
The Eurasia Proceedings of Educational & Social Sciences (EPESS), 2016

Volume 4, Pages 251-254

ICEMST 2016: International Conference on Education in Mathematics, Science & Technology

AN INVESTIGATION OF THE EFFECT OF FAMILY BACKGROUND VARIABLES ON INNOVATION PERCEPTIONS OF ENGINEER AND TEACHER CANDIDATES

Mehmet Ali Çorlu
Istanbul Commerce University

Emin Aydın
Marmara University

ABSTRACT: The aim of this study is to investigate the innovation perceptions of teacher candidates in the areas of mathematics, science and social sciences. The data collection tools are the Turkish versions of the Individual Innovativeness Scale (IIS) and Big5 Scale for personality characteristics. Multivariate linear regression is the main data analysis technique. Results indicate that 47% of the variation in the IIS is explained by the independent variables.

Keywords: Teacher education, innovativeness perception, personality characteristics

INTRODUCTION

Mathematics and science education carry a vital role in the development of the 21st century skills and positive attitudes towards innovation in the next generation. Developing innovation/entrepreneurship skills is important for the Turkey's vision for its integration to the technologically developed international community. Preservice training of future science and mathematics teachers is especially important since the highly qualified technology workforce is the outcome of high quality education at the pre-university level.

The industrial revolution started with using the water and steam power to mechanize the production. This was followed by the technological revolution initiated by the discovery of electricity that started at the post 1800s. Electronical age is the third phase in which is known for the automatization of production. Now the world is at the brink of the fourth industrial revolution which is different from its preceding developments in its speed, scope and approach (Schwab, 2015). The occurring change is at an exponential rate rather than being linear (ibid, 2015). To survive in this new world the keyword is innovation. Technological innovation and entrepreneurship are major forces in economic growth (Acs and Audretsch 2003; Audretsch and Keilbach, 2003; Rosenberg, 2004)

Innovation and creativity are among the major components along with critical thinking, problem solving, creativity and collaboration in the 21st century skills framework developed by the US based P21 partnership NGO (Fadel, 2008). These skills are pre-requisites in many different industries, and teacher training programs are crucial in the education of the teacher force that will be responsible for education the youth (Çorlu & Corlu, 2012; Erdogan, Corlu, & Capraro, 2013; Çorlu & Aydın, 2016).

It is stated in the Strategy Document published by the Scientific and Technological Research Council of Turkey 2003-2023 (TÜBİTAK, 2004) that the Turkey aims to develop technologically competent individuals who can

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- Selection and peer-review under responsibility of the Organizing Committee of the conference

*Corresponding author: Mehmet Ali Çorlu-icemstoffice@gmail.com

develop new technologies. On the other hand, it is indicated in the World Economic Forum's (2015) 144-nation Global Competitiveness Index, Turkey ranked between 55 and 131 in terms of the index's educational components. It is unfortunate that Turkey has lagged well behind even its own standards for teacher education development, which were established two decades earlier by the National Education Development Project.

Studies on attitudes and performance related to innovation are generally available in the areas of business and engineering education (e.g. Wang, & Lin, 2012; Stajkovic & Luthans, 1998) but there are less work in the area of education (e.g. Mathisen & Bronnick, 2009). There is evidence that innovation perception is related to personality variables (James & Mazerolle, 2002; Sung & Choi, 2009; Aydin & Çorlu, 2016). There is, however, less concern on other variables that can shape personality as possible predictors of innovation perception and/or performance. Family attitude towards the student is one such variable for which the distinction is generally made between protective, oppressive or democratic attitudes. Geographical background and family type are other two variables of such kind that might have an influence of some degree.

Aim of the Study

The aim of the present study is to investigate the influence of some domestic factors other than personality characteristic on innovation perceptions of student teachers (mathematics, science and social science). and engineering candidates. These factors are family attitude, family type and geographical background.

METHOD

A quantitative research design was selected for this research study. The study collects data from a state university in Istanbul. The sample comprises of 189 second year students in the science teaching (n=69), mathematics teaching (n=62) and social sciences teaching (n=58) departments. These departments are in the first three in the rankings of the university entrance examination so these students are among the country's very successful teacher candidates. The data collection tools are the Turkish versions of the Individual Innovativeness Scale (IIS) (Kılıçer & Odaşası, 2010) and the domestic factors inventory which is comprised of three fully structured questions: (1) How do you describe your family attitude towards yourself?, (2) What type of location were you raised in? and (3) What is your family type? (Table 1).

Table 1. Options in the domestic factors inventory

Family Attitude	Geographical Background	Family Type
Protective	Village-Small town	Big family
Democratic	Big city	Nuclear family
Oppressive	City	Other
Inconsistent behavior		

For the current study, survey design was used. The three factor ANOVA is the main technique for data analysis. The influence of the three independent variables on a single outcome variable (dependent) was investigated by a single statistical model (Creswell, 2003). In this study, we investigated the influence on the IIS (the single dependent variable) of the three independent variables listed above (Table 1). The calculated reliability score for the IIS is 0.77 (Aydın & Çorlu, 2016).

FINDINGS

We adopted a three factor ANOVA model to study the influence of the three independent variables on the innovation perception variable. We get a lot more information from the three-way design than using a three separate one-way ANOVAs. We also eliminated the danger of the increase of making a Type I error. For example, for a variable with n levels (with n > 2), conducting n T-tests instead of a one one-way ANOVA, increases the probability of making a Type I error as a result of doing an experiment with many groups and analyzing the data with n factorial comparisons. In the case of using a three-way ANOVA, this danger is much greater because this time number of groups and number of comparisons extensively higher (Pagano, p.385). Prior analyses indicates that the three assumptions for using a three-way ANOVA. Independence of observations, equality of variances and normal distribution of the scores of the independent variables

(Büyüköztürk, 2011, p.55) were satisfied. Effect size values were also calculated using the eta-squared (η^2) value calculated by the ratio of SS_{between} to SS_{total} ($=SSB/SST$). F values and effect sizes in the three way model we used were summarized in Table 2.

Table 2. Tests of Between-Subjects Effects (Dependent Variable: Innovativeness Perception)

Source	Sum of Squares	df	Mean Square	F	Partial η^2
Corrected Model	1878.67(a)	19	98.88	1.49	0.11
Intercept	156799.09	1	156799.09	2355.34 (*)	0.91
Family attitude	537.32	3	179.11	2.69 (*)	0.03
Family Type	66.98	2	33.49	0.50	0.00
Geographical Background	220.59	2	110.30	1.66	0.01
Family Attitude * Family Type	63.00	3	21.00	0.32	0.00
Family Attitude * Geographical Background	476.98	6	79.50	1.19	0.03
Family Type * Geographical Background	270.75	2	135.38	2.03	0.02
Family Attitude * Family Type * Geographical Background	17.86	1	17.86	0.27	0.00
Error	14978.64	225	66.57		
Total	1295592.00	245			
Corrected Total	16857.31	244			

Results of the analysis indicated that the only statistically significant effect on innovativeness perception comes from of family attitude variable ($F=2.69$) The eta-squared value. ($\eta^2 = 0.03$) suggests a small effect of the independent variable.

Afterwards, we run the Sheffe test to make post-hoc comparisons to understand from which level(s) of the family attitude variable the significant F value resulted. The results indicated that (Table 3) there is a statistically significant difference between the innovativeness scores of the protective and democratic families in favor of the democratic families ($M2-M1=4.76$, $p<0.01$).

Table 3. Sheffe test: Dependent Variable: Innovativeness

(I) Family attitude	(J) Family attitude	Mean Difference (I-J)	Std. Error	Sig.
Protective	Democratic	-4.76(*)	1.39	0.01
	Oppressive	0.26	1.98	1.00
	Inconsistent	-2.02	2.03	0.80

*. The mean difference is significant at the 0.05 level.

DISCUSSION and CONCLUSIONS

Aydın & Çorlu (2016) studied the relationship of a set of personality characteristics to innovation perceptions and reached a regression equation that explained 47% of variation in the dependent variable. This study investigated the influence of three domestic variables attitude, geographical background and the type of the family in which the student was raised that might, in some way, be related to innovativeness perception using not a correlational model but ANOVA statistics. Nevertheless, the study did not yield significant result. The only factor that has an influence emerged as the family attitude. Findings indicated that children with parents that have more democratic attitudes towards themselves tended to have statistically significantly more positive attitudes innovativeness than those having oppressive attitudes in their childhood years. More research is needed to find a model to more fully explain the factors that is responsible for high innovativeness perception.

REFERENCES

- Aydın, E & Çorlu, M.A. (2016). An investigation of the personality factors affecting innovation perceptions of mathematics, science and social sciences teacher candidates. International Conference on Education in Mathematics, Science & Technology (ICEMST). Bodrum. Turkey.
- Çorlu, M. A., & Corlu, M. S. (2012). Scientific inquiry based professional development models in teacher education. *Educational Sciences: Theory & Practice*, 12(1), 514–521
- Creswell, J. W. (2003). *Research design: Qualitative, quantitative, and mixed methods approaches* (2nd ed.). Thousand Oaks, CA: Sage
- Büyüköztürk, Ş. (2011) *Sosyal Bilimler İçin Veri Analizi El Kitabı*. Pagem Akademi (14. baskı).
- Erdogan, N., Corlu, M. S., & Capraro, R. M. (2013). Defining innovation literacy: Do robotics programs help students develop innovation literacy skills? *International Online Journal of Educational Sciences*, 5(1), 1-9.
- Fadel. C. (2008). 21st Century Skills: How can you prepare students for the new Global Economy? Downloaded at: <http://www.oecd.org/site/educeri21st/40756908.pdf>. Downloaded in 10.04.2016.
- Kılıçer, K. ve Odabaşı, H.F. (2010). Bireysel yenilikçilik ölçeği (BYÖ): Türkçeye uyarlama, geçerlik ve güvenilirlik çalışması, *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 38, 150-164.
- Mathisen, G.E. & Bronnack, K.S. (2009). Creative self-efficacy: An intervention study. *International Journal of Educational Research* 48, 21–29
- Rosenberg, N. (2004). INNOVATION AND ECONOMIC GROWTH. OECD. Downloaded at: <https://www.oecd.org/cfe/tourism/34267902.pdf> . Downloaded in 10.04.2016.
- Schwab, K. (2015). The Fourth Industrial Revolution: What It Means and How to Respond. *Foreign Affairs*. December 12. Downloaded at: <https://www.foreignaffairs.com/articles/2015-12-12/fourth-industrial-revolution>. Downloaded in 10.04.2016.
- Sung, S.Y and Choi, J.N. (2009). Do Big Five personality factors affect individual creativity? The moderating role of extrinsic motivation. *Social Behavior and Personality*, 37(7), 941-956.
- Stajkovic, A.D. & Luthans, F., (1998). Self-efficacy and work-related performance: a meta-analysis. *Psychological Bulletin* 124 (2), 240–261.
- Türkiye Bilimsel ve Teknik Araştırma Kurumu (TÜBİTAK) (2004). Ulusal bilim ve teknoloji politikaları: 2003-2023 Strateji belgesi. [Downloaded at: http://www.tubitak.gov.tr/tubitak_content_files//vizyon2023/Vizyon2023_Strateji_Belgesi.pdf], Accessed: 25 Nisan 2016
- Wang, R. & Lin, C., (2012). Understanding innovation performance and its antecedents: A socio-cognitive model. *J. Eng. Technol. Manage.* 29 (2012) 210–225