how to use technology in the teaching process (Shore, 2008). During their education, future teachers have the opportunity to experiment with the use of new technologies in teaching and they can realize all the advantages that their use brings, on their own example. Although the education of future teachers is only the first step in a long-term professional development, it can be an important link in changing some preconceived ideas about teaching because it is located exactly between the students' previous experiences and their future experiences as teachers (Kennedy, 1997).

Research Model and Hypotheses

The research model is based on the previous research on factors influencing adoption of IT (Hsu & Lin, 2008; Venkatesh & Balla, 2008; Koc & Bakir, 2010; Lai & Chen, 2010) mentioned in the introduction. For prospective teachers, we cannot use factors based on the characteristics of school as future teachers do not have the experience of working in school and relationships with the school administration. Other factors of technology use adoption in classroom, found in previous research, are more or less applicable to future teachers, depending on the degree of interdependence of the factors with prior teaching experience.

Individual Characteristics

Required Effort

The required effort is the perception of time and effort required to find the appropriate educational software, master its use, review the entire contents, do the preparation for its use in the classroom and to train students to use it. In addition to these minimum requirements for the use of educational software, there are additional requirements for its creation. Then the required effort also includes time and effort required to devise a way in which knowledge can be represented in educational software and an effort to make the software if the teacher has enough knowledge to do so (Markus, 2001). Teachers can use educational software to help students in the learning process. Using educational software by students sometimes leads to situations where a teacher must answer student questions with more detailed elaboration. After presenting the material, teachers can also be in a position to respond to the new demands of students (Goodman & Darr, 1998; Kankanhalli, Tan, & Wei, 2005). From the previous reasons, we assume that:

H1. The required effort has a negative impact on the acceptance of the use of educational software in the classroom by future teachers.

Loss of Knowledge Power

People are reluctant to share knowledge because they consider it their private individual property and an advantage over others (Bock, Sabherwal, & Qian, 2008).

When it comes to teaching without the use of educational software, teachers are almost the only source of information in the classroom and students usually have only the information that the teacher presents. When students use educational software, especially those based on the Internet, they come into possession of much more information than the teacher is able to present to them during classes. Therefore, the position of the teacher as an undisputed source of information is challenged (Kankanhalli et al., 2005) and his advantage over the students when it comes to the amount of useful knowledge is reduced. People may be concerned about losing their own benefits or value due to a change in the balance of power that occurs by providing greater access to information to others (Ba, Stallaert, & Whinston, 2001; Gray, 2001). Therefore, we assume that:

H2. Loss of knowledge power has a negative impact on the acceptance of the use of educational software in the classroom by future teachers.

Reputation

Reputation represents the perception of teachers about the impression they leave by using educational software in teaching (Kankanhalli et al., 2005). Teachers can give the impression of their own wisdom to others, using educational software. Therefore, we assume that:

H3. Reputation has a positive impact on acceptance of the use of educational software in the classroom by future teachers.

Altruism

Altruism is a form of unconditional kindness without expectation of reciprocation services (Fehr & Gachter, 2000). People simply offer assistance to others and feel good about it (Kollock, 1999). Altruistic teachers who want to help others have the will to spend their spare time in order to be well prepared for use of educational software that would help students in the process of learning.

H4. Altruism has a positive impact on acceptance of the use of educational software in the classroom by future teachers.

Knowledge Self-Efficacy

Knowledge self-efficacy represents confidence in one's capabilities when providing useful knowledge concerned (Spreitzer, 1995). This factor is most conspicuous in the situation where a future teacher has the possibility of designing educational software. However, self-esteem comes into play when it comes to situations when they need to understand and use educational software designed by someone else. Teachers with low self-esteem, when it comes to knowledge of the subject matter, may fear that the knowledge presented in educational software surpasses them. Teachers with knowledge self-efficacy are confident in their ability to use any educational software from the subject matter in the classroom in the best possible way.

H5. Knowledge self-efficacy has a positive impact on the acceptance of the use of educational software in the classroom by future teachers.

Personal Innovativeness

Personal innovativeness represents the willingness of a person to try out new information technologies (Agarwal & Prasad, 1998). People with different degrees of innovativeness react differently, indicating their tendency to adopt innovations (Rogers, 1995). In an uncertain situation, such individuals show a greater degree of acceptance than others (Lu, Liu, Yu, & Wang, 2008). Innovativeness is considered to be an internal individual characteristic affecting the willingness to be one of the first to accept innovations that would replace the previous option or the preferred method (Rogers, 1995; Agarwal & Prasad, 1998). Personal innovativeness affects future teachers to embrace the use of educational software, both during their education and in the future.

H6. Personal innovativeness has a positive impact on the acceptance of the use of educational software in the classroom by future teachers.

Technological Characteristics

Perceived Usefulness

Perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320). Future teachers will be more willing to accept the use of educational software in the classroom if their use can help them achieve better results in teaching.

H7. Perceived usefulness has a positive impact on the acceptance of the use of educational software in the classroom by future teachers.

Perceived Ease of Use

Perceived ease of use is defined as "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989, p. 320). When users meet with a system that is complicated to use, the degree of acceptance and use of this system is lower (Venkatesh, 1999). If educational software is easy to use, future teachers will readily accept it as a learning tool and as a means of teaching.

H8. Perceived ease of use has a positive impact on the acceptance of the use of educational software in the classroom by future teachers.

Previous Technical Training

Previous technical training refers to the current ability of future teachers that enables them to use educational software and technical resources required for their use. This factor has a similar impact as well as technological characteristics, but in this factor the ease of use and benefits that are realized by using educational software depends on the ability of user and not of the characteristics of software (better trained people will make it easier to use even the most complex software and achieve better results). If

teachers are well trained for the use of educational software, they will be more willing to accept them as a tool in teaching (Koc & Bakir, 2010).

H9. Previous technical training has a positive impact on the acceptance of the use of educational software in the classroom by future teachers.

Methods

The questions used to measure the impact of factors on the acceptance of the use of educational software on the future teachers have been developed based on previous research. Some questions were modified to fit into the context of the use of educational software and the attitudes of future teachers. Measuring a general construct with a single question is not a common practice but because of the context of questions that respondents had to answer about the future profession, for some factors, it was not possible to create more than one item that would be sufficiently different (questions concerning teaching experience from previous studies could not be modified to fit into the context). The constructs measured with more than one question were assessed for reliability. The internal consistency for constructs was decided according to Cronbach's alpha. All 18 items were measured with a five-point Likert scale (from 1 for strongly disagree to 5 for strongly agree).

In this study, the survey method was used to collect data. The paper and pencil version was used and distributed to students of the Faculty of Education in Sombor (Serbia). A total of 133 surveys were returned and 114 valid surveys were collected. The survey was conducted among students in their third and fourth (final) year. It was important for the research that the participants could observe the process of teaching from the perspective of teachers and students and therefore, students in the first and second year were not included in the study due to the possibility that they still had not acquired a completely clear picture of the educational process from the perspective of teachers. The sample included 62 female and 52 male respondents.

To the phrase "I would use educational software in the classroom", complete agreement was expressed by 22 students, 54 students agreed, while 38 students were undecided or gave negative responses. Students who expressed agreement and complete agreement were grouped as those who accept the use of educational software, while the remaining students were grouped as those who (to some degree) do not accept the use of educational software. With respect to gender, there was no significant difference in the number of those who accept the use of educational software in the classroom. However, when it comes to answers that show some kind of confidence in their own capabilities, male respondents have a better opinion of their abilities than female respondents.

Respondents' answers were divided into two groups, a group of 76 students who accepted the use of educational software in teaching and a group of 38 students who did not accept. The Mann-Whitney U test was used to confirm the difference in the attitudes of these two groups when it comes to these factors. All values of p less than

0.01 were considered acceptable, i.e. such a result for p indicates a significant difference in the responses between the two groups.

Results

Reliability of the 4 factors measured with more than one question is obtained with values ranging from 0.719 to 0.7986, which exceeded the commonly accepted level of 0.70 (Nunnally, 1978).

When the individual characteristics of respondents are concerned, the impact of the required effort was measured with five items which were obtained for each item p less than 0.01 thus confirming the hypothesis H1. Effects of the loss of knowledge power and reputation factors were measured with one item each, and the obtained values of p were greater than 0.01, which does not confirm hypotheses H2 and H3. When it comes to altruism, for one item that measured the impact of this factor on the acceptance of the use of educational software, the obtained value is p<0.01 which confirmed hypothesis H4. Knowledge self-efficacy is also measured by one item with the obtained value p>0.01 which does not confirm the hypothesis H5. The influence of personal innovativeness was measured with three items with the obtained value for each item p less than 0.01 thus confirming the hypothesis H6.

Regarding technical characteristics, the impact of the perceived usefulness was measured with one item for which the obtained value is p<0.01 confirming the hypothesis H7. The influence of perceived ease of use was measured with two items; for both the obtained value for p is less than 0.01 thus confirming the hypothesis H8. Impact of previous training and technical ability is measured with three items for which the obtained values for p were less than 0.01 so the hypothesis H9 is also confirmed. To summarize, the Mann-Whitney U test confirmed the hypotheses H1, H4, H6, H7, H8 and H9.

Table 1.

Differences in attitudes between groups of future teachers who accept and do not accept the use of educational software in teaching

Item	Average grade of responses from students who accept the use of educational software	Average grade of responses from students who do not accept the use of educational software	The significance of the difference p
The required effort			
1. I would not have time to use educational software in teaching.	1.95	3.00	p<0.01
2. It takes a lot of effort for me to master the use of an educational software.	2.87	3.47	p<0.01
3. I would not use educational software in the classroom if that would require to invest extra effort in my spare time.	1.95	2.58	p<0.01

4. I would not use educational software in teaching because I would have to invest extra effort to answer the students' questions about the software.	1.79	2.26	p<0.01
5. I'm worried that the use of educational software in teaching would inspire further questions about the material which would cause additional work for me.	1.97	2.58	p<0.01
Loss of knowledge power			
6. I worry that educational software could contain more knowledge than what I own.	2.53	3.00	p>0.01
Reputation			
7. If I use educational software in teaching colleagues would respect me more.	2.61	2.37	p>0.01
Altruism			
8. I would use educational software in teaching because it would facilitate the students' process of learning.	4.24	3.58	p<0.01
Knowledge self-efficacy			
9. I have enough knowledge from area that I teach to keep pace with any educational software.	3.45	2.95	p>0.01
Personal innovativeness			
10. Usually I try new technology first.	3.11	2.47	p<0.01
11. I like to work with the new information technologies.	3.92	3.21	p<0.01
12. I would use educational software in teaching because I love to bring innovations in what I do.	4.32	3.53	p<0.01
Perceived usefulness			
13. By using educational software in teaching I would be a better teacher than those who do not use it.	3.71	3.05	p<0.01
Perceived ease of use			
14. I have a clear vision of how I could implement some educational software in teaching.	3.45	2.84	p<0.01
15. I believe that it is very easy to use educational software in teaching.	3.32	2.68	p<0.01
Technical training and ability			
16. I use computers and other technical equipment very well	4.13	3.11	p<0.01
17. I think that I gained enough knowledge in the current education that allows me possible future use of educational software in teaching.	3.63	2.79	p<0.01
18. I possess the knowledge necessary to use educational software in teaching.	3.58	2.42	p<0.01

Table 2.

Gender differences in attitudes towards the use of educational software

Item	Average grade of responses from female subjects	Average grade of responses from male subjects	The significance of the difference p
The required effort			
1. I would not have time to use educational software in teaching.	2.48	2.08	p>0.01
2. It takes a lot of effort for me to master the use of an educational software.	3.39	2.69	p<0.01
3. I would not use educational software in the classroom if that would require to invest extra effort in my spare time.	2.00	2.35	p>0.01
4. I would not use educational software in teaching because I would have to invest extra effort to answer the students' questions about the software.	1.84	2.08	p>0.01
5. I'm worried that the use of educational software in teaching would inspire further questions about the material which would cause additional work for me.	2.10	2.27	p>0.01
Loss of knowledge power			
6. I worry that educational software could contain more knowledge than what I own.	2.81	2.54	p>0.01
Reputation			
7. If I use educational software in teaching colleagues would respected me more.	2.32	2.77	p>0.01
Altruism			
8. I would use educational software in teaching because it would facilitate the students' process of learning.	4.00	4.04	p>0.01
Knowledge self-efficacy			
9. I have enough knowledge from area that I teach to keep pace with any educational software.	3.06	3.54	p<0.01
Personal innovativeness			
10. Usually I try new technology first.	2.77	3.04	p>0.01
11. I like to work with the new information technologies.	3.52	3.88	p>0.01
12. I would use educational software in teaching because I love to bring innovations in what I do.	4.13	3.96	p>0.01
Perceived usefulness			
13. By using educational software in teaching I would be a better teacher than those who do not use it.	3.23	3.81	p<0.01
Perceived ease of use			
14. I have a clear vision of how I could implement some educational software in teaching.	3.23	3.27	p>0.01
15. I believe that it is very easy to use educational software in teaching.	2.97	3.27	p>0.01
Technical training and ability			
16. I use computers and other technical equipment very well.	3.52	4.12	p<0.01
17. I think that I gained enough knowledge in the current education that allows me possible future use of educational software in teaching.	3.19	3.54	p>0.01
18. I possess the knowledge necessary to use educational software in teaching.	2.87	3.58	p<0.01

Discussion

The required effort to use educational software is a very important factor influencing the acceptance of the use of educational software in teaching by future teachers. This is consistent with the findings of previous research which has also suggested that required effort reduces the likelihood of new approach and technology adoption in teaching (Goodman & Darr, 1998; Kotrlik & Redmann, 2009). Future teachers who do not accept the use of educational software in teaching are not willing to devote a part of their free time to choose (or possibly conceptualize or create) the appropriate educational software, master its use and go through the entire contents of the software. Also, unlike students who wish to use educational software, they see as a problem the amount of effort and time required during teaching, that future teacher must invest in training students to use educational software as well as the effort they need to invest for additional answers and instructions. When future teachers think they need to invest extra effort and time, they are less willing to use educational software in teaching. Therefore, the required effort has a great influence on the acceptance of the use of educational software in teaching by future teachers.

The loss of knowledge power has no influence on the acceptance of the use of educational software because the Mann Whitney U test value obtained for p is less than 0.01, indicating that there is no significant difference between the views of groups that accept and do not accept the use of educational software. This result is consistent with previous research which suggests that loss of knowledge power has no significant influence on the decision of teachers to adopt the use of certain ICT in teaching (Lai & Chen, 2010). A possible explanation for this result may be the already high availability of information to students so future teachers probably believe that the use of educational software in teaching cannot be of much more influence on their role in the classroom from other external influences outside the school.

Reputation also has no influence on the decision to accept the use of educational software in teaching. Previous studies have pointed out that reputation has no significant influence on the decision of teachers to adopt use of ICT in teaching (Lai & Chen, 2010). Future teachers who accept the use of educational software, with respect to their wide distribution and use, consider their use quite normal. On the other hand, future teachers who do not accept their use do not believe that someone who uses educational software is better than they are, so they do not see why this would enhance their reputation among colleagues and students.

Altruism is an important factor in the decision to accept the use of educational software in teaching. This result is consistent with previous research which suggests that altruism has a positive effect on ICT adoption in teaching (Mumtaz, 2000). In accordance with the hypothesis, altruistic teachers enjoy helping others and are more willing to put in extra effort to help students use educational software in the classroom. The study showed a clear difference in attitudes about helping others between the two groups of future teachers.

Knowledge self-efficacy does not affect the acceptance of the use of educational software in teaching, because there is no significant difference between the two groups of future teachers. Teachers are professionals who possess knowledge in certain areas and the ability to solve problems (Lin et al., 2008). Whether they do or do not use educational software in teaching, future teachers can have confidence in their ability to present knowledge and use any type of educational material.

Personal innovativeness significantly affects the decision of future teachers on the use of educational software in teaching. Previous studies have shown that personal innovativeness affects a person's decision to accept the use of IT more quickly than others (Schillewaert, Ahearne, Frambach, & Moenaert, 2005). In accordance with the hypothesis, personal innovativeness affects future teachers to more easily accept the use of educational software in teaching.

The perceived usefulness has a positive effect on the acceptance of IT (Mumtaz, 2000; Jeyaraj, Schillewaert et al., 2005; Rottman & Lacity, 2006). This research confirmed that perceived usefulness has a positive impact on future teachers when it comes to accepting the use of educational software in teaching. Educational software can help students to better and more easily learn the content and increase the efficiency of the teaching process.

Perceived ease of use has a positive effect on the future teachers' decision to accept the use of educational software in teaching (all values of p are less than 0.01). If future teachers believe that educational software is easy to use, they will more readily accept its use in teaching. Also, if teachers have the knowledge and tools so that they can easily develop their own software, or their school infrastructure offers associates who can easily provide them creation of educational software based on their ideas, teachers will be more willing to engage in designing their own educational software.

Previous technical training has a great influence on the decision to accept the use of educational software in teaching (all values of p are less than 0.01). This is inconsistent with previous research by Becker (2000) and Becker, Ravitz and Wong (1999). Research by Vannatta (2004) suggests that previous technical training in combination with other factors has a positive influence on classroom technology use. This research confirms the results of Koc and Bakir (2010). During their education and leisure time, future teachers gain knowledge and skills which enable them to use IT technology including the educational software. If future teachers have a high degree of technical training, it will be much easier for them to use educational software, regardless of their complexity. In accordance with the hypothesis, previous technical training has a positive impact on the decision to accept the use of educational software in teaching.

When we look at the gender of the respondents, there are no significant differences in the acceptance of use of educational software in teaching. This result is in contrast with previous research which has suggested that gender was a significant factor in explaining differences in computer anxiety and attitudes toward computers (Anderson,

1996). Other research confirms that gender has no influence on ICT adoption in teaching (Kotrlik & Redmann, 2009). The percentage of men and women who accept/ reject the use of educational software is almost the same. However, when it comes to certain items in the questionnaire in which in some way respondents expressed the degree of confidence in their abilities, there is a significant difference in the answers of respondents of different genders. When asked about the effort required to master the use of some educational software, female respondents' middle score was 3.39 and male 2.69 indicating that male respondents believe that they will be able to more easily use the new educational software than women (p<0.01). Also, when knowledge self-efficacy is concerned, male respondents are much more confident in their knowledge in the area that they will teach than female (3.54 male, 3.06 female, p<0.01). And when it comes to previous technical training, male respondents have again a much better opinion of their abilities than female respondents. The only item from this factor, in which the responses of different genders do not differ significantly, is the amount of knowledge acquired in former education. Both genders equally valued the knowledge acquired in school and in college either to find that it is sufficient or insufficient. Although there is a possibility that men spend more free time using computers and therefore use them better, answers to other questions that also concern confidence report that, in fact, male respondents are likely to have a much better opinion of their own abilities than women, although they have the same ability.

This difference in attitude between the genders is a warning sign that researchers should pay special attention when it comes to surveys in which respondents in some way express an opinion about their own abilities. This difference could be a problem especially if the groups studied have different percentages of men and women. Therefore, it would be very good if such answers were supported with concrete evidence (e.g. technical skills test).

Considering that the examined literature shows the importance and influence of attitudes acquired during the education of future teachers for their future profession this study went a step further in the attempt to discover factors that influence the attitude of future teachers to accept the use of educational software in teaching. It is important that the factors that influence teachers with experience have an impact on future teachers, too. Future research could examine the extent to which future teachers still hold their views expressed during the education, after having certain experience in teaching. Also, this study points to the field of education of future teachers where more attention could be directed. It is important that future teachers acquire impeccable knowledge of IT use during their education, so that they could later use IT resources in teaching with less effort. In addition to technology training, another important part of education of future teachers is the development of their motivation for using educational software and other technological aids in teaching, with frequent demonstration of practical use and the positive effects achieved.

As the research shows that the required effort to master (and possibly create) educational software is one of the main reasons why teachers refuse to use ES in teaching, school management should make special efforts in the creation of school infrastructure, which would make it easier for teachers to use educational software to a larger extent and enable the less technically capable teachers to obtain educational software designed to their specifications and needs of students.

As technical features of educational software are an important factor in the acceptance or rejection by teachers, educational software makers should, in addition to adapting their products to end users (students), pay particular attention to the teachers, that is, their requirements in terms of interface and content of educational software.

Conclusion and Limitations

A large number of studies deal with the acceptance of IT by teachers. Also, many research studies are about the attitudes of teachers towards IT which are formed during their education and which they retain later during their work in education. In this paper, we studied more precisely the factors that affect the creation of teachers' attitudes toward educational software during their education. This study gives insight into the reasons why future teachers would like to use educational software in teaching. The decision of future teachers is significantly affected by six factors: the required effort to master and use educational software, altruism, personal innovativeness, perceived usefulness, perceived ease of use and technological training of teachers. The research also revealed the difference between genders when it comes to items that in some way require the respondents to talk about their abilities. In other words, the research showed that male respondents have a much better opinion of their abilities and capabilities to overcome some problems, though it probably is not based on real advantage when the application of educational software and the use of technology are in question.

This study has some limitations. The sample would be more representative if the questionnaire was distributed and filled in on more universities. More extensive data collection is needed for greater generalizability. Furthermore, this research is based on data collected at the university in Serbia, so it is possible that future teachers in other countries with different cultures and different technological development may have different attitudes towards the use of educational software in teaching. For these reasons, it would be good if this research was repeated in other countries with a larger sample.

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Čimbenici koji utječu na buduće nastavnike u primjeni obrazovnog softvera

Sažetak

Svrha ovoga istraživanja bila je razotkriti čimbenike koji značajno utječu na odluku budućih nastavnika o korištenju obrazovnog softvera u podučavanju. Istraživanje je sadržavalo devet faktora, a obrađeno je 112 važećih upitnika. Rezultati su pokazali da na odluku budućih nastavnika o korištenju obrazovnog softvera utječe šest čimbenika: potreban napor, osobna inovativnost, percepcija jednostavnog korištenja, percepcija korisnosti, prijašnje tehničko obrazovanje i uživanje u pomoći drugima (altruizam). Iako ne postoje veće razlike u stavovima o korištenju obrazovnog softvera s obzirom na spol, istraživanje je pokazalo da postoje značajne razlike kod nekih čestica vezanih uz mišljenje o vlastitim sposobnostima.

Ključne riječi: *istraživanje prema spolu; obrazovanje nastavnika; stavovi budućih nastavnika; upotreba informacijske tehnologije.*

Uvod

Iako obrazovni softver stoji na raspolaganju učenicima i nastavnicima već neko vrijeme, u današnje vrijeme postoji mogućnost da učenici umjesto knjiga upotrebljavaju primjereni obrazovni softver (OS) u razredu (Wrench, 2001). Prije je obrazovni softver bio samo jedna mogućnost za poboljšanje znanja učenika, ili samo drugi način učiteljeva prezentiranja sadržaja, međutim, danas postoje uvjeti koji primjereni obrazovni softver mogu učiniti integralnim dijelom učenja u razredu (Hinostroza i Mellar, 2001). Sredinom osamdesetih bilo je otprilike 8.000 različitih obrazovnih softverskih programa (Mattas, 1985), a taj broj uzastopno je rastao tijekom sljedećih godina (Maslowski i Visshcher, 1999).

Uz širok spektar obrazovnog softvera koji nastavnicima nudi mogućnosti prezentiranja nastavnih jedinica (Niederhauser i Stoddart, 2001), povećava motivaciju učenika (Lambić, 2011), razvoj informacijske tehnologije omogućio je nastavnicima da kreiraju vlastiti (jednostavni) obrazovni softver kako bi se zadovoljile njihove potrebe i potrebe njihovih studenata. U današnje vrijeme se programski softver tako lako

upotrebljava da ga i učenici, uz malo pomoći, mogu upotrebljavati (Lambić, 2011). Nastavnici s minimalnim vještinama programiranja mogu sami kreirati (jednostavan) obrazovni softver na osnovi svojih ideja (Devedzic, 2004; Pollard i Duke, 2005).

S obzirom na to da za nastavnike postoje gotovo neograničene mogućnosti izbora obrazovnog softvera, jedan od glavnih problema je žele li ih nastavnici koristiti i koji čimbenici utječu na tu odluku. Venkatesh i Balla (2008) proučavali su čimbenike koji utječu na to da radnik pristaje upotrebljavati informacijsku tehnologiju na radnome mjestu. Percepcija korisnosti i percepcija jednostavnosti upotrebe bila je uvrštena kao čimbenik prihvaćanja tehnologije. Čimbenik dijeljenja znanja uključivao je altruizam i ugled. Čimbenik socijalnog utjecaja podrazumijevao je poistovjećivanje sa zajednicom (Hsu i Lin, 2008). Lai i Chen (2010) predstavili su model za prihvaćanje IKT-a koji sadrži četiri dimenzije (pojedinac, inovativna tehnologija, škola i karakteristike okoline) i 14 čimbenika. Među čimbenicima su osobna inovativnost, samodjelotvorno znanje, gubitak moći znanja i napor koji je potreban za upotrebu IKT-a. Čimbenik koji prilično može utjecati na odluku nastavnika da upotrebljava edukacijski softver je osposobljavanje prije upotrebe informacijskih tehnologija (Koc i Bakir, 2010).

Odnosi među nastavničkim pogledima na čimbenike koji podržavaju ili inhibiraju upotrebu tehnologije i njihova uvjerenja i postupci prilično su složeni (Levin i Wadmany, 2006). Istraživanje je provedeno na budućim nastavnicima jer većina nastavnika stvara svoje poglede na proces podučavanja i upotrebe tehnologije u podučavanju tijekom obrazovanja (Richardson, 1996; Zeichner i Tabachnick, 1981; Raths, 2001), bez obzira na daljnji napredak tehnologije. Štoviše, upravo je to razdoblje najpodobnije za mogući pozitivan utjecaj na buduće nastavnike i na inicijative za češćom upotrebom obrazovnog softvera. U vrijeme podučavanja nastavnici često moraju odgovarati na pitanja učenika te ponuditi odgovarajuće izvore informacija iz kojih mogu doći do odgovora. Obrazovni softver novih generacija može, donekle, zamijeniti nastavnika kada je riječ o davanju informacija i korištenjem obrazovnog softvera dolazi do pozitivnih popratnih pojava poput povećane motivacije učenika za njihovom upotrebom, a time i za učenjem (Binshan i Chang-tseh, 2001). Nastavnici imaju važnu ulogu u primjeni obrazovnog softvera u podučavanju jer moraju u cijelosti razumjeti softver koji će preporučiti učenicima te moraju imati dovoljno znanja kako bi učenicima dali sve potrebne informacije o korištenju obrazovnim softverom. Ovo istraživanje usmjereno je na otkrivanje čimbenika koji utječu na to da budući nastavnici primijene obrazovni softver u vlastitoj nastavi.

Ovo se istraživanje nastavlja na rad Rogersa (1995) i inovacijsko-difuzijsku teoriju (IDT) koja uključuje važne čimbenike prihvaćanja IT-a pojedinaca iz literature, literaturu o primjeni obrazovnog softvera u nastavi i literaturu o čimbenicima prihvaćanja ITK u obrazovanju nastavnika, kao i utjecaj koji takvi stavovi imaju na njihov budući rad. Razumijevanje čimbenika koji značajno utječu na prihvaćanje upotrebe obrazovnog softvera u nastavi kod budućih nastavnika može utjecati na pristup koji se koristi u obrazovanju budućih nastavnika.

Pregled literature

Obrazovni softver u nastavi

Obrazovni softver odnosi se na računalne programe za podučavanje koji se koriste za učeničko samostalno učenje (Ng Lee, Kamariah, Samsilah, Wong, i Petri, 2005) i za podučavanje učenika u školi (Buckleitner, 1999). Postoje različite vrste obrazovnog softvera kao što je softver za podučavanje djece, softver za obrazovanje kod kuće, softver za tečajeve, softver za procjenu znanja, zabavno-obrazovni softver, softver za citiranje, računalne igrice koje podučavaju, softver u korporativnom osposobljavanju za posebne obrazovne svrhe (Johnson, 2003). Neki od glavnih razloga upotrebe obrazovnog softvera u podučavanju su povećanje motivacije učenika i zanimanje za učenje predmeta (Cordova i Lepper, 1996; Cox, 1997), kao i stalan i jednostavan pristup potrebnoj informaciji (Becker, 2001; Binshan i Chang-tseh, 2001).

Proučena literatura daje različite poglede na učinke upotrebe računala i obrazovnog softvera u nastavi. Cuban (2001) zaključuje da ne postoji veza između promjena u obrazovnom sustavu koje su rezultat upotrebe računala i veće učinkovitosti nastavnog procesa. Iz toga slijedi da su računala, barem za sada, precijenjena. Russell (2001, p. 1) na osnovi procjene 355 istraživačkih izvješća, sažetaka i radova koji su sadržavali različite tehnologije učenja na daljinu otkriva da „ne postoji značajna razlika u rezultatima studenata kod korištenja drugih načina prezentiranja sadržaja."

Međutim, mnogi istraživači ne slažu se sa zaključcima Cubana i Russella. Metode analize podataka kojima se koristio Russell dovedene su u pitanje (Ramage, 2001) tvrdnjom da postoji mogućnost da su dobili NDS rezultate koji nisu usredotočeni primarno na razlike u mediju, nego na metode upotrijebljene *putem* medija. U opovrgavanju Cubana, Becker i Ravitz (2001) pozvali su se na vlastito istraživanje koje je pokrivalo više od 4100 učitelja u više od 1100 škola diljem SAD-a kako bi zaključili da je vjerojatnije da će računala postati središnji aspekt obrazovanja od predškolskog obrazovanje do završetka srednje škole. Učinkovitost podučavanja ovisi ne samo o alatima koji se koriste već i o materijalima koji se prezentiraju (Salomon, 2000). Upotreba računala u razredu dovela bi do obrazovne promjene i unapređenja ishoda učenja samo onda kada bi obrazovni softver bio dobro osmišljen iz pedagoške i obrazovne perspektive (Osborne i Hennessy, 2003; Soong, 2008).

U svakom slučaju, računala i računalne igrice stvaraju jaku motivaciju za njihovom upotrebom kod učenika, stoga visokokvalitetni obrazovni sadržaji kreirani u obliku obrazovnih igara mogu imati pozitivan utjecaj, motivacijski faktor, na učenje (Virvou, Katsionis, i Manos, 2005; Pelletier, 2009). Nadalje, obrazovni softver (utemeljen na internetu, softver za citiranje) omogućuje lak i brz pristup informacijama (Binshan i Chang-tseh, 2001; Wrench, 2001), što ga čini korisnim alatom u obrazovnom procesu.

Postoje daljnja istraživanja koja prikazuju mnoge prednosti upotrebe obrazovnog softvera u podučavanju i važnost volje nastavnika da ih upotrijebi. Međutim, malo je toga rečeno o specifičnim čimbenicima koji utječu na stavove budućih nastavnika

za upotrebom obrazovnog softvera u podučavanju. Otkrivanjem razloga zbog kojih neki od budućih učitelja nevoljko prihvaćaju mogućnost korištenja obrazovnom tehnologijom već unaprijed, bez praktičnog iskustva, može biti korisno i za sam proces obrazovanja učitelja.

Inovacijsko-difuzijska teorija (IDT)

Kako bismo bolje razumjeli difuziju i prihvaćanje inovativnih tehnologija, Rogers (1995) je predložio Inovacijsko-difuzijsku teoriju (IDT). Difuziju definiramo kao „proces kojim se inovacija određeno vrijeme prenosi kroz određene komunikacijske kanale među članove nekog društvenog sustava" (str. 10), a inovacija kao objekt, proces ili ideja čini se nova samoj osobi. IDT inovacija ima pet važnih karakteristika: relativnu prednost, kompatibilnost, mogućnost probe i mogućnost promatranja. Te su karakteristike korištene kako bi se objasnio proces prihvaćanja inovacija od korisnika. Međutim, poslije je otkriveno da su samo relativna prednost, složenost i kompatibilnost uvijek povezane s prihvaćanjem inovacija (Agarwal i Prasad, 1998). IDT se koristi za ispitivanje prihvaćanja informacijske tehnologije od pojedinaca ili organizacija.

Utjecaj stavova usvojenih u vrijeme obrazovanja za buduće učiteljsko zanimanje

Studenti započinju svoje obrazovanje sa slikom sebe kao uspješnih nastavnika u budućnosti (Kennedy, 1997). Budući nastavnici često se koriste prethodno stečenim vjerovanjima o podučavanju i učenju kao filtrom za daljnje procese u osposobljavanju za nastavničko zanimanje (Goodman, 1988; Kagan, 1990; Borko & Putnam, 1996; Richardson, 1996; Pederson & Liu, 2003). Unatoč činjenici da je teško promijeniti nečija vjerovanja, iskustva mogu dovesti do promjena u razmišljanju i vrednovanju (Richardson, 1996). Kako bi nastavnici promijenili svoje stavove (primjerice o informacijskoj tehnologiji), obično je potrebno ponoviti prezentaciju i praktične situacije (Nuthall i Alton-Lee, 1993). Zbog navedenoga, da bi se prihvatilo korištenje obrazovnog softvera, potrebno je započeti s pozitivnim utjecajem na buduće nastavnike što prije. Najbolje je takav proces započeti na početku njihova školovanja, prezentirajući nove načine primjene nekih od postojećih tehnologija kojom su se imali priliku koristiti i u svom prethodnom obrazovanju. Potičući buduće nastavnike na pronalazak drugih pristupa u svome obrazovanju, možemo utjecati na promjenu u njihovim vjerovanjima (Albion i Ertmer, 2002).

Budući učitelji ne prihvaćaju automatizmom upotrebu tehnologije kao alata za podučavanje u svakodnevnom radu (Keren-Kolb i Fishman, 2006). Budući nastavnici, kao i oni s iskustvom, nisu zapravo sigurni kako se koristiti tehnologijom u obrazovnom procesu (Shore, 2008). Za vrijeme njihova obrazovanja budući nastavnici imali su priliku eksperimentirati s korištenjem novih tehnologija u nastavi i mogu realizirati sve prednosti koje njihovo korištenje donosi na svome primjeru. Iako je obrazovanje budućih nastavnika samo prvi korak u dugotrajnom stručnom usavršavanju, ono

može biti važna poveznica u promjeni nekih prije stečenih ideja o podučavanju jer se nalazi upravo između prijašnjih iskustava kao studenata i budućih iskustava kao nastavnika (Kennedy, 1997).

Model istraživanja i hipoteze

Model istraživanja utemeljen je na prijašnjem istraživanju o čimbenicima koji utječu na prihvaćanje IT-a (Hsu & Lin, 2008; Venkatesh & Balla, 2008; Koc & Bakir, 2010; Lai & Chen, 2010), a koje se spominje u uvodnome dijelu rada. Za buduće nastavnike ne možemo se koristiti čimbenicima koji su utemeljeni na karakteristikama škole s obzirom na to da budući nastavnici nemaju iskustvo rada u školi i iskustvo sa školskim rukovodstvom. Drugi čimbenici koji se odnose na primjenu tehnologije u razredu, a koji su obilježili prethodno istraživanje, više su ili manje primjenjivi na buduće nastavnike ovisno o stupnju njihove međuovisnosti s čimbenikom prethodnog nastavnog iskustva.

Pojedinačne karakteristike

Potreban napor

Potreban napor podrazumijeva percepciju vremena i napora potrebnog za pronalaženje primjerenog obrazovnog softvera, za usavršavanje njegove upotrebe, pregled cjelokupnog sadržaja, pripremu za upotrebu u razredu i pripremu učenika na pravilnu upoitrebu. Uz te minimalne uvjete za upotrebu obrazovnog softvera postoje uvjeti za njegovo stvaranje. U tom slučaju potreban napor podrazumijeva vrijeme i napor potreban za domišljanje načina na koji će znanje biti prikazano putem obrazovnog softvera i napor kako izraditi takav softver ako učitelj posjeduje to znanje (Markus, 2001). Nastavnici se mogu koristiti obrazovnim softverom kako bi pomogli učenicima u učenju. No ponekad, kako bi se učenici mogli koristiti obrazovnim softverom, dolazi do situacija u kojima nastavnik mora više objašnjavati od jednostavnog davanja odgovora na svoja pitanja. A nakon prezentiranja materijala nastavnici bi se također mogli naći u položaju da moraju pronaći odgovore na nova učenička pitanja i zahtjeve (Goodman i Darr, 1998; Kankanhalli, Tan i Wei, 2005). Zbog navedenih razloga smatramo da:

H1. Potreban napor ima negativan utjecaj na prihvaćanje korištenja obrazovnim softverom u razredu kod budućih nastavnika.

Gubitak moći znanja

Ljudi nevoljko dijele znanje jer ga smatraju privatnim, osobnim vlasništvom i time stvaraju prednost u odnosu na druge (Bock, Sabherwal i Qian, 2008). Kada se govori o podučavanju bez korištenja obrazovnim softverom, nastavnici postaju gotovo jedini izvor informacija u razredu i učenici obično dobiju samo informaciju koju nastavnik prezentira. Kada se učenici koriste obrazovnim softverom, posebno internetskim, dolaze do puno više informacija nego što im nastavnik može prezentirati za vrijeme

sati. Prema tome, propitkuje se položaj nastavnika kao neospornog izvora informacija (Kankanhalli i sur., 2005) i njihova prednost nad učenicima kada govorimo o količini korisnih informacija koje su izravno reducirane. Ljude može zabrinuti gubitak vlastitog dobitka ili vrijednosti kada je riječ o promjeni ravnoteže moći koja se dogodi ako se drugima omogući pristup većoj količini informacija (Ba, Stallaert i Whinston, 2001; Gray, 2001). Prema tome, pretpostavljamo da:

H2. Gubitak moći znanja ima negativan učinak na prihvaćanje korištenja obrazovnim softverom u razredu od budućih nastavnika.

Ugled

Ugled predstavlja percepciju nastavnika o dojmovima koje ostavljaju koristeći se obrazovnim softverom u nastavi (Kankanhalli i sur., 2005). Nastavnici mogu ostaviti dojam mudrosti na druge ako se koriste obrazovnim softverom. Prema tome, pretpostavljamo da:

H3. Ugled ima pozitivan utjecaj na prihvaćanje korištenja obrazovnim softverom u razredu kod budućih nastavnika.

Altruizam

Altruizam je oblik bezuvjetne dobrote bez očekivanja recipročne usluge (Fehr i Gachter, 2000). Ljudi jednostavno ponude pomoć drugima i zbog toga se osjećaju dobro (Kollock, 1999). Altruistični nastavnici žele pomoći drugima i imaju želju svoje slobodno vrijeme utrošiti u bolju pripremu za korištenje obrazovnim softverom koji će pomoći učenicima u učenja.

H4. Altruizam ima pozitivan učinak na prihvaćanje korištenja obrazovnim tehnologijama kod budućih nastavnika.

Samodovoljno znanje

Samodovoljno znanje podrazumijeva pouzdanje u vlastite sposobnosti kada dajemo korisne informacije (Spodpreitzer, 1995). Taj je čimbenik najočitiji u situaciji kada budući nastavnik ima mogućnost kreiranja obrazovnog softvera. Međutim, samopoštovanje ulazi u igru kada treba razumjeti i koristiti se obrazovnim softverom koji je kreirao netko drugi. Nastavnici s niskom razinom samopouzdanja mogu osjećati strah da će znanje koje će biti prezentirano putem obrazovnog softvera premašiti njihovo znanje kada je riječ o prezentiranju sadržaja. Nastavnici čije je znanje samodovoljno pouzdani su u sposobnosti korištenja bilo kojim obrazovnim softverom određene tematike u razredu na najbolji mogući način.

H5. Samodovoljno znanje ima pozitivan učinak na buduće nastavnike u prihvaćanju korištenja obrazovnim softverom u nastavi.

Osobna inovativnost

Osobna inovativnost predstavlja volju osobe da isproba nove informacijske tehnologije (Agarwal i Prasad, 1998). Ljudi različitih stupnjeva inovativnosti različito

reagiraju, pokazujući tendenciju za prihvaćanjem inovacija (Rogers, 1995). Kod nejasnih situacija takvi pojedinci pokazuju veći stupanj prihvaćanja (Lu, Liu, Yu i Wang, 2008). Inovativnost se smatra jednom od unutarnjih osobnih karakteristika koja utječe na volju za prihvaćanjem inovacija koje će zamijeniti prethodne mogućnosti ili preferiranu metodu (Rogers, 1995; Agarwal & Prasad, 1998). Osobna inovativnost utječe na buduće nastavnike na način da prihvate korištenje obrazovnim softverom za vrijeme svoga obrazovanja i u budućnosti.

H6. Osobna inovativnost ima pozitivan učinak na buduće nastavnike u prihvaćenju korištenja obrazovnim softverom u nastavi.

Tehnološke karakteristike

Percepcija korisnosti

Percepcija korisnosti definirana je kao „stupanj do kojega osoba vjeruje da korištenje određenog sustava može poboljšati njezinu radnu učinkovitost" (Davis, 1989, str. 320). Budući nastavnici prihvatit će obrazovni softver u nastavi ako njegova upotreba može postići bolje rezultate u podučavanju.

H7. Percepcija korisnosti ima pozitivan učinak na prihvaćanje obrazovnog softvera od budućih nastavnika.

Percepcija jednostavne upotrebe

Percepcija jednostavne uporabe definira se kao „stupanj do kojega osoba vjeruje da se određeni stupanj može koristiti bez velikoga napora" (Davis, 1989, str. 320). Kada se korisnici susretnu sa sustavom čija je upotreba složena, stupanj prihvaćanja i korištenja takva sustava je znatno niži (Venkatesh, 1999). Ako je obrazovni softver jednostavan za upotrebu, budući nastavnici rado će ga prihvatiti kao alat za učenje i kao način podučavanja.

H8. Percepcija jednostavne upotrebe ima pozitivan učinak na buduće nastavnike u prihvaćanju korištenja obrazovnim softverom u nastavi.

Prethodno tehničko osposobljavanje

Prethodno tehničko osposobljavanje podrazumijeva trenutnu sposobnost budućih nastavnika koja im omogućuje korištenje obrazovnim softverom i tehničkim izvorima potrebnim za njihovu upotrebu. Taj čimbenik ima sličan učinak kao i tehnološke karakteristike, osim što kod tog čimbenika jednostavnost korištenja i korist dobivena od obrazovnog softvera ovisi o sposobnosti korisnika, a ne o karakteristikama softvera (bolje osposobljeni ljudi lakše će se moći koristiti čak i vrlo složenim softvero pa će i rezultati biti bolji). Ako su nastavnici dobro osposobljeni za korištenje obrazovnim softverom, bit će spremniji prihvatiti ga kao alat u nastavi (Koc i Bakir, 2010).

H9. Prethodno tehničko osposobljavanje ima pozitivan učinak na prihvaćanje korištenja obrazovnim softverom kod budućih nastavnika.

Metode

Pitanja koja služe za mjerenje učinka faktora na prihvaćanje upotrebe obrazovnog softvera kod budućih nastavnika razvijena su na osnovi prijašnjih istraživanja. Neka su pitanja modificirana kako bi se uklopila u kontekst korištenja obrazovnim softverom i stavove budućih nastavnika. Mjerenje općenitog konstrukta jednim pitanjem nije uobičajena praksa, ali zbog konteksta pitanja na koja su ispitanici morali odgovoriti u vezi s njihovim budućim zanimanjem, za neke je čimbenike bilo nemoguće proizvesti više od jedne čestice koja bi bila dovoljno različita (pitanja vezana uz nastavno iskustvo iz prethodnih istraživanja nije moglo biti modificirano kako bi se uklopilo u ovaj kontekst). Pojmovi koji su mjereni s više od jednog pitanja procijenjeni su za pouzdanost. Unutarnja konzistencija za pojmove određena je prema Cronbach alpha. Svih 18 čestica mjereno je uz pomoć Likertove skale od pet stupnjeva (1 – u potpunosti se ne slažem, do 5 – u potpunosti se slažem).

U istraživanju je upotrijebljena metoda ankete kako bi se došlo do podataka. Verzija papir i olovka distribuirana je studentima Pedagoškog fakulteta u Somboru (Srbija). Prikupljene su ukupno 133 ankete od kojih je 114 bilo valjanih. Anketa je provedena sa studentima na trećoj i četvrtoj (posljednjoj) godini studija. Za istraživanje je bilo važno da ispitanici mogu pratiti proces podučavanja iz perspektive nastavnika i studenata, pa zbog toga studenti prve i druge godine nisu sudjelovali u istraživanju jer je postojala mogućnost da nisu u mogućnosti sagledati jasnu sliku obrazovnog procesa iz perspektive nastavnika. Uzorak se sastojao od 62 studentice i 52 studenta.

Na tvrdnju "Koristio bih se obrazovnim softverom u razredu" apsolutno su se složila 22 studenta, 54 studenta se složilo s tvrdnjom, a 38 studenata je bilo neodlučno ili su dali negativne odgovore. Studenti koji su iznijeli apsolutno slaganje i oni koji su se složili s tvrdnjom bili su grupirani kao oni koji prihvaćaju upotrebu obrazovnog softvera, a ostali su studenti grupirani kao oni koji (do određenog stupnja) ne prihvaćaju upotrebu obrazovnog softvera. S obzirom na spol nije bilo značajne razlike kod broja onih koji prihvaćaju upotrebu obrazovnog softvera u razredu. Međutim, kod odgovora koji su ukazivali na vrstu samopouzdanja u vlastite sposobnosti, muški ispitanici imali su bolji stav o svojim sposobnostima nego ženski.

Prema odgovorima, ispitanici su bili podijeljeni u dvije grupe. Jednu grupu činilo je 76 studenata koji su prihvatili upotrebu obrazovnog softvera u nastavi i drugu grupu od 38 studenata koji nisu. Mann-Whitney U test koristio se da bi se utvrdile razlike u stavovima tih dviju grupa kada je riječ o tim čimbenicima. Sve p vrijednosti manje od 0,01 smatrale su se prihvatljivima, odnosno, takav rezultat za p vrijednost ukazivao je na značajne razlike u odgovorima između dviju grupa.

Rezultati

Pouzdanost četiri čimbenika mjerena samo jednim pitanjem dobivena je vrijednostima od 0,719 do 0,7986, što premašuje uobičajeno prihvaćenu razinu od 0,70 (Nunnally, 1978).

Kada se uzmu u obzir osobne karakteristike ispitanika, učinak potrebnog napora mjeren je s ukupno pet čestica koje su dobivene za svaku od čestica u kojoj je p vrijednost manja od 0,01. Na taj su način potvrdile hipotezu H1. Učinci gubitka moći znanja i čimbenici mjereni su s jednom česticom, a dobivene p vrijednosti bile su veće od 0,01, što ne potvrđuje hipoteze H2 i H3. Kada je riječ o altruizmu, za jednu česticu koja je mjerila učinak tog čimbenika na prihvaćanje upotrebe obrazovnog softvera, dobivena je vrijednost p<0,01, što potvrđuje hipotezu H4. Samodovoljno znanje mjereno je također korištenjem jedne čestice za koju je dobivena vrijednost p>0,01, što ne potvrđuje hipotezu H5. Utjecaj osobne inovativnosti mjeren je korištenjem tri čestice, a p vrijednost svake bila je manja od 0,01, što potvrđuje hipotezu H6.

S obzirom na tehničke karakteristike učinak percepcije korisnosti mjeren je uz pomoć jedne čestice čija je p vrijednost p<0,01, što potvrđuje hipotezu H7. Utjecaj percepcije jednostavnog korištenja mjeren je uz pomoć dvije čestice. Za obje je dobivena p vrijednost bila manja od 0,01, što potvrđuje hipotezu H8. Učinak prethodnog osposobljavanja i tehnička sposobnost mjereni su s tri čestice, a dobivena p vrijednost za svaku je manja od 0,01, što potvrđuje hipotezu H9. Na kraju, Mann-Whitney U test potvrdio je hipoteze H1, H4, H6, H7, H8 i H9.

Tablica 1 i 2.

Rasprava

Napor potreban za upotrebu obrazovnog softvera vrlo je važan čimbenik koji utječe na prihvaćanje upotrebe obrazovnog softvera u nastavu budućih nastavnika. Ta stavka u skladu je s rezultatima prijašnjih istraživanja koja su potvrdila da je napor koji je potrebno uložiti u korištenje obrazovnim tehnologijama u nastavi smanjio vjerojatnost njegove upotrebe (Goodman i Darr, 1998; Kotrlik i Redmann, 2009). Budući nastavnici koji ne prihvaćaju korištenje obrazovnim softverom u nastavi nisu voljni posvetiti dio svog slobodnog vremena u biranju (ili promišljanju, odnosno stvaranju) primjerenog obrazovnog softvera, svladavanju upotrebe i proučavanju cjelokupnog sadržaja određenoga softvera. Također, za razliku od studenata koji se žele koristiti obrazovnim softverom, oni problem vide u količini napora i vremena koje je potrebno za vrijeme podučavanja, a koje moraju uložiti u pripremanju učenika na korištenje obrazovnim softverom, kao i napora koji moraju uložiti u pronalazak dodatnih odgovora i uputa. Kada budući nastavnici misle da moraju uložiti dodatni napor i vrijeme, postaju manje voljni koristiti se obrazovnim softverom u nastavi. Prema tome, ulaganje napora ima značajan utjecaj na buduće nastavnike u prihvaćanju korištenja obrazovnim softverom.

Gubitak moći znanja nema utjecaja na prihvaćanje korištenja obrazovnim softverom s obzirom na to da je rezultat Mann Whitney U testa za vrijednost p bila manja od 0,01, što upućuje na to da ne postoji značajna razlike u stavovima grupa koje prihvaćaju i koje ne prihvaćaju korištenje obrazovnim softverom. Taj rezultat u skladu je s rezultatima prijašnjih istraživanja koji pretpostavljaju da gubitak moći znanja

nema značajan utjecaj na odluku nastavnika da primijene određenu informacijsku-komunikacijsku tehnologiju u nastavi (Lai i Chen, 2010). Moguće objašnjenje tog rezultata može biti već postojeća velika dostupnost informacija učenicima, tako da budući nastavnici vjerojatno vjeruju da korištenje obrazovnim softverom u nastavi ne može puno više utjecati na njihovu ulogu u razredu od ostalih izvanškolskih utjecaja.

Ugled također nema utjecaja na odluku nastavnika da primijene obrazovni softver u nastavi. Prijašnja istraživanja istaknula su da ugled nema značajan utjecaj na odluku nastavnika da primijene IK-tehnologiju u nastavi (Lai i Chen, 2010). Budući nastavnici koji prihvaćaju korištenje obrazovnim softverom, a s obzirom na njegovu široku distribuciju i upotrebu, smatraju korištenje softverom prilično normalnom pojavom. S druge strane, budući nastavnici koji ne prihvaćaju korištenje obrazovnim softverom ne vjeruju u to da je onaj koji se njime koristi nužno bolji od njih, i stoga ne vide zašto bi obrazovni softver poboljšao njihov ugled među kolegama i učenicima.

Altruizam je važan čimbenik kod donošenja odluke o korištenju obrazovnim softverom u nastavi. Taj je rezultat u skladu s rezultatima prijašnjih istraživanja koji pretpostavljaju da altruizam ima pozitivan učinak na prihvaćanje IK tehnologije u nastavi (Mumtaz, 2000). U skladu s hipotezom, altruistični nastavnici uživaju u pružanju pomoći drugima i više su voljni uložiti dodatni trud kako bi pomogli učenicima u korištenju obrazovnim softverom u razredu. Istraživanje je pokazalo da postoji jasna razlika u stavovima o pomoći drugima između te dvije skupine budućih nastavnika.

Samodovoljno znanje ne utječe na nastavnike u prihvaćanju obrazovnog softvera u nastavi jer ne postoji značajna razlike između dviju skupina budućih nastavnika. Nastavnici su profesionalci koji posjeduju znanje u određenim područjima i sposobnost rješavanja problema (Lin i sur., 2008). Bez obzira na to koriste li se ili ne obrazovnim softverom u nastavi, budući nastavnici mogu imati samopouzdanje u svoju sposobnost prezentiranja znanja i korištenja bilo kojom vrstom obrazovnog materijala.

Osobna inovativnost značajno utječe na odluku budućih nastavnika o korištenju obrazovnim softverom u nastavi. Prijašnja istraživanja pokazala su da inovativnost utječe na odluku osobe da prihvati korištenje IK tehnologijom značajno brže od drugih (Schillewaert, Ahearne, Frambach i Moenaert, 2005). U skladu s hipotezom, osobna inovativnost utječe na buduće nastavnike tako da oni puno lakše prihvaćaju korištenje obrazovnim softverom u nastavi.

Percepcija korisnosti ima pozitivan učinak na prihvaćanje IT-a (Mumtaz, 2000; Jeyaraj, Schillewaert et al., 2005; Rottman & Lacity, 2006). Ovo je istraživanje potvrdilo da percepcija korisnosti ima pozitivan utjecaj na buduće nastavnike kada govorimo o prihvaćanju korištenja obrazovnim softverom u nastavi. Obrazovni softver može pomoći učenicima da bolje i lakše nauče sadržaj i da se poveća djelotvornost nastavnog procesa.

Percepcija jednostavnog korištenja ima pozitivan utjecaj na odluku budućih nastavnika u korištenju obrazovnim softverom u nastavi (sve p vrijednosti manje

su od 0,01). Ako budući nastavnici vjeruju da je obrazovni softver jednostavan za korištenje, tada će ga lakše prihvatiti i u nastavi. Također, ako nastavnici posjeduju znanje i imaju određene alate putem kojih mogu jednostavno razviti vlastiti softver, ili im školska infrastruktura može ponuditi suradnike koji će ih lakše pripremiti na stvaranje vlastitog obrazovnog softvera utemeljenog na vlastitim idejama, nastavnici će biti više voljni upustiti se u stvaranje vlastitog obrazovnog softvera.

Prijašnje tehničko usavršavanje ima značajan utjecaj na odluku nastavnika da prihvate obrazovni softver u nastavi (sve p vrijednosti manje su od 0,01). Točnije u skladu s prijašnjim istraživanjima koja su proveli Becker (2000) i Becker, Ravitz i Wong (1999). Istraživanje koje je proveo Vannatta (2004) pretpostavlja da prijašnje tehničko usavršavanje u kombinaciji s drugim čimbenicima ima pozitivan utjecaj na korištenje tehnologijom u razredu. To istraživanje potvrdili su Koc i Bakir (2010). Za vrijeme svog obrazovanja i u svoje slobodno vrijeme budući nastavnici stječu znanje i vještine koje će im omogućiti korištenje informacijskom tehnologijom uključujući i obrazovni softver. Ako budući nastavnici imaju visok stupanj tehničke naobrazbe, bit će im puno lakše koristiti se obrazovnim softverom, bez obzira na njegovu složenost. U skladu s hipotezom, prijašnje tehničko usavršavanje ima pozitivan utjecaj na odluku o prihvaćanju korištenja obrazovnim softverom u nastavi.

S obzirom na spol ispitanika, ne postoje značajne razlike u prihvaćanju obrazovnog softvera u nastavi. To je u suprotnosti s prijašnjim istraživanjima koja pretpostavljaju da je spol značajan čimbenik koji objašnjava razlike kod straha od korištenja računalom i stavova prema računalima (Anderson 1996). Druga istraživanja potvrđuju da spol nema utjecaja na korištenje IK tehnologijom u nastavi (Kotrlik i Redmann, 2009). Postotak muškaraca i žena koji prihvate/odbiju korištenje obrazovnog softvera gotovo je jednak. Međutim, određene čestice u upitniku koje na neki način upućuju na to da ispitanici imaju stupnjeve samopouzdanja u sposobnostima postjavljuju se značajne razlike u odgovorima ispitanika s obzirom na spol. Na pitanje o naporu koji je potreban za pravilnu upotrebu obrazovnog softvera ženski ispitanici dali su srednju ocjenu 3,39, a muški ispitanici 2,69, što znači da muški ispitanici vjeruju da će se lakše moći koristiti novim obrazovnim softverom od žena (p<0,01). Također, kada je riječ o samoučinkovitosti, muški ispitanici imaju više samopouzdanja u svoje znanje iz područja koje će poučavati od ženskih ispitanika (3,54 muški, 3,06 ženski, p<0,01). S obzirom na prijašnje tehničko usavršavanje, muški ispitanici imaju bolje mišljenje o svojim sposobnostima nego ženski ispitanici. Jedina čestica u vezi s tim čimbenikom kod koje ne dolazi do značajnih promjena s obzirom na spol jest količina znanja usvojena iz prijašnjeg obrazovanja. Oba spola jednako procjenjuju znanje usvojeno u školi i na fakultetu, bez obzira na to smatraju li ga dovoljnim ili nedovoljnim. Iako postoji mogućnost da su muški ispitanici proveli više slobodnog vremena koristeći se računalom i da se njima bolje služe, odgovori na ostala pitanja koja se tiču samopouzdanja govore da muški ispitanici imaju puno bolje mišljenje o svojim sposobnostima od žena, iako su po sposobnostima jednaki.

Ta razlika u stavovima među spolovima znak je za uzbunu kada je riječ o anketama u kojima ispitanici na neki način iznose mišljenje o vlastitim sposobnostima. Ta bi razlika mogla predstavljati problem pogotovo ako skupine koje se proučavaju imaju različit postotak muškaraca i žena. Prema tome, bilo bi uputno da se takvi odgovori potkrijepe stvarnim dokazima (npr. test tehničkih sposobnosti).

S obzirom na to da proučena literatura ukazuje na važnost i utjecaj stavova stečenih tijekom obrazovanja za buduće zanimanje ovo istraživanje otišlo je korak dalje u nastojanju da otkrije čimbenike koji utječu na stavove budućih nastavnika o korištenju obrazovnim softverom u nastavi. Važno je da čimbenici koji utječu na nastavnike s iskustvom također imaju utjecaja na buduće nastavnike. Daljnja bi istraživanja mogla proučavati granice do kojih budući nastavnici zadržavaju stavove iznesene za vrijeme svog obrazovanja nakon stjecanja određenog iskustva u nastavi. Također, ovo istraživanje usmjereno je na polje obrazovanja budućih nastavnika u kojemu bi više pažnje trebalo posvetiti ovom problemu. Važno je da budući nastavnici steknu nepogrešivo znanje IT-a za vrijeme svoga obrazovanja tako da bi se poslije mogli koristiti IT izvorima sa što manje napora. Uz usavršavanje tehnologije drugi, ne manje važan aspekt obrazovanja budućih nastavnika, jest motiviranje za korištenje obrazovnim softverom i drugim tehnološki, pomagalima u nastavi s učestalim prikazivanjem praktične upotrebe i ostvarenih pozitivnih učinaka.

Kao što istraživanje pokazuje, napor koji je potrebno uložiti za usvajanje (i eventualno stvaranje) obrazovnog softvera jedan je od glavnih razloga zašto nastavnici odbijaju korištenje obrazovnih softvera u nastavi. Rukovodstvo škole trebalo bi uložiti dodatne napore u infrastrukturu zbog koje će se nastavnicima biti lakše koristiti obrazovnim softverom u većem opsegu i omogućiti tehnički manje osposobljenim nastavnicima dobivanje obrazovnog softvera koji je oblikovan prema njihovim specifikacijama i potrebama njihovih učenika.

S obzirom na to da su tehničke karakteristike obrazovnog softvera kod nastavnika važan čimbenik prihvaćanja ili odbijanja, njegovi bi stvaraoci trebali, uz prilagodbu proizvoda krajnjim korisnicima (učenicima), osobitu pažnju posvetiti nastavnicima, odnosno njihovim potrebama s obzirom na sučelje i sadržaj obrazovnog softvera.

Zaključci i ograničenja

Velik broj istraživanja bavi se prihvaćanjem IT-a od nastavnika. Također, puno istraživanja vezano je uz stavove nastavnika prema IT-u koji se stvaraju za vrijeme njihova obrazovanja i koje zadržavaju u svome radu u obrazovanju. U ovome radu bavimo se čimbenicima koji utječu na stvaranje stavova nastavnika prema obrazovnom softveru za vrijeme svoga obrazovanja. Na taj način ovo nam istraživanje daje uvid u razloge zbog kojih se budući nastavnici žele koristiti obrazovnim softverom u nastavi. Na odluku budućih nastavnika značajno utječe šest čimbenika: napor potreban za usvajanje i korištenje obrazovnim softverom, altruizam, osobna inovativnost, percepcija korisnosti, percepcija jednostavne upotrebe i tehnološko usavršavanje

nastavnika. Istraživanje je otkrilo razliku kod spolova kada ispitanici govore o svojim sposobnostima. Drugim riječima, istraživanje je pokazalo da muški ispitanici imaju puno bolje mišljenje o svojim sposobnostima i mogućnostima rješavanja problema, iako to nužno nije realna prednost kada govorimo o primjeni obrazovnog softvera i korištenju tehnologijom.

Ovo istraživanje ima određena ograničenja. Uzorak je mogao biti reprezentativniji da je upitnik poslan i ispunjen na više sveučilišta. Više podataka potrebno je kako bi se moglo generalizirati. Nadalje, ovo istraživanje temelji se na prikupljenim podacima na sveučilištu u Srbiji, pa je tako moguće da budući nastavnici u drugim zemljama, drugim kulturama i s drukčijim tehnološkim napretkom imaju i drukčije stavove prema korištenju obrazovnim softverom u nastavi. Zbog tih razloga bilo bi dobro ovo istraživanje ponoviti u drugim zemljama i na većem uzorku.