Croatian Journal of Education
Vol.17; No.2/2015, pages: 507-534
Original research paper
Paper submitted: 24th April 2013
Paper accepted: 11th July 2014
doi:10.15516/cje.v17i2.871

Rogers' Diffusion of Innovation Model in Action: Individual Innovativeness Profiles of Pre-service Teachers in Turkey

Ismail Yuksel
Eskisehir Osmangazi University

Abstract

The purpose of the study was to determine adopter categories and individual innovativeness levels of pre-service teachers. Four hundred and twenty pre-service teachers from five different departments participated in the study. The application of Rogers' adopter measurement scale revealed that early pre-service teachers dominated the group of participants in the study. The study also revealed that department and gender of the participants made a significant difference in their innovativeness level. The majority of female participants were early majority whereas the majority of male participants were early adopters. The analysis showed that male participants were highly innovative as opposed to female participants. The study indicated that unlike Rogers' bell shaped, normal distribution of the adopter categories, the distribution in this study was positively skewed. The results support the idea that pre-service teachers, especially in some departments, need change in their perception of innovation. Evidence also suggests that Rogers' model of innovation decision process should be taken into consideration while planning the course objectives.

Key words: *adopter categories; adoption of innovation; innovation; teacher training.*

Introduction

The world has recently witnessed inspiring innovations, technological upheavals, and remarkable developments. A global market intelligence company reports that in 2012 the digital worlds currently ten times the size it was in 2006 (Anderson, 2010).

As per the latest survey report there were nearly 70 million WordPress and 39 million Tumblr Blogs worldwide till July 2012 (Bowen, 2012). Millions of new blog posts are updated daily and each day more than a billion songs are shared over the internet (Anderson, 2010). There were only 361 million Internet users in the world in 2000. There are more than six times (2,267 bn) as many Internet users now as there were in 2000(Internetworldstats, 2012). One of the social networking services and websites launched in 2004 has now more than 845 million active users and has received a new round of investment that values the social media firm at $50bn. This is worth more than many well-established companies (Arthur, 2012). Similarly, one of the most innovative social networking services initiated in 2006 has over 465 million accounts and their value is about $4 billion (Ross,2012).A company that only commenced a few years ago, now has 800 million unique users and hosts four billion video streams a day (YouTube, 2012). Resta and Patru (2010) estimate that more than 7,000 scientific and technical articles are published each day. All these figures can describe such a huge digital universe (IDC, 2008).

Children born at the beginning of this century are growing up in this digital universe. They are labelled as the "next generation" or "digital natives" in today's world (Prensky, 2001). Their world includes 3D televisions, camera phones, iPods, MP3-4 players, 3D interactive videogames, etc. (Anderson, 2010). On the contrary, unlike "digital natives", the "digital immigrants" which stands for parents (Prensky, 2001), struggle in adopting the innovations that their children are exposed to. This complicated situation attributes great meanings as communication, participation and sharing innovations stands between children and their parents. Such a relationship also affects teacher-student interaction especially in learning and teaching process. Since such innovations allow students to engage, communicate and relate to each other and their teachers in different ways, they often feel disconnected from traditional teaching practices in schools (Anderson, 2010; Nallaya, 2010). Fortunately, in recent years the traditional teaching practices have gradually evolved from local environments to online-based applications (Mora Bonilla et al., 2010), and technological innovations such as IPads, mobile phones, interactive boards, etc. have been used widely.

Governments generally recognize students' needs for education or training about innovation literacy, technology and new ICT skills if they are to function in this digital universe. Teachers have the greatest responsibilities in preparing students for this new digital world. They use software tools such as word processing, excel, etc.; however, they rarely implement innovations for teaching. Thus, policy makers in teacher education have great challenges of preparing pre-service teachers for integrating innovations into teaching (Davis et al., 2010). As the first step, teachers' perceptions about innovation should change. Then the adoption of innovation can start(Chesney & Benson, 2012). As Roger (2003) stated, the individuals' perception regarding innovation is mostly related to their characteristics such as problem solving, risk taking, being open to new things. That is related to their innovativeness. Therefore,

to change the perceptions of teachers about innovations, it is crucial to determine the innovativeness profiles for such analysis. Rogers' Diffusion Innovations model has been suggested and used in literature since 1993. In this context, the present study aims to determine innovativeness profiles of pre-service teachers based on Rogers' model.

Innovation, Innovativeness and Adoption of Innovation

Technology has been an integral part of everyday life; the concepts of innovation, innovative(ness) and diffusion of innovation are widely used (Dadura & Lee, 2011). Increasing the speed and quality of life, they are appreciated globally, and are concerned as the indicators of "being in front" (Kilicer, 2011). Though the term "innovation" seems to be used interchangeably with the term "technology" in the literature (Parashos & Messer, 2006), innovation is defined lexically as the introduction of something new (Merriam-Webster, 2012). It is defined in Rogers' (2003, p.12) Diffusion of Innovation as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption". To Parashos and Messer (2006) innovation is disruptive when it redefines a procedure, and is sustaining when it is a better way of doing something. Rogers (2004, p. 13) defines diffusion broadly as "the process through which an innovation, defined as an idea perceived as new, spreads via certain communication channels over time among the members of a social system". According to Lundblad (2003) diffusion of innovation is adoption and implementation of new ideas, processes, products or services. The model explains the procedures through ideas, practices, or objects adopted by members of society (Richardson, 2009).

The process of adoption of innovation has been investigated for more than forty years. Rogers' Diffusion of Innovations model has been accepted as one of the most popular adoption models (Sahin & Thomson, 2006). With the pioneer of Rogers' model, aiming to provide insights into the fundamental factors influencing individual's tendency of utilizing innovation, the diffusion of innovation model has been adopted in different disciplines ranging from hybrid seed corn to modern math; from drug prevention in the health sector to the use of mobile phones and PDAs; from city planning to organic farming and finally to education (Dooley, 1999; Haider & Kreps, 2004; Kauffman & Tecyatassanasoontorn, 2005; Oliver & Goerke, 2008; Richardson, 2009; Stuart, 2000; Tabata & Johnsrud, 2008). Once an individual comes across an innovation, the adoption process starts; information is gathered and the innovation is tested to see whether it suggests an acceptable development to the investment of time and energy. Thus, the model is concerned with the style in which an innovation is perceived by the individuals (Loogma, Kruusvall, & Umarik, 2012; Lundblad, 2003; Richardson, 2009; Timuçin, 2009; Yi, Fiedler, & Park, 2006; Wilson & Stacey, 2004). The styles of individuals are derived from their attitudes towards the innovation. The reaction of the individual towards the innovation, a new idea or a new technology differs because of the differences in innovativeness, a tendency toward approving innovation. Thus, innovativeness mainly refers to behavioural change, just because

individuals are intrinsically more or less inclined to innovative behaviour (Wilson & Stacey, 2004; Loogma et al., 2012). Rogers (2003) classified such behaviours into adopter categories. He defined the adopter categories as "the classifications of members of a social system on the basis of innovativeness" (p. 22). For Rogers, innovativeness helped in understanding the desired and main behaviour in the innovation-decision process (Sahin, 2006). Therefore, he classifies the adopters into five groups as innovators, early adopters, early majority, late majority, and laggards based on their innovativeness. They are distributed along a bell shaped curve/normal distribution (Figure 1).

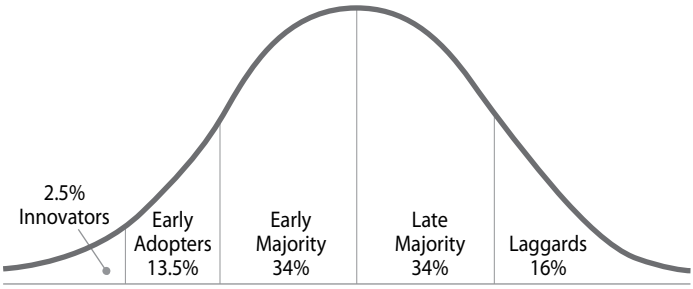

Figure 1. Adopter categories based on innovativeness (source: Rogers, 2003, p.163)

As indicated in Figure 1, innovators or described as venturesome by Rogers (2003) are the first to test new products and processes (Wilson & Stacey, 2004). They seek out and embrace innovations, and are not afraid of risks (Lundblad, 2003; Soffer et al., 2010).They have more advanced technical knowledge than the others (Loogma et al., 2012; Yi et al., 2006). On the other hand, Moore (1999) defines innovators as the proponents of disruptive technologies. Early adopters, representing 13.5% of the population, are open to change, but are connected to and respected within the social system (Lundblad, 2003). They tend to be respected leaders in society, and their behaviours may serve as models for the rest of the group (Greenhalgh et al., 2008; Loogma et al., 2012; Soffer et al., 2010). The third group of adopters is early majority, representing 34% of the population. They are more deliberate about their adoption decision (Lundblad, 2003). The members of this group are cautious and safe individuals reluctant to take risks (Soffer et al., 2010). They simply prefer "wait and see" and how other people react to the innovation (Yi et al., 2006). To make an adoption decision, they require well-established references (Rogers, 2003). Late majorities, representing 34% of the population, are those sceptical about or resistant to innovations (Lundblad, 2003; Soffer et al., 2010). Such individuals adopt a new idea when it becomes a well-known standard. Thus, they tend to buy just from large well-established companies (Greenhalgh et al., 2008; Yi et al., 2010). Finally, the laggards, representing 16% of the population, are the traditionalists, very suspicious of new ideas and most probably never adopt an innovation unless it becomes a necessity (Greenhalgh et al., 2008; Loogma et al., 2012; Lundblad, 2003; Soffer et al., 2010).

The model is suggested as the most appropriate theory for investigating the adoption of innovation in educational environment (Sahin & Thomson, 2006). Diffusion studies in educational context focused only on technological innovations except for a study on the adopter categories conducted by Sahin & Thomson (2006). For defining the categories, Sahin and Thomson used a five item questionnaire, each item for each of the adopter categories. However, considering Rogers' complicated and large scope of adopter categories, there is a need for more comprehensive analysis of these categories. Addressing this need, the present study aimed to investigate the adopter categories of pre-service teachers via a scale directly developed to determine adopter categories.

Method

Design

The cross sectional survey design was used to examine participants' adopter categories and to compare their levels of innovativeness in terms of some variables.

Participants

The study aimed to investigate the adopter categories of pre-service teachers and to compare their innovativeness levels in a cross-sectional research design. The data of the study were collected from 420 pre-service teachers attending five different departments in Eskisehir Osmangazi University in the 2011/2012 academic year. Of the 420 participants 288 (68.6%) were female and 132 (31.4%) were male.

Instrument

The "Innovativeness Scale" (IS) developed by Hurt, Joseph, and Cook (1977) was used to define the adopter categories and innovativeness levels of participants. This five-point Likert scale consists of 20 items. In the study, the Turkish version of IS adapted by Kilicer & Odabasi (2010) was administered. According to Hurt et al. (1977), "Innovativeness Scale" has good internal consistency, with a Cronbach alpha coefficient reported of .89; the Turkish version of the scale carried out with 343 students also has good internal consistency, a Cronbach alpha coefficient reported of .82 (Kilicer & Odabasi, 2010). In the current study, the Cronbach alpha coefficient was .78.

To calculate the participants' total scores of the scale, a formula of [42] was used. Thus, the maximum score that can be taken from the scale was 94 and minimum score was 14. By favour of total scores, participants were classified into Rogers' adopter categories:

- above 80 as innovators;
- between 69 and 80 as early adopters;
- between 57 and 68 as early majority;
- between 46 and 56 as late majority;
- under 46 as laggards.

Additionally, participants were classified according to their scale scores as highly innovative (above 68 points); moderately innovative (68-64 points) and lowly innovative (under 64 point).

Data Analysis

To analyse the data, descriptive statistics (means, standard deviations, percentages etc.), independent groups t-test, one way analyses of variance test had been applied. In comparisons where the distribution was not a normal one, nonparametric tests were conducted. The significance level in the study was set as 0.05.

Results

The first concern that guided this study was to identify the innovativeness levels of participants and compare their scores according to their gender and departments. To identify the innovativeness levels, the total scores for each participant were calculated and the scores were classified into three categories suggested by Hurt et al. (1977). The results are presented in Table 1.

Table 1

Comparison of participants' innovativeness scores according to gender

Gender	n	M	SD	df	t	p
Female	288	64.08	8.35	418	-6.218	.001*
Male	132	69.45	7.90			

*p<0.05

The findings showed that male participants were highly innovative[M=69.45, SD=7.90] whereas female participants were moderately innovative [M=64.08, SD=8.35]. An independent samples t-test manifested that there was a significant difference in scores for females and males [t (418) = 6.22, p=.001]. Overall, the analysis clearly showed that male participants were highly innovative as opposed to female participants.

To examine the impact of the department on prospective teachers' innovativeness scores, a one-way analysis of variance test was conducted. The test results are indicated in Table 2.

Table 2

Comparison of participants' innovativeness scores according to departments

Departments	N	M	SD		SS	df	MS	F	p
CEIT	104	69.96	6.52	Between Groups	4552.685	4	1138.171	17.998	.001*
Maths	83	64.71	9.52	Within Groups	26244.449	415	63.240		
Turkish P.	81	62.38	7.69	Total	30797.133	419			
Chemistry	87	68.14	7.92						
History	65	61.45	8.20						
Total	420	65.77	8.57						

*p<0.05

The results indicated that participants from both CEIT (M=69.96, SD=6.52) and Chemistry (M=68.14, SD=7.92) departments were highly innovative, while participants from the Maths (M=64.71, SD=9.42) department were moderately innovative and participants from Turkish P. (M=62.38, SD=7.69) and History (M=61.45, SD=8.20) departments were not highly innovative. ANOVA revealed that there was a statistically significant difference at the p< .05 level in participants' IIS scores for these five departments [F(4,415)= 18.01, p=.001]. Post-hoc comparisons using Tukey HSD test indicated that participants from both CEIT and Chemistry departments were more innovative than participants from other departments.

To better understand the innovativeness profiles of prospective teachers, they were classified into five innovativeness categories suggested by Rogers (2003). Initially, the adopter categories of the participants were determined, and then the differences between distributions of participants in adopter categories regarding departments were tested. The frequencies and percentages of the total scores of the participants were used to interpret data (see Table3).

Table 3

The distribution of adopter categories of pre-service teachers according to gender and departments

		Innovators	Early Adopters	Early Majority	Late Majority	Laggards
Characteristics	*N*	*f (%)*	f (%)	f (%)	f (%)	f (%)
Gender						
Female	288	14 *(4.9)*	73(25.3)	117(40.6)	78(27.1)	6(2.1)
Male	132	16 (12.1)	54(40.9)	49(37.1)	10(7.6)	3(2.3)
Department						
CEIT	104	13 (12.5)	53(51)	29(27.9)	9(8.7)	-(-)
Maths	83	4 (4.8)	23(27.7)	32(38.6)	21(25.3)	3(3.6)
Turkish P.	81	4 (4.9)	12(14.8)	38(46.9)	25(30.9)	2(2.5)
Chemistry	87	6 (6.9)	28(32.2)	38(43.7)	13(14.9)	2(2.3)
History	65	3 (4.6)	11(16.9)	29(44.6)	20(30.8)	2(3.1)
Total	420	30 (7.1)	127(30.2)	166(39.5)	88(21)	9(2.1)

The findings showed that a great majority (40.6%) of the female participants were Early Majority whereas the great majority (40.9%) of the male participants were Early Adopters. The rate of male participants for innovators (12.1%) was three times bigger than the ratio for female participants (49%). In contrast to Rogers' normal distribution of categories, the distribution in this study had different ratios for adopter categories (see Figure2). The first difference between the two distributions was the ratio for late majority. According to Rogers (2003) 34% of individuals were late majority, whereas 21% of participants were defined late majority in this study. Secondly, the ratio of laggards in Rogers' distribution is almost eight times bigger than the ratio of laggards found in this study. However, the ratio of innovators in this study is almost three times bigger than the ratio of innovators in Rogers' distribution (see Figure 2).

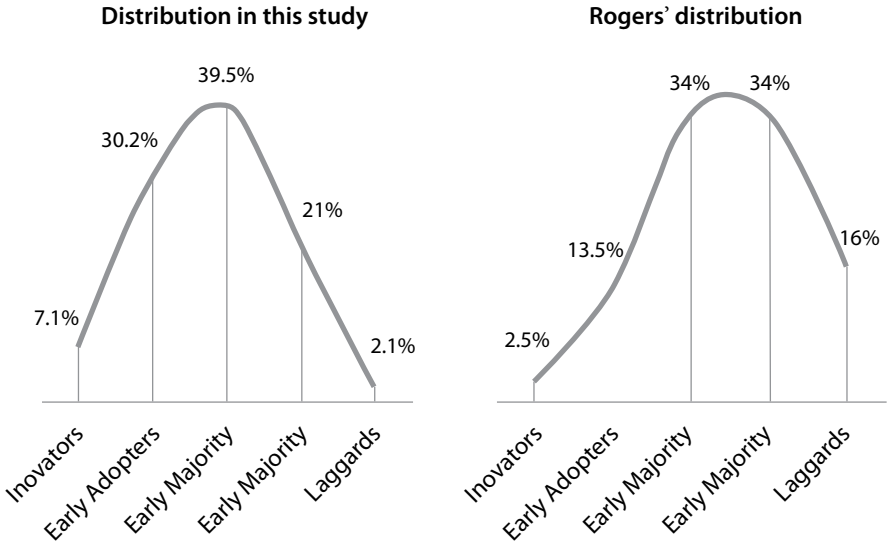

Figure 2. Comparison of distribution of adopter categories in this study and Rogers' study

The participants who took the scores above 80 from IS were labelled as innovator in the study. The findings indicated that the majority of innovators were CEIT students (12.5%) and Chemistry students (6.9%).The ratio of innovators for the remaining departments was almost the same. Individuals who took the test scores between 69 and 80 were labelled as early adopters. The analysis showed that half of the CEIT students (51.1%) were early adopters whereas one third of participants from Chemistry (32.2%) and Mathematics (27.7%) were early adopters. The most represented adopter category among participants was early majority. The findings manifested that almost half of the participants from Turkish P. (46.9%), Chemistry (43.7%) and History (44.6%) were early majority. One third of participants from Turkish P. (30.9%), and History (30.8%) departments were late majority. Finally, the results showed that none of the CEIT students were laggards. It is interesting to note that 3.6% of participants from Mathematics department were laggards. This ratio was the highest one among the other departments. The findings highlighted that the great majority of the participants were early majority. In contrast to Rogers' diffusion ratio for laggards (16%), the ratio for laggards in this study was 2.1%.

To draw conclusions about the differences between distributions of participants in categories regarding departments, the innovativeness scores for each adopter categories in line with their departments were compared.

Innovators were the first adopter category which consisted of 7.1% of the distribution. To investigate the impact of department on innovators' scores in IIS one-way analysis of variance test was employed. The results are shown in Table 4.

Table 4

Comparison of innovativeness scores of innovators according to their departments

Departments	*n*	*Mean Rank*	*df*	χ^2	*p*
CEIT	13	10.81	4	21.206	.001*
Maths	4	20.25			
Turkish P.	4	5.50			
Chemistry	6	25.75			
History	3	22.33			
Total	30				

* p<0.05

Since the sample size was small (n=30), and data were not normally distributed, a Kruskal–Wallis one-way ANOVA was performed on the five departments. Innovators in the Turkish Philology department had the least innovativeness score(Mdn=80) and innovators in the Chemistry department had the most (Mdn=84). Innovators in the Mathematics department had a median of 82.5 while innovators in the History department had a median of 82and in the CEIT department the median was 81.The Kruskal-Wallis test revealed a statistically significant difference in scores of innovators according to their departments [χ2(4,n=30)= 21.206, p=.001].The results indicated that students who regarded themselves as innovators in the Chemistry Department had significantly higher innovativeness scores than students in other departments, who declared themselves as innovators.

The second innovativeness category was early adopters. Since the distribution of early adopters' scores in IIS was normal, one way ANOVA test was used to compare their scores according to their departments. The results are shown in Table 5.

Table 5

Comparison of innovativeness scores of early adopters according to their departments

Departments	n	M	SD		SS	df	MS	F	p
CEIT	53	72.00	1.77	Between Groups	70.424	4	17.606	3.723	.007*
Maths	23	72.52	2.04	Within Groups	576.993	122	4.729		
Turkish P.	12	73.92	1.78	Total	647.417	126			
Chemistry	28	73.14	2.85						
History	11	71.09	2.63						
Total	127	72.45	2.27						*

p<0.05

ANOVA test results indicated that there was a significant difference between early adopters' innovativeness scores according to their departments [F(4,122)=3.723 p=.007]. Post-hoc comparisons using the Tukey HSD test indicated that the mean score for Turkish Phil. (M=73.92, SD =1.78) was significantly different from History

(M=71.09, SD=2.63). There was no significant difference between other groups. These results indicated that early adopters' score from the Turkish Philology department performed better in IIS than did the early adopters in the History department.

Early Majority comprised 39.5% of prospective teachers in the study. To examine the effect of department on their innovativeness scores a one-way analysis of variance test was employed. The results were shown in Table 6.

Table 6

Comparison of innovativeness scores of early majority according to their departments

	n	M	SD		SS	df	MS	F	p
CEIT	29	65.90	2.38	Between Groups	811.315	4	202.829	48.796	.001*
Maths	32	66.63	1.96	Within Groups	669.221	161	4.157		
Turkish P.	38	62.00	2.43	Total	1480.536	165			
Chemistry	38	66.87	1.63						
History	29	62.10	1.63						
Total	166	64.70	3.00						

* p<0.05

The findings indicated that there was a statistically significant difference at the p<.05 level in IIS scores for the five departments: F(4, 161) = 48.796, p=.001. Post-hoc comparisons using the Tukey HSD test revealed that the mean score for Chemistry (M=66.87, SD =1.63) was significantly different from History (M= 62.10, SD = 1.63) and Turkish Phil. (M=62.00, SD=2.43).Moreover, the mean scores for Maths (M=66.63, SD=1.96)and for CEIT (M=65.90, SD=2.38) were significantly different from History and Turkish Phil. departments. There was no significant difference between early majority in Chemistry, Maths and CEIT departments. These results highlighted that early majority in Chemistry, Maths and CEIT departments performed higher in IIS than did the early majority in History and Turkish Phil. departments.

Late majority was the fourth innovativeness category and consisted of 21% of participants. A one-way between-groups analysis of variance was conducted to explore the impact of departments on innovativeness levels of early majority, as measured by IIS. The results are given in Table 7.

Table7

Comparison of innovativeness scores of late majority according to their departments

	n	M	SD		SS	df	MS	F	p
CEIT	9	55.67	2.18	Between Groups	199.056	4	49.764	18.838	.001*
Maths	21	52.90	2.34	Within Groups	219.262	83	2.642		
Turkish P.	25	55.96	1.17	Total	418.318	87			
Chemistry	13	56.85	0.55						
History	20	53.60	1.35						
Total	88	54.80	2.19						

* p<0.05

The test results indicated that there was a significant difference between late majority's innovativeness scores according to their departments [F(4,83)=18.838 p=.001]. Post-hoc comparisons using the Tukey HSD test indicated that the mean scores for Chemistry (M=56.85, SD=0.55), Turkish Phil. (M=55.96, SD=1.17) and CEIT (M=55.67, SD =2.18) were significantly higher than the scores of late majority in History (M= 53.60, SD = 1.35) and Maths (M=52.90, SD=2.34). There was no significant difference between Chemistry, Turkish Phil. and CEIT. The results indicated that late majority from Chemistry department had the highest innovativeness scores among the other groups.

The last innovativeness category suggested by Rogers was Laggards. Laggards comprised only 2.1% of the participants. To investigate the impact of department on laggards' innovativeness scores, nonparametric analysis of variance test was conducted. The results are given in Table 8.

Table 8

Comparison of innovativeness scores of laggards according to their departments

Departments	*n*	*Mean Rank*	*df*	χ^2	*p*
Maths	3	3.33	3	2.680	.444
Turkish P.	2	5.25			
Chemistry	2	7.00			
History	2	5.25			
Total	9				

A Kruskal-Wallis Test revealed a non-significant difference in laggards' innovativeness scores across five different departments (Maths, n=3; Turkish Phil., n=2; Chemistry, n=2; History, n=2), $\chi 2$ (3, n= 9)=2.680, p=.444. Laggards in the Chemistry department recorded a non-significant higher median score (Mdn=46) than the other three groups, which both recorded median values of 45.5 and one recorded median values of 44. None of the students declared themselves as laggards in the CEIT department.

Overall, the results indicate that prospective teachers were either early majority or early adopters. Male participants were found more innovative than female participants. Moreover, participants from the CEIT department were more highly innovative than participants from other departments.

Discussion and Conclusion

Through this study the adopter categories of pre-service teachers in Turkey had been determined and the effect of gender and field of study on the level of individual innovativeness had also been examined. The individual innovativeness scale was administered to pre-service teachers in five different teacher education departments.

One of the concerns of this study is to determine the innovativeness levels of the participants and to compare their mean scores in IS for gender and fields of study.

The result indicated that two thirds of pre-service teachers were highly or moderately innovative. Independent samples t-test established that male participants were more highly innovative than female participants. This is in complete agreement with the findings of Shim and Kotsiopoulos (1994). They revealed in their studies on adoption of technological innovation in textile retailing that the gender of participants had a significant role on adoption of innovations, too. They found out that male participants were more innovative than the female participants. This finding is also consistent with the findings of Kavak and Demirsoy (2009) and Kilicer (2011). Kavak and Demirsoy (2009) investigated demographic and lifestyle characteristics of adopters of online banking services in Turkey. They reported that male participants showed a higher tendency to accept innovations than female participants. Kilicer (2011) conducted his study on pre-service teachers and revealed that male pre-service teachers were highly innovative compared to the female ones. On the other hand, this finding does not support the findings of Less (2003). She investigated faculty adoption of computer technology for instruction and did not find important differences between faculty adopter categories and gender.

The study revealed that participants' departments accounted for a statistically significant difference in their innovativeness scores. The findings showed that participants from both the CEIT and Chemistry departments were more innovative than participants from other departments. As Greenhalgh et al. (2008), Loogma et al. (2012), Mumcu, (2004), Soffer et al. (2010), and Hug and Reese (2006) stated in their studies, the individuals in these departments are open to new technologies, tend to accept changes and are not afraid of taking risks. This finding disproves the findings of Zakaria (2001). He examined the factors related to IT implementation in the curriculum and found no significant difference between participants' departments and IT use in general.

The findings revealed that the great majority of the participants were early majority. Lundblad (2003) states that early majority are deliberate about innovation. According to Yi et al. (2006) they wait and monitor the reactions of people to innovations. This finding thus indicates that pre-service teachers are more careful about their adoption decisions, reluctant to take risks and need well-established references. The findings also revealed that the majority of female participants were early majority whereas the majority of male participants were early adopters. Lundblad (2003) reports that early adopters are open to change, but are connected to and respected with in social system closely. They tend to buy or try out innovations sooner than most of their colleagues. This finding concurs well with the findings of Kilicer (2011), Timucin (2009), and Şahinand Thompson (2006)who investigated Turkish pre-service teachers' tendencies to innovations. The great majority of the male participants in these studies were early adopters. The finding in the current study refutes Rogers' distribution. Rogers (1995) states that 34% of individuals (which is one of the top ranges in the distribution) are early adopters. However, the ratios of innovators and laggards in this study showed

difference with Rogers' distribution. The distribution of Rogers is bell shaped whereas the distribution in this study is positively skewed.

The adopter categories were also analysed according to participants' fields of study. The findings manifested that the majority of participants from the CEIT department were early adopters. This does not confirm the findings of Kilicer (2011). He investigated CEIT students' adopter categories and found that a great majority of them were early majority. However, Greenhalgh et al. (2008), Loogma et al. (2012), Mumcu, (2004), and Soffer et al. (2010) state that individuals in computer related departments are technology-focused individuals, open to innovations and changes, and risk takers. On the other hand, the comparison test revealed that early adopters in the Turkish Philology department performed better on the innovativeness scale than did early adopters in other departments.

In the study, the majority of participants from Turkish Philology, History, Chemistry and Maths departments were early majority. This does not match with Hug and Reese's (2006) ideas on students in science departments. They claim that the students in science departments are more prone to being cautious about their adoption decisions than students in social sciences and need well-established references, evidences and experiments about the innovations they encounter. However, cross-comparisons between early majority indicated that early majority in Chemistry, Maths and CEIT departments had significantly higher innovativeness scores than the early majority in History and Turkish Phil. departments. This, in fact, supports the idea of Hug and Reese (2006). Although the majority of participants from Turkish Philology and History departments were early majority, about one third of them were late majority. Greenhalgh et al. (2008) specify that the individuals in these groups are in need of high assistance about innovations. Cross-comparisons on late majority according to their departments revealed that late majority from the Chemistry department had the highest innovativeness scores among the other groups. This indicates that students in the Chemistry departments are less sceptical about or resistant to innovations than the late majority in other departments. Finally, the results revealed that none of the CEIT participants regarded themselves as laggards. The comparison analysis indicated that laggards in Chemistry department recorded insignificantly higher innovativeness scores than the other three groups. As Soffer et al. (2010) claim, laggards adopt innovation as and when needed. Thus, it can be concluded that prospective Chemistry teachers are less suspicious about adopting innovations than their fellows in other departments.

In conclusion, this study presented the adopter categories and innovativeness degree of pre-service teachers. The results of this study suggest that pre-service teachers especially in some departments need a change in their perception of innovation. Hall and Hord (1987) claim that a three- to five-year-implementation of the innovation is required to adopt innovation. Fullan (1990) supports the idea that the effective change in individual behaviours takes time. As Rogers (2003) reports, a decision about

a new thing, idea or technology is not a sudden act. He states that "this is a process through which an individual passes from gaining initial knowledge of an innovation, to forming an attitude toward the innovation, to making a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision" (p.172). Thus, students should be provided with training on innovations and innovation use in instruction. Ali (2003) also claims that training in technology should be provided before availing technology. In Turkey, the course aims and objectives are organized according to the principles of Bloom's taxonomy. However, evidence from this study suggests that Rogers' model of innovation decision process should be taken into consideration while planning objectives. Moreover, the instructor might provide students with an active program of, and support and consultation for, research using educational technologies as suggested by Anderson and Campbell (1998).

This study was limited in several ways. The most important limitation lies in the fact that the innovativeness levels and profiles of prospective teachers were determined by a self-reported measure. Thus, to ensure a deeper understanding about their perceptions on innovations longitudinal studies, qualitative studies, observations, etc. should be conducted. Moreover, the current study has only investigated the adopter categories and innovativeness levels of pre-service teachers. Therefore, in the future, researchers may investigate the factors that hinder the individuals from adopting innovations. The findings of this research might not be transferable to teachers. Thus, further studies should be done to investigate teachers' adopter categories and innovativeness levels.

References

Al-Gahtani, S. S. (2003). Computer technology adoption in Saudi Arabia: Correlates of perceived innovation attributes. *Information Technology for Development,10*, 57-69. http://dx.doi.org/10.1002/itdj.1590100106

Ali, A. (2003). Faculty adoption of technology: Training comes first. *Educational Technology*, 43, 51-53.

Anderson, J. (2010). *ICT transforming education: A Regional guide*. Bangkok: UNESCO.

Anderson, T., Varnhagen, S., & Campbell, K. (1998). Faculty adoption of teaching and learning technologies: Contrasting earlier adopters and mainstream faculty. *The Canadian Journal of Higher Education*, 28(23),71-78.

Arthur, C. (2012). Is Facebook worth $100bn?*TheGuardian*. Retrieved on 2nd February 2012 from http://www.guardian.co.uk/technology/2012/feb/02/is-facebook-worth-100-billion-dollars.

Bowen, S. (2012). *Blog writing: Easy as butter and hard as diamond* [Web log post]. Retrieved on 15th May 2012 from http://www.webgranth.com/blog-writing-easy-as-butter-and-hard-as-diamond

Chauhan, D., & Mason A. (2008). Factors affecting the uptake of new medicines in secondary care—a literature review. *Journal of Clinical Pharmacy & Therapeutics*, 334, 339–348. http://dx.doi.org/10.1111/j.1365-2710.2008.00925.x

Chesney, S., & Benson, J. (2012). Anything other than silence: Using a personal learning system for continuing professional development. *Innovations in Education and Teaching International*, 49(1), 73-82. http://dx.doi.org/10.1080/14703297.2012.647785

Dadura, A. M., & Lee, T. R. (2011). Measuring the innovation ability of Taiwan's food industry using DEA. *Innovation-the European Journal of Social Science Research*, 24(1-2), 151-172. http://dx.doi.org/10.1080/13511610.2011.583863

Davis, H., Hartshorne, R., & Ring, G. (2010). Being an innovative teacher: Pre-service teachers conceptions of technology and innovation. *International Journal of Education*, 2(1), 1-28. http://dx.doi.org/10.5296/ije.v2i1.242

Dooley, K. E. (1999).Towards a holistic model for the diffusion of educational technologies: An integrative review of educational innovation studies. *Educational Technology & Society*, 2(4), 35-45.

Franzel, J. M. (2008). Urban government innovation: Identifying current innovations and factors that contribute to their adoption. *Review of Policy Research*, 253, 253–277. http://dx.doi.org/10.1111/j.1541-1338.2008.00326.x

Fullan, M. G. (1990). Staff development, innovation, and institutional development. In B. Joyce (Ed.), *Changing school culture through staff development: The 1990 ASCD yearbook*. (pp. 3– 25). Alexandria, VA: ASCD.

Goldsmith, R. E. & Foxall, G. P. (2003).The measurement of innovativeness. In L. V. Shavinina (Ed.)*The international handbook of innovation* (pp.321-329). Oxford: Elsevier Sciences Ltd. http://dx.doi.org/10.1016/B978-008044198-6/50022-X

Greenhalgh, T., Robert, G., & Bate, P. (2008).*Diffusion of innovations in health service organizations*: *A systematic literature review*. Chichester, GBR: John Wiley Sons Ltd.

Haider, M., & Kreps, G. L. (2004). Forty years of Diffusion of Innovations: Utility and value in public health. *Journal of Health Communication*, *9*, 3-11. http://dx.doi.org/10.1080/10810730490271430

Hall, G. E., &Hord, S. M. (1987). *Change in schools: Facilitating the process*. Albany: State University of New York Press.

Hug, B., & Reese, G. (2006). How technology integration in Mathematics and Science teaching can occur: The role of the maverick teacher. *Teaching Education*, 17(2), 167-179. http://dx.doi.org/10.1080/10476210600680390

Hurt, H. T., Joseph, K.& Cook, C. D. (1977). Scales for the measurement of innovativeness. *Human Communication Research*, 4, 58-65. http://dx.doi.org/10.1111/j.1468-2958.1977.tb00597.x

IDC. (2008).*The Diverse and Exploding Digital Universe*. Retrieved from http://www.emc.com/collateral/analyst reports/diverseexploding-digital-universe.pdf

Internetworldstats (2012). *Internet usage statistics: The Internet big picture*. Retrieved on 15th May 2012 from http://www.internetworldstats.com/stats.htm

Kauffman, R. J., & Tecyatassanasoontorn, A. A. (2005). International diffusion of digital mobile technology: A coupled-hazard state-based approach. *Information Technology and Management*, 6,253-292. http://dx.doi.org/10.1007/s10799-005-5882-3

Kavak, B., & Demirsoy,C. (2009). Identification of adopter categories for online banking in Turkey. *The Service Industries Journal, 29*(8), 1037-1051. http://dx.doi.org/10.1080/02642060902764228

Kilicer, K., & Odabasi, H. F. (2010). Individual Innovativeness Scale (IS): The Study of adaptation to Turkish, validity and reliability. *Hacettepe University Journal of Education,38*, 150-164.

Lacy, S. (2009).*The Facebook Story*. Richmond, UK: Crimson.

Less, K.H. (2003). *Faculty adoption of computer technology for instruction in the North Carolina Community College System.*(Doctoral dissertation).Johnson City, TN: East Tennessee State University.

Loogma, K., Kruusvall, J., & Umarik, M. (2012). E-learning as innovation: Exploring innovativeness of the VET teachers' community in Estonia. *Computers* & *Education*, *58*(2), 808-817. http://dx.doi.org/10.1016/j.compedu.2011.10.005

Lundblad, J.P. (2003). A review and critique of Rogers' diffusion of innovation theory as it applies to organizations. *Organization Development Journal, 21*(4),50-64

Merriam-Webster.(2012). Innovation. Retrieved on 12th May 2012 from http://www.merriam-webster.com/dictionary/innovation

Moore, G. A. (1999). Crossing the chasm: *Marketing and selling high-tech products to mainstream customers*. New York: Harper Business.

Mora Bonilla, A., Sarmiento Moreno, M. D., & Merida Casermeiro, E. (2010). How we can mark the rhythm of the daily work by using a Learning Management System as Moodle? WSEAS *Transactions on Advances in Engineering Education, 2*(7),53-62

Mumcu, F. (2004).*Teachers' views regarding the perceived attributes and the obstacles in the diffusion of informatics technologies in vocational and technical schools*.(Unpublished master's thesis). Ankara: Hacettepe University.

Nallaya, S. (2010).*The Impact of Multi-modal Texts on the Development of English Language Proficiency*. (Unpublished doctoral thesis).Adelaide: The University of Adelaide.

Oliver, B., & Goerke, V. (2008). Undergraduate students' adoption of handheld devices and Web 2.0 applications to supplement formal learning experiences: Case studies of Australia, Ethiopia and Malaysia. *International Journal of Education and Development Using ICT, 4*(3), 78-94

Parashos, P., & Messer, H.H. (2006). The diffusion of innovation in dentistry: A review using rotary nickel-titanium technology as an example. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology, 101*(3), 395–401. http://dx.doi.org/10.1016/j.tripleo.2005.02.064

Prensky, M. (2001). Digital natives, digital immigrants. *On the Horizon, 9*(5), 1-6. http://dx.doi.org/10.1108/10748120110424816

Resta, P., &Patru, M. (2010).*Teacher Development in an E-learning Age: A Policy and Planning Guide*. Paris: UNESCO.

Richardson, J. (2009). Diffusion of technology adoption in Cambodia: The test of a theory. *International Journal of Education and Development using Information and Communication Technology* (IJEDICT), 5(3), 157-171.

Rogers, E. M. (2003). *Diffusion of innovations* (Fifth Edition). New York: Free Press

Rogers, E.M. (2004). A prospective and retrospective look at the diffusion model. *Journal of Health Communication, 9*, 13–19. http://dx.doi.org/10.1080/10810730490271449

Ross, M. (2012). *Infographic: Twitter stats 2012*. Retrieved on 15th May 2012 from http://shesthegeek.co.za/2012/03/infographic-twitter-stats-2012/

Sahin, I., & Thompson A. (2006).Using Rogers' theory to interpret instructional computer use by COE faculty. *Journal of Research on Technology in Education, 39*(1), 81-104. http://dx.doi.org/10.1080/15391523.2006.10782474

Sahin, I. (2006). Detailed review of Rogers' diffusion of innovations theory and educational technology-related studies based on Rogers' theory. *The Turkish Online Journal of Educational Technology – TOJET,5*(2), 14-23.

Soffer, T., Nachmias, R., & Ram, J. (2010). Diffusion of web supported instruction in higher education - The Case of Tel-Aviv University. *Educational Technology* & *Society*, 13(3), 212–223.

Stuart, T. E. (2000). Interorganizational alliances and the performance of firms: A study of growth and innovation rates in a high-technology industry. *Strategic Management Journal, 21*(8), 791-811. http://dx.doi.org/10.1002/1097-0266(200008)21:8<791::AID-SMJ121>3.0.CO;2-K

Tabata, L., & Johnsrud, L. (2008).The impact of faculty attitudes toward technology, distance education, and innovation. *Research in Higher Education, 49*(7), 625-646. http://dx.doi.org/10.1007/s11162-008-9094-7

Timucin, M. (2009). Diffusion of technological innovation in a foreign languages unit in Turkey: A focus on risk-aversive teachers. *Technology, Pedagogy and Education, 18*(1), 75-86. http://dx.doi.org/10.1080/14759390802704121

Wilson, G.,& Stacey, E. (2004). Online interaction impacts on learning: Teaching the teachers to teach online. *Australasian Journal of Educational Technology, 20*(1), 33-48.

Yi, M. Y., Fiedler, K. D., & Park, J. S. (2006). Understanding the role of individual innovativeness in the acceptance of IT-based innovations: Comparative analyses of models and measures. *Decision Sciences*, *37*(3), 393-426. http://dx.doi.org/10.1111/j.1540-5414.2006.00132.x

Youtube. (2012). *Statistics*. Retrieved on 15th May 2012 from http://www.youtube.com/t/press_statistics.

Zakaria, Z. (2001). *Factors related to information technology implementation in the Malaysian Ministry of Education Polytechnic*. (Unpublished doctoral dissertation).Virginia: Virginia Polytechnic Institute and State University.

Ismail Yuksel
Eskisehir Osmangazi University
Meşelik Kampüsü, Atatürk Bulv., 26480 Osmangazi/Eskişehir, Turkey
iyuksel78@gmail.com

Rogersov model difuzije inovacije u praksi: pojedinačni profili inovativnosti budućih nastavnika u Turskoj

Sažetak

Svrha ovoga istraživanja bila je odrediti kategorije usvajanja i pojedinačne razine inovativnosti budućih nastavnika. 420 budućih nastavnika iz pet različitih odjela sudjelovalo je u ovome istraživanju. Primjena Rogersove skale za mjerenje usvajanja otkrila je da kod budućih nastavnika u uzorku ispitanika u istraživanju dominiraju rani usvojitelji. Istraživanje je također otkrilo da odjel i spol ispitanika čine značajnu razliku u razini njihove inovativnosti. Većina ispitanika – žena bili su rani usvojitelja, a većina muških ispitanika bila je u skupini ranih usvojitelja. Analizom je otkriveno da su muški ispitanici visoko inovativni za razliku od ispitanica. Istraživanje je također ukazalo na to da je za razliku od Rogersove normalne distribucije (zvonastog oblika) kategorija usvojitelja, distribucija u ovome istraživanju pozitivno zakrivljena. Rezultati podupiru ideju da budući nastavnici, posebno u nekim odjelima, moraju promijeniti svoju percepciju inovacije. Dokazi također upućuju na to da se Rogersov model odlučivanja o inovaciji mora uzeti u obzir za vrijeme određivanja ciljeva kolegija.

Ključne riječi: *inovacija; kategorije usvojitelja; obuka nastavnika; usvajanje inovacije.*

Uvod

U posljednje vrijeme svijet preplavljuju inspirativne inovacije, tehnologijski pomaci i značajni razvoj. Globalna tvrtka za tržišnu inteligenciju izvješćuje da je 2012. digitalni svijet deset puta veći od onoga 2006. godine (Anderson, 2010). Posljednje izvješće iz provedenih anketa govori o tome da je do srpnja 2012. registrirano gotovo 70 milijuna WordPress i 39 milijuna Tumblr blogova širom svijeta (Bowen, 2012). Milijuni novih blogova objavljuje se dnevno, a više od milijardu pjesama razmjenjuje se putem interneta (Anderson, 2010). U 2000. registrirano je samo 361 milijuna korisnika interneta u svijetu. Danas postoji gotovo šest puta više (2,267 milijardi) korisnika Interneta, nego u 2000. (Internetworldstats, 2012). Jedna od mrežnih usluga i mrežnih

stranica pokrenutih u 2004. godini danas ima više od 845 milijuna aktivnih korisnika te je dobila novi krug poticaja koji procjenjuje tu tvrtku na $50 milijardi, što je više od mnogih dobrostojećih tvrtki (Arthur, 2012). Nadalje, jedna od inovativnijih usluga društvenih mreža koja je nastala 2006. godine ima više od 465 milijuna korisničkih računa te se njihova vrijednost procjenjuje na oko $ 4 milijarde (Ross, 2012). Tvrtka koja je nastala prije nekoliko godina danas ima 800 milijuna jedinstvenih korisnika i adresa je za četiri milijarde video snimaka dnevno (YouTube, 2012). Resta i Patru (2010) procjenjuju da se dnevno objavljuje više od 7000 znanstvenih i tehničkih radova. Ti podaci opisuju veličinu digitalnog svijeta (IDC, 2008.).

Djeca rođena početkom ovoga stoljeća rastu u spomenutom digitalnom svijetu. Njih nazivamo „sljedeća generacija" ili „digitalni urođenici" današnjega svijeta (Prensky, 2001). Njihov svijet uključuje 3D televizore, telefone-foto-aparate, iPodove, MP3-4 playere, 3D interaktivne videoigrice, itd. (Anderson, 2010). Suprotno tome, i za razliku od „digitalnih urođenika", „digitalni useljenici" koji podrazumijevaju roditelje (Prensky, 2001) ulažu goleme napore u prihvaćanju inovacija kojima su njihova djeca izložena. Ta složena situacija obilježena je i pojmovima poput komunikacije, uključenosti i dijeljenja inovacija koja postoji između djece i njihovih roditelja. Takav odnos također utječe i na interakciju nastavnika i učenika, a posebno u procesu učenja i poučavanja. S obzirom na to da takve situacije omogućuju učenicima uključivanje, komunikaciju i povezanost s njihovim nastavnicima na različite načine, učenici često nailaze na nepovezanost s tradicionalnim oblicima nastave u školama (Anderson, 2010; Nallaya, 2010). Srećom, posljednjih godina su tradicionalni oblici nastave postupno prepustili mjesto on-line aplikacijama i u lokalnim okruženjima (Mora Bonilla i dr., 2010), a tehnologijske inovacije poput IPada, mobilnih telefona, interaktivnih ploča i ostaloga postaju češće korišteni.

Vladajući organi uglavnom prepoznaju potrebu učenika za obrazovanjem ili obukom o inovativnoj pismenosti, tehnologiji i novim ICT vještinama kako bi mogli funkcionirati u digitalnom svijetu. Nastavnici imaju najveću odgovornost u pripremi učenika za digitalni svijet. Koriste se softverskim alatima poput obrade teksta i obrade podataka (Word, Excel) itd., međutim, rijetko primjenjuju inovacije u poučavanju. Prema tome, oni koji rade na politici obrazovanja nastavnika suočeni su s velikim izazovima u pripremi budućih nastavnika za integracijom inovacija u poučavanje (Davis i dr., 2010). Kao prvi korak, potrebno je promijeniti percepciju nastavnika o inovaciji (Chesney i Benson, 2012). Prema Rogersu (2003), percepcija pojedinca o inovaciji uglavnom ovisi o njihovim sposobnostima poput rješavanja problema, izlaganja izazovima, otvorenosti novitetima. To se povezuje i s njihovom vlastitom inovativnošću. Prema tome, promjena percepcije nastavnika o inovacijama ključna je za određivanje profila inovativnosti u takvim analizama. Rogersov model difuzije inovacije ponuđen je i korišten u literaturi od 1993. U tom kontekstu, ovo istraživanje nastojat će prepoznati profile inovativnosti budućih nastavnika na osnovi Rogersova modela.

Inovacija, inovativnost i usvajanje inovacije

Tehnologija je sastavni dio svakodnevnog života; koncepti inovacije, inovativnosti i širenja inovacije u širokoj su uporabi (Dadura i Lee, 2011). Povećanjem brzine i kvalitete života inovacija je globalno prisutna, te se vodi indikatorima „prvoga mjesta" (Kilicer, 2011). Iako se u literaturi koncept „inovacije" često koristi naizmjenično s konceptom „tehnologije" (Parashos i Messer, 2006), inovacija se leksički definira kao uvođenje novine (Merriam-Webster, 2012). U Rogersovoj (2003, str. 12) Difuziji inovacije kao "ideja, postupak ili objekt koji pojedinac doživljava kao nov ili kao neka druga jedinica usvajanja". Parashos i Messer (2006) inovaciju vide kao remećenje kada ona redefinira proceduru i kao životno bitnu kada predstavlja bolji način djelovanja. Rogers (2004, str. 13) definira difuziju općenito kao „proces kroz koji se inovacija, definirana kao nova ideja, širi putem određenih komunikacijskih kanala u određenom vremenu među ljudima u nekom društvenom uređenju". Prema Lundbladu (2003) difuzija inovacije je „usvajanje i implementacija novih ideja, procesa, proizvoda ili usluga. Model, koji povezuje te koncepte, objašnjava procedure putem ideja, postupaka ili objekata, a komuniciraju ih i usvajaju članovi u društvu (Richardson, 2009).

Proces usvajanja inovacije bio je predmet proučavanja više od četrdeset godina. Rogersov model difuzije inovacije bio je prihvaćen kao jedan od popularnijih modela usvajanja (Sahin i Thomson, 2006). S prvijencem Rogersova modela, čiji je cilj izdvojiti fundamentalne čimbenike koji utječu na tendenciju pojedinca za usvajanjem inovacije, model difuzije inovacije bio je primijenjen i u drugim disciplinama od hibridnog sjemena kukuruza do moderne matematike; od prevencije konzumacije narkotika u zdravstvu do korištenja mobilnih telefona i osobnih digitalnih asistenata (PDAs); od prostornog planiranja do organske poljoprivrede i naposljetku obrazovanja (Dooley, 1999; Haider i Kreps, 2004; Kauffman i Tecyatassanasoontorn, 2005; Oliver i Goerke, 2008; Richardson, 2009; Stuart, 2000;Tabata i Johnsrud, 2008). Kada pojedinac jednom naiđe na inovaciju, započinje proces usvajanja; informacija se prikuplja i testira s obzirom na to osigurava li prihvatljivu učinkovitost u odnosu na uloženo vrijeme i energiju. Prema tome, model prepoznaje načine na koje se inovacija doživljava kod pojedinaca (Loogma, Kruusvall, i Umarik, 2012; Lundblad, 2003; Richardson, 2009; Timuçin, 2009; Yi, Fiedler, i Park, 2006; Wilson i Stacey, 2004). Pojedinačni stilovi proizlaze iz njihovih stavova prema inovaciji. Reakcije pojedinaca na inovaciju, novu ideju ili novu tehnologiju razlikuju se zbog razlika u inovativnosti, odnosno tendenciji za prihvaćanjem inovacije. Prema tome, inovativnost se uglavnom odnosi na promjenu u ponašanju samo zato što su pojedinci intrinzično, manje ili više, skloni inovativnom ponašanju (Wilson i Stacey, 2004; Loogma i dr., 2012). Rogers (2003) je klasificirao takva ponašanja u kategorije usvojitelja. Definirao je kategorije usvojitelja kao „klasifikaciju članova društvenog sustava na osnovi inovativnosti" (str. 22). Za Rogersa, inovativnost je pomogla kod razumijevanja željenoga i glavnoga ponašanja u procesu odluke o inovaciji (Sahin, 2006). On klasificira usvojitelje u pet

skupina: rani usvojitelji, rana većina, kasna većina, i one koji su lijeni s obzirom na vlastitu inovativnost. Te su skupine raspoređene prema Gaussovoj krivulji, odnosno distribucija je normalna (Slika 1).

Slika 1.

Kao što je prikazano na slici 1, inovatori ili kako ih Rogers (2003) opisuje smjeli, prvi testiraju nove proizvode i procese (Wilson i Stacey, 2004). Traže i prihvaćaju inovacije i ne suprežu se od rizika (Lundblad, 2003; Soffer i dr., 2010). Oni imaju naprednije tehnološko znanje od ostalih (Loogma i dr., 2012; Yi i dr., 2006). S druge strane, Moore (1999) definira inovatore kao zagovornike razornih tehnologija. Rani usvojitelji, koji čine 13,5% populacije, prihvaćaju promjenu, ali su isto tako povezani s društvenom zajednicom i od nje cijenjeni (Lundblad, 2003). Naginju poslovima vodećih u društvu, a njihova ponašanja mogu služiti kao modeli za ostale članove skupine (Greenhalgh i dr., 2008; Loogma i dr., 2012; Soffer i dr., 2010). Treća skupina usvojitelja je rana većina koju čini 34% populacije. Oni su odlučniji u svojim odlukama o usvajanju (Lundblad, 2003). Članovi te skupine su oprezni i sigurni pojedinci koji nevoljko prihvaćaju rizike (Soffer i dr., 2010). Oni jednostavno preferiraju „čekaj i vidjet ću" stav ili čekaju reakciju ostalih na inovaciju (Yi i dr., 2006). Kod odlučivanja o usvajanju, ta skupina zahtijeva utemeljene preporuke (Rogers, 2003). Kasna većina, koja predstavlja 34% populacije, jesu oni skeptični prema inovacijama ili oni koji pružaju otpor inovacijama (Lundblad, 2003; Soffer i dr., 2010). Takvi pojedinci usvajaju novu ideju tek kada ona postane dobro poznat standard. Shodno tome kupuju od velikih i dobro poznatih tvrtki (Greenhalgh i dr., 2008; Yi i dr., 2010). Na kraju, lijeni, koji čine 16% populacije, jesu oni tradicionalisti, sumnjičavi prema novim idejama i oni vrlo vjerojatno neće prihvatiti inovaciju dok ona ne postane potreba (Greenhalgh i dr., 2008; Loogma i dr., 2012; Lundblad, 2003; Soffer i dr., 2010).

Taj se model predstavlja kao pogodna teorija za proučavanje usvajanja inovacije u obrazovnom sustavu (Sahin i Thomson, 2006). Istraživanja širenja (difuzije) u obrazovnom okruženju uglavnom se usredotočuju na tehnološke inovacije, a samo je jedno istraživanje uključilo proučavanje kategorija usvojitelja (Sahin i Thomson, 2006). Za definiranje kategorija Sahin i Thomson koristili su se upitnikom od pet pitanja od kojih je svako bilo za jedno od kategorija usvojitelja. Međutim, s obzirom na Rogersove prilično složene i sveobuhvatne kategorije usvojitelja, postoji potreba za njihovom detaljnijom analizom. S obzirom na tu potrebu, ovo istraživanje pokušalo je istražiti kategorije usvojitelja kod budućih nastavnika koristeći se posebno izrađenom skalom kako bi se odredile kategorije usvojitelja.

Metoda

Dizajn

Metodom anketnog presječnog istraživanja istražile su se kategorije usvojitelja ispitanika te su se usporedile njihove razine inovativnosti s obzirom na neke varijable.

Ispitanici

Istraživanje je provedeno kako bi se definirale kategorija usvojitelja kod budućih nastavnika i kako bi se usporedile razine njihove inovativnosti u presječnom istraživanju. Podaci iz istraživanja dobiveni su od 420 budućih nastavnika iz pet različitih odjela Eskisehir Osmangazi Sveučilišta u 2011./2012. akademskoj godini. Od 420 ispitanika 288 (68,8%) su bile žene, a 132 (31,4%) su bili muškarci.

Instrument

„Skala inovativnosti" (SI) koju su kreirali Hurt, Joseph i Cook (1977) korištena je kako bi se definirale kategorije usvojitelja i razine inovativnosti kod ispitanika. Likertova skala od pet stupnjeva sadrži 20 pitanja. U ovome istraživanju primijenjena je Turska inačica SI koju su prilagodili Kilicer i Odabasi (2010). Prema Hurt i dr. (1977) "Skala inovativnosti" ima dobru unutarnju konzistentnost, s Cronbach alpha koeficijentom od ,89; Turska inačica skale koja je provedena na 343 studenta također ima dobru unutarnju konzistentnost, a Cronbah alpha koeficijent je ,82 (Kilicer i Odabasi, 2010). U ovome istraživanju Cronbach alpha koeficijent bio je ,78.

Kako bi izračunali ukupan rezultat ispitanika na skali, koristili smo se sljedećom formulom: [42]. Najveći rezultat koji se mogao dobiti iz skale bio je 94, a najmanji 14. Ispitanici su smješteni u Rogersove kategorije usvojitelja prema ukupnom rezultatu:

- Iznad 80 inovatori
- Između 69 i 80 rani usvojitelji
- između 57 i 68 rana većina
- između 46 i 56 kasna većina
- ispod 46 lijeni usvojitelji.

Nadalje, ispitanici su klasificirani prema svojim rezultatima na skali kao vrlo inovativni (iznad 68 bodova), umjereno inovativni (68-64 boda), skromno inovativni (ispod 64 boda).

Analiza podataka

Za analizu podataka koristila se deskriptivna statistika (srednja vrijednost, standardna devijacija, postotci itd.), nezavisni t-test, jednosmjerna analiza varijance. Kod usporedbi kada distribucija nije bila normala, rađeni su neparametrijski testovi. Razina značajnosti za ovo istraživanje postavljena je na 0,05.

Rezultati

Prvi problem koji je postavljen u ovome istraživanju bio je identificirati razine inovativnosti kod ispitanika i usporediti njihove rezultate s obzirom na spol i odjel na kojemu studiraju. Kako bi se identificirale razine inovativnosti, izračunat je ukupan rezultat za svakog ispitanika te je klasificiran u tri kategorije koje su predložili Hurt i dr., (1977). Rezultati su prikazani u tablici 1.

Tablica 1.

Rezultati ukazuju na to da su muški ispitanici vrlo inovativni[M=69.45, SD=7.90], a da su ženski ispitanici umjereno inovativni [M=64.08, SD=8.35]. Nezavisan t-test otkrio je da postoji značajna razlika u rezultatima za žene i muškarce [t (418) = 6.22, p=.001]. Analiza je jasno pokazala da su muški ispitanici vrlo inovativni za razliku od ženskih ispitanika.

Kako bi se istražio utjecaj odjela na rezultate inovativnosti budućih nastavnika koristio se jednosmjerni test analize varijance. Rezultati testa prikazani su u tablici 2.

Tablica 2.

Rezultati ukazuju na to da su ispitanici iz CEIT odjela (M=69.96, SD=6.52) i odjela Kemije (M=68.14, SD=7.92) vrlo inovativni, da su ispitanici iz odjela Matematike (M=64.71, SD=9.42) umjereno inovativni, a ispitanici iz odjela Filologije (M=62.38, SD=7.69) i Povijesti (M=61.45, SD=8.20) skromno inovativni. ANOVA je otkrila da postoji statistički značajna razlika na razini p< .05 kod SI rezultata ispitanika za tih pet odjela [F(4,415)= 18.01, p=.001]. Post-hoc usporedbama, koristeći se Tukey HSD testom, doznali smo da su ispitanici iz CEIT i Kemijskog odjela više inovativni nego ispitanici iz ostalih odjela.

Za bolje razumijevanje profila inovativnosti budućih nastavnika oni su klasificirani u pet kategorija inovativnosti koje predlaže Rogers (2003). Najprije je određena kategorija usvojitelja ispitanika, a zatim razlika u distribucijama ispitanika u kategorijama usvojitelja prema odjelima. Frekvencije i postotci ukupnih rezultata ispitanika korišteni su za interpretaciju podataka (vidi tablicu 3).

Tablica 3.

Rezultati pokazuju da velika većina (40,6%) ispitanica pripada ranoj većini, a velika većina (40,9%) ispitanika ubraja se u skupinu ranih usvojitelja. Omjer muških ispitanika za inovatore (12,1%) bio je tri puta veći nego omjer za ispitanice (4,9%). Za razliku od Rogersove normalne distribucije kategorija, distribucija u ovome istraživanju imala je različite omjere za kategorije usvojitelja (vidi sliku 2). Prva razlika između tih dviju distribucija bila je omjer za kasnu većinu. Prema Rogersu 34% pojedinaca bila je kasna većina, a u ovome je istraživanju 21% ispitanika definirana kao kasna većina. Drugo, omjer lijenih u Rogersovoj distribuciji gotovo je osam puta veći od omjera lijenih iz ovoga istraživanja. Međutim, omjer inovatora u ovome istraživanju gotovo je tri puta veći od omjera inovatora u Rogersovoj distribuciji (vidi sliku 2).

Slika 2.

Ispitanici koji su imali rezultat veći od 80 za SI obilježeni su kao inovatori u ovome istraživanju. Rezultati upućuju na to da je većina inovatora iz odjela CEIT (12,5%) i studenata iz odjela Kemije (6,9%). Omjer inovatora u odnosu na ostale odjele gotovo je identičan. Pojedinci čiji su rezultati bili između 69 i 80 (uključujući) obilježeni

su kao rani usvojitelji. Analiza je pokazala da je polovina CEIT studenata (51,1%) kategorizirana kao rani usvojitelji, a trećina je ispitanika iz odjela Kemije (32,2%) i Matematike (27,7%) u skupini ranih usvojitelja. Najreprezentativnija kategorija među ispitanicima bila je ona ranih usvojitelja. Rezultati su također otkrili da gotovo polovina ispitanika iz odjela Filologije (46,9%), Kemije (43,7%) i Povijesti (44,6%) pripadaju kategoriji rana većina. Trećina ispitanika iz odjela Filologije (30,9%), i Povijesti (30,8%) kasna su većina. Na kraju, rezultati ukazuju na to da nitko od CEIT studenata ne pripada kategoriji lijenih. Zanimljivo je da 3,6% ispitanika iz odjela Matematike pripada kategoriji lijenih. Taj je omjer najveći u odnosu na sve ostale odjele. Rezultati ističu da velika većina ispitanika pripada kategoriji rana većina. Za razliku od Rogersova omjera distribucije za lijene (16%), omjer lijenih u ovome istraživanju bio je 2,1%.

Kako bi mogli doći do zaključka o razlikama u distribucijama ispitanika u kategorijama vezanim uz odjel, rezultati inovativnosti za svaku kategoriju usvojitelja uspoređeni su s njihovim odjelima.

Inovatori su bili prva kategorija usvojitelja koja se sastojala od 7,1% distribucije. Kako bi se istražio utjecaj odjela na rezultat inovatora u SI rezultatima, primijenjena je jednosmjerna ANOVA. Rezultati su prikazani u tablici 4.

Tablica 4.

S obzirom na to da je uzorak ispitanika malen (n=30) i da podaci nisu normalne distribucije, primijenjen je Kruskal-Wallis jednosmjerna ANOVA test za svih pet odjela. Inovatori u odjelu Filologije imali su najmanji rezultat za inovativnost (Mdn=80) a inovatori u odjelu Kemije imali su najveći rezultat (Mdn=84). Inovatori na odjelu Matematike imali su srednju vrijednost 82.5, inovatori na odjelu Povijesti imali su srednju vrijednost 82, a u CEIT odjelu srednju vrijednost 81. Kruskal-Wallis Test ukazao je na statistički značajne razlike u rezultatima inovatora s obzirom na njihov odjel [$\chi 2(4,n=30)= 21.206,p=.001$]. Rezultati pokazuju da studenti koji se smatraju inovativnima u odjelu Kemije imaju značajno više rezultate inovativnosti nego studenti u ostalim odjelima koji se isto tako deklariraju kao inovatori.

Druga kategorija inovativnosti je kategorija ranih usvojitelja. S obzirom na to da je distribucija rezultata za rane usvojitelje SI normalna, ANOVA testom usporedili smo rezultate s obzirom na odjel. Rezultati su prikazani u tablici 5.

Tablica 5.

Rezultati ANOVA testa upućuju na to da postoji značajna razlika između rezultata inovativnosti za rane usvojitelje s obzirom na njihove odjele [$F(4,122)=3.723$ $p=.007$]. Post-hoc usporedbama, koristeći se Tukey HSD testom, pokazuje se da je srednja vrijednost rezultata za Filologiju ($M=73.92$, $SD =1.78$) značajno različita od onih iz odjela Povijesti ($M= 71.09$, $SD = 2.63$). Ne postoji značajna razlika među ostalim skupinama. Ti rezultati ukazuju na to da su rezultati ranih usvojitelja iz odjela Filologije bolji u SI od ranih usvojitelja u odjelu Povijesti.

Rana većina pokriva 39,5% budućih nastavnika u ovome istraživanju. Kako bi se istražio učinak odjela na rezultate njihove inovativnosti, primijenili smo jednosmjeran ANOVA test. Rezultati su prikazani u tablici 6.

Tablica 6.

Rezultati su ukazali na to da postoji statistički značajna razlika na razini $p < .05$ kod rezultata SI za svih pet odjela: $F(4, 161) = 48.796$, $p=.001$. Post-hoc usporedbe, koristeći se Tukey HSD testom, ukazale su na to da se srednje vrijednosti za rezultate Kemije (M=66.87, SD =1.63) značajno razlikuju od Povijesti (M= 62.10, SD = 1.63) i Turske filologije (M=62.00, SD=2.43). Štoviše, srednje vrijednosti za rezultate Matematike (M=66.63, SD=1.96) i za CEIT (M=65.90, SD=2.38) značajno su različite od rezultata iz odjela Povijesti i Filologije. Ne postoji značajna razlika između rane većine u odjelu Kemije, Matematike i CEIT. Ti su rezultati ukazali na to da rana većina u odjelima Kemije, Matematike i CEIT ima viši SI nego što ima rana većina u odjelima Povijesti i Filologije.

Kasna većina bila je četvrta kategorija inovativnosti kojoj pripada 21% ispitanika. Jednosmjernim ANOVA testom između skupina istražen je utjecaj odjela na razinu inovativnosti za ranu većinu, kao što mjeri SI. Rezultati su prikazani u tablici 7.

Tablica 7.

Rezultati testa ukazuju na to da postoji značajna razlika između rezultata inovativnosti kod kasne većine s obzirom na njihov odjel [$F(4,83)=18.838$ $p=.001$]. Post-hoc usporedbe korištenjem Tukey HSD testa pokazuju da je srednja vrijednost rezultata za Kemiju (M=56.85, SD=0.55), Filologiju (M=55.96, SD=1.17) i CEIT (M=55.67, SD=2.18) značajno viša od rezultata kasne većine za odjel Povijesti (M=53.60, SD =1.35) i Matematike (M=52.90, SD=2.34). Značajne razlike među rezultatima između odjela Kemije, Filologije i CEIT nije bilo. Rezultati također upućuju na to da kasna većina iz odjela Kemije ima najveće bodove za inovativnost od svih ostalih skupina.

Posljednja kategorija inovativnosti koju predlaže Rogers odnosi se na kategoriju lijenih. Od ispitanika 2.1% pripada skupini lijenih. Kako bi se istražio učinak odjela na rezultate inovativnosti kod lijenih koristio se neparametrijski test analize varijance. Rezultati su prikazani u tablici 8.

Tablica 8.

Kruskal-Wallis test otkrio je neznačajnu razliku u rezultatima inovativnosti kod lijenih u pet odjela (Matematika, n=3; Filologija, n=2; Kemija, n=2; Povijest, n=2), χ^2 (3, n=9) = 2.680, p=.444. Lijeni u odjelu Kemije imaju neznačajno viši rezultat srednje vrijednosti (Mdn=46) od ostale tri skupine koje su imale srednje vrijednosti 45,5 i 44. Nitko od studenata iz CEIT odjela nije se izjasnio kao lijen.

Općenito, rezultati upućuju na to da budući nastavnici pripadaju kategorijama rane većine ili ranih usvojitelja. Muški ispitanici inovativniji su od ženskih ispitanica. Nadalje, ispitanici iz CEIT odjela inovativniji su od ispitanika iz ostalih odjela.

Rasprava i zaključak

U ovom su istraživanju određene kategorije usvojitelja kod budućih nastavnika u Turskoj, kao i utjecaj spola i područja studija na razinu osobne inovativnosti. Anketni upitnik sa skalom osobne inovativnosti proveden je u pet različitih odjela za obrazovanje nastavnika.

Jedan od ciljeva ovoga istraživanja bio je odrediti razine inovativnosti kod ispitanika, te usporediti srednje vrijednosti njihovih rezultata u SI s obzirom na spol i područje studija. Rezultati upućuju na to da je dvije trećine budućih nastavnika vrlo ili umjereno inovativno. Nezavisnim t-testom ustanovljeno je da su muški ispitanici više inovativni od ženskih ispitanika. Taj podatak u potpunosti odgovara nalazima Shima i Kotsiopoulosa (1994). Oni su u svojemu istraživanju usvajanja tehnološke inovacije u području prodaje odjeće utvrdili da spol ispitanika ima značajnu ulogu na usvajanje inovacija. Otkrili su da su muški ispitanici inovativniji od ženskih ispitanika. Taj je nalaz također u skladu s nalazima Kavaka i Demirsoya (2009), kao i Kilicera (2011). Kavak i Demirsoy (2009) istražili su demografske karakteristike i karakteristike životnoga stila usvojitelja online bankovnih usluga u Turskoj. Ustanovili su da su muški ispitanici pokazali veću tendenciju prihvaćanja inovacija od ženskih ispitanika. Kilicer (2011) je istraživanje proveo na budućim nastavnicima i otkrio da su budući nastavnici – muškarci inovativniji od ženskih. S druge strane taj nalaz ne podržava rezultate istraživanja koje je provela Less (2003). Ona je istraživala nastavno osoblje kod usvajanja računalne tehnologije u svrhu poučavanja i nije zabilježila značajne razlike između kategorija usvojitelja i spola.

Ovo je istraživanje otkrilo da su odjeli iz kojih ispitanici dolaze razlog za statistički značajnu razliku u njihovim rezultatima inovativnosti. Rezultati ukazuju na to da su ispitanici iz CEIT odjela i odjela Kemije inovativniji od ispitanika iz ostalih odjela. Kao što u svojim istraživanjima navode Greenhalgh i dr. (2008), Loogma i dr. (2012), Mumcu, (2004), Soffer i dr. (2010), Hug i Reese (2006), pojedinci iz ovih odjela otvoreni su prema novim tehnologijama, uglavnom prihvaćaju promjene i ne plaše se upustiti u rizik. Ti rezultati pobijaju rezultate do kojih je došao Zakaria (2001). On je proučavao faktore povezane s implementacijom ITa u kurikul te je naišao na značajne razlike između odjela ispitanika i korištenja ITa općenito.

Rezultati su otkrili da velika većina ispitanika pripada kategoriji rane većine. Lundblad (2003) tvrdi da je rana većina odlučna kada je riječ o inovaciji. Prema Yi i dr. (2006) oni čekaju i promatraju reakcije ljudi na inovacije. Taj rezultat dakle upućuje na to da su budući nastavnici pažljiviji kod odluka o usvajanju, da se nevoljko upuštaju u rizike te zahtijevaju dobro utvrđene preporuke. Rezultati također upućuju na to da većina ženskih ispitanika pripada skupini rane većine, a da muški ispitanici pripadaju skupini ranih usvojitelja. Lundblad (2003) izvješćuje da su rani usvojitelji otvoreni za promjene, kao i da su uključeni i uvažavani od društva. Imaju tendenciju kupiti ili probati inovacije prije većine njihovih kolega. Taj se rezultat slaže s rezultatima Kilicera (2011), Timucina (2009) i Şahina i Thompsona (2006) koji su istraživali tendencije

budućih nastavnika u Turskoj prema inovacijama. Velika većina muških ispitanika u tim istraživanjima pripada kategoriji ranih usvojitelja. Taj pronalazak pobija Rogersovu distribuciju. Rogers (1995) tvrdi da je 34% pojedinaca (što je jedan od većih opsega u distribuciji) kategorija ranih usvojitelja. Međutim, omjeri inovatora i lijenih u ovome istraživanju ukazali su na razliku u odnosu na Rogersovu distribuciju. Rogersova je distribucija zvonastog oblika, a distribucija u ovome istraživanju pozitivno je zakrivljena.

Kategorije usvojitelja također su analizirane s obzirom na područje studija ispitanika. Rezultati su pokazali da je većina ispitanika iz CEIT odjela iz skupine ranih usvojitelja. To nije u skladu s rezultatima do kojih je došao Kilicer (2011). On je istražio kategorije usvajanja studenata CEITa i došao do zaključka da je većina studenata zapravo u skupini rane većine. Međutim, Greenhalgh i dr. (2008), Loogma i dr. (2012), Mumcu, (2004) i Soffer i dr. (2010) tvrde da su pojedinci u odjelima vezanima uz računala usredotočeni na tehnologiju, otvoreni prema promjenama i da prihvaćaju rizik. S druge strane, usporedni je test otkrio da rani usvojitelji na odjelu Filologije imaju bolje rezultate na skali inovativnosti od ostalih ranih usvojitelja u drugim odjelima.

U ovome istraživanju većina ispitanika iz odjela Filologije, Povijesti, Kemije i Matematike pripadaju ranoj većini. Taj se pronalazak ne slaže s onim Huga i Reesa (2006) sa studentima iz odjela Znanosti. Oni tvrde da su studenti u odjelima za znanost skloni oprezu kada donose odluke o usvajanju od studenata društvenih znanosti, te traže potvrđene preporuke, dokaze i istraživanja o inovacijama na koje nailaze. Međutim, unakrsnim usporedbama rane većine saznali smo da rana većina u odjelu Kemije, Matematike i CEITa imaju znatno veće rezultate za inovativnost od rane većine u odjelima Povijesti i Filologije. To zapravo potvrđuje ideju kojom su se vodili Hug i Reese (2006). Iako je većina ispitanika odjela Filologije i Povijesti bila rane većine, jedna trećina njih bili su kasna većina. Greenhalgh i dr. (2008) tvrde da pojedinci u tim skupinama trebaju veliku pomoć kada je riječ o inovativnosti. Unakrsne usporedbe kasne većine s obzirom na odjel otkrile su da kasna većina iz odjela Kemije ima najviše rezultate za inovativnost u odnosu na ostale skupine. To ukazuje na činjenicu da su studenti na odjelu Kemije manje skeptični ili neskloni inovacijama od kasne većine u ostalim odjelima. Konačno, rezultati otkrivaju da se nitko od CEIT ispitanika nije deklarirao kao lijen. Usporedna analiza ukazala je na to da lijeni iz odjela Kemije imaju neznatno veće rezultate inovativnosti od ostale tri skupine. Kao što tvrde Soffer i dr. (2010) lijeni usvajaju inovaciju samo kada je to nužno. Prema tome, možemo tvrditi da su budući nastavnici kemije manje sumnjičavi u usvajanju inovacija od svojih kolega u drugim odjelima.

Zaključno, ovo istraživanje prikazuje kategorije usvojitelja i razinu inovativnosti budućih nastavnika. Rezultati ovoga istraživanja ukazuju na to da budući nastavnici, posebno iz nekih odjela, moraju promijeniti percepciju inovacije. Hall i Hord (1987) tvrde da implementacija inovacije zahtijeva od tri do pet godina kako bi se inovacija usvojila. Fullan (1990) podržava ideju da učinkovita promjena u ponašanju pojedinca

zahtijeva vrijeme. Kao što Rogers (2003) izvještava da odluka o novoj, osjetljivoj ideji ili tehnologiji nije nagli čin. Tvrdi da je to „proces kroz koji pojedinac prolazi od dobivanja prvobitnog saznanja o inovaciji, od formiranja stava prema inovaciji, do donošenja odluke o prihvaćanju ili odbijanju, implementacije nove ideje te, na kraju, potvrđivanja odluke" (str. 172). Stoga bi studenti trebali imati obuku o inovacijama i pouku o tome kako se koristiti inovacijama. Ali (2003) također tvrdi da bi obuka s tehnologijom trebala biti osigurana prije početka korištenja tehnologije. U Turskoj se ciljevi kolegija organiziraju prema načelima Bloomove taksonomije. Međutim, dokazi iz ovoga istraživanja ukazuju na to da bi Rogersov model donošenja odluke o inovaciji trebao biti razmotren za vrijeme planiranja ciljeva. Štoviše, nastavnik može studentu osigurati aktivan program podrške i savjetovanja za istraživanja o korištenju obrazovnih tehnologija, kako predlažu Anderson i Campbell (1998).

Ovo istraživanje ima nekoliko ograničenja. Prvo ograničenje je činjenica da su razine inovativnosti i profili budućih nastavnika određene samoprocjenom ispitanika. Prema tome, da bi se osiguralo bolje razumijevanje njihovih percepcija o inovaciji, potrebno je provesti longitudinalna istraživanja, kvalitativna istraživanja, opservacije itd. Štoviše, ovo istraživanje usredotočilo se samo na kategorije usvojitelja i razine inovativnosti budućih nastavnika. Stoga slijedi da je u budućnosti potrebno istražiti faktore koji sprečavaju pojedince da prihvaćaju inovacije. Rezultati ovoga istraživanja možda se neće moći prenijeti na same nastavnike. Daljnja istraživanja potrebna su kako bi se istražile kategorije usvajanja kod nastavnika i njihove razine inovativnosti.