iojes
www.iojes.net

International Online Journal of Educational Sciences

ISSN: 1309-2707

Investigation of Faculty of Education Students' Attitudes towards Scientific Research

Research Article

Mehmet OZCAN[1]

[1]*Nevşehir Haci Bektas Veli University, Faculty of Education, Department of Educational Science, Nevsehir, Turkey,* ORCID: 0000-02-5451-0773

To cite this article: Ozcan, M. (2019). Investigation of Faculty of Education Students' Attitudes towards Scientific Research, *International Online Journal of Educational Sciences*, 11 (3),1.

ARTICLE INFO

Article History:
Received 20.02.2019

Available online
29.05.2019

ABSTRACT

This study aims to determine the level of attitudes of faculty of education students' attitudes towards scientific research and investigate whether the determined level is significantly predicted by 10 independent variables in the research. This is a quantitative research designed as survey model. Study group consists of 420 faculty of education students studying at Nevşehir Hacı Bektaş Veli University in 2017- 2018 academic year. The data of this research is collected by 'The scale of attitude towards scientific research'. In this study Ordinal Logistic Regression analysis and descriptive statistics are used. According to research results, attitudes of faculty of education students' towards scientific research mean is 3.58 out of 5. Besides, female faculty of education students' attitudes towards scientific research is 0.43 higher than male students. The attitude of the group believing in the accuracy of scientific research result is 0.52 higher than the group not believing. The attitude towards scientific research of the group having a low level of belief that scientific research develops country's education is 3.45 higher than the group having a high level of belief that scientific research develops country's education. The attitude towards scientific research of the group paying attention while to filling scales is 0.30 higher than the group not paying attention. The attitude towards scientific research of the group believing that scientific results are taken seriously by authorities is 1.4 higher than the group not believing.

Keywords:[1]
Faculty of education students, Scientific research, Scientific thinking, Scientific thinking skill

Introduction

Humankind is differentiated among other creatures since he is a creature who is able to think. Therefore the human has become superior to the other creatures with his thinking abilities and his productivity in fields of science, art, music and literature that are the outcomes of his thinking ability (Dunbar and Fugelsang, 2005). Thanks to his distinctive features, the human makes life more practical, makes cause and effect relationships, analyzes and synthesizes them, deals with problems from a different point of view and predicts the results

[1] Corresponding author's address: Nevşehir Hacı Bektaş Veli Üniversitesi
Telephone:
e-mail: mehmetozcan@nevsehir.edu.tr
DOI: https://doi.org/10.15345/iojes.2019.03.008

beforehand. In addition, he interprets the events in the nature in terms of philosophy, creates sociologically viable societies, makes the law the foundation of the social life, adopts education as the pioneer of development and considers science and technology as the essentials of development. In the framework of these definitions, scientific thinking can be defined as a systematic way of thinking in which the individual looks at the nature from a different point of view, is able to think about solving a problem, investigates the problem based on theories, reasons on the problem, determines the method for solution, uses this method and reaches a conclusion and in which these conclusions test to what extent the problem is solved.

When scientific thinking definitions are examined, according to Grinnell, Dalley, Shepherd and Reisch (2018), the scientific thinking skill is thinking as being a scientist, planning and being able to express his opinions clearly in every field. Moreover, these behaviors are the skills that have been tried and accepted via scientific researches. According to Kuhn (2002), scientific thinking is not something individuals have but the things they do. What is more, it can also be stated that having scientific thinking skill provides a number of privileges. According to Paul and Elder (2006) these privileges mean the researcher to manage himself, to be organized, to monitor and edit himself. Scientific skills provide the development of not only talents and tendencies but also effective communication and problem solving skills.

Pre-service teachers are expected to have scientific thinking skills and to increase the quality of the education by reflecting this to their lessons. The fact that the students who have enough experience to be ready for the school are more capable in terms of scientific thinking indicates the relationship between scientific thinking and education (Polat, 2006). For this reason, it is a very important skill that pre-service teachers have scientific thinking skills (Kaçan, 2015). Finally, the scientific thinking skill which is intended to be widespread in the whole society and designed especially with the education system is among the most basic professional skills that teachers should have. Teachers may gain this skill when they are just prospective teachers at faculties of education because the most common method of developing scientific thinking skill is to take formal education and universities provide students with many opportunities to think scientifically (Soyyılmaz, Griffin, Martín, Kucharský, Peycheva, Vaupotič and Edelsbrunner, 2017). In this respect, the ability of pre-service teachers to think scientifically is important in terms of educating individuals who can think scientifically.

For this reason, this research aims to investigate levels of faculty of education students' attitudes towards scientific research and variables that predict this level. The questions below were investigated for this purpose.

1. What is the level of faculty of education students' attitudes towards scientific research?
2. Does the level of faculty of education students' attitudes towards scientific research show a significant difference according to the gender variable and the questions below?

- ✓ Do you believe in the accuracy of scientific research results?
- ✓ What is your level of belief towards our country's educational system's development by scientific researches on education?
- ✓ What is your level of following scientific research?
- ✓ Do you pay necessary attention while filling a scale?
- ✓ Do you think that scientific research results on education are taken seriously by authorities?
- ✓ Have you taken a scientific research course?
- ✓ Can you come up with new ideas for problems?
- ✓ Do you think that you are open to criticism?
- ✓ Do you want to be an academician?

Method

Research model, universe of research, data collection, collection tool and analysis are presented in this section.

Research model

This study is a quantitative research formed as a correlational survey model. Correlational survey models aim to investigate the relations of two or more existing situation with an objective approach (Karasar, 2009).

Study Group

The study group consists of 420 faculty of education students studying at Nevşehir Hacı Bektaş Veli University in 2017-2018 academic year. At Table 1 below, the information of the research group attending the study and serving the aim of the study is presented.

Table 1. Descriptive information of dependent and independent variables

Dependent Variable	**Categories**	n	%
Attitudes towards scientific research	Low	167	39.8
	Moderate	176	41.9
	High	77	18.3
Independent Variable	**Categories**	f	%
Gender	Female	327	77.9
	Male	93	22.1
Do you believe in the accuracy of scientific research results?	Yes	345	82.1
	No	75	17.9
What is your level of belief towards our country's educational system's development by scientific researches on education?	Low	75	17.9
	Moderate	226	53.8
	High	119	28.3
What is your level of following scientific research?	Low	69	16.4
	Moderate	246	58.6
	High	105	25.0
Do you pay necessary attention while filling a scale?	Yes	359	85.5
	No	61	14.5
Do you think that scientific research results on education are taken seriously by authorities?	Yes	180	42.9
	No	240	57.1
Have you taken a scientific research method course?	Yes	236	56.2
	No	184	43.8
Can you come up with new ideas for problems?	Yes	377	89.8
	No	43	10.2
Do you think that you are open to criticism?	Yes	362	86.2
	No	58	13.8
Do you think of being an academician?	Yes	238	56.7
	No	182	43.3

According to Table 1, it is found out that pre - service teachers' attitudes towards scientific research are mostly moderate (*n = 176, 41.9%)* and the majority of the research group is composed of women (*n = 327, 77.9%*). The majority of the pre-service teachers are seen to believe in the accuracy of scientific research results *(n=345, 82.1%)* and their level of belief towards our country's educational system's development by scientific researches on education is seen to be moderate *(n=226, 53.8%)*. It is observed that the pre-service teachers' level of following scientific research is moderate *(n=246, 58.6%)*, that they pay necessary attention while filling a

scale *(n=359, 85.5%)* and that they do not believe scientific research results on education are taken seriously by authorities *(n=240, 57.1%)*. They are also seen to have taken a scientific research method course *(f=236, 56.2%)*, to be able to come up the problems with new ideas *(n=377, 89.8%)*, to be open to criticism *(n=362, 86.2%)* and to think of being an academician *(n=238, 56.7%)*.

Data Collection

The "Scale of attitudes towards scientific research" was used in the study. The independent variables are listed in scale form and will be investigated for the purpose of the research. The scale forms are collected by researchers in two weeks time.

Data Collection Tool

In this research, the "Scale of attitudes towards scientific research" was used developed by Korkmaz, Şahin and Yeşil (2011). The scale is 5-point-likert-type. It has four dimensions and 30 items.

When the findings related to the validity and reliability of the scale were analyzed, (KMO) value regarding the structural validity was found as .88 and Bartlett's results were found as 6079.864 ($p<.000$). These results indicate that factor analysis hypotheses are provided and 55.35% of total variance of the four-factor scale is explained. It was also concluded that Cronbach alpha coefficient value was (α =.87). These results explain that this scale is valid and reliable.

Data Analysis

Scale forms filled without being paid necessary attention are taken out of analysis. As a result of calculating Z point, since 12 data which are out of -3 and +3 points form an extreme value, they were not included in analysis and 487 scale forms were analyzed.

The data analyse type serving to the purpose of the study is ordinal logistic regression and according to ordinal logistic regression, in case of having missing data in any of ten independent variables taking place in the research, that scale form was not involved in the analyse process. Therefore, due to the independent variables, 67 missing data were encountered within 487 scale forms and these data were not involved in the analyse process. As a result, 420 valid forms scale forms were put in data analysis.

Data of the research was analysed by statistical program and significant level was taken .05 for this research. For data analysis, descriptive statistics, frequency analyses and ordinal logistic regression analysis of students participating to research were used. Wald test was used in order to investigate each category's independent variables distribution. By Wald test parameter significances were tested. By examining Pseudo R^2 values, Goodness of fit was tested. These tests are Cox and Snell, Nagelkerke and McFadden tests. These tests explain of how many of dependent variables can predict independent variables.

Forming an Ordinal Logistic Regression Model

In the ordinal logistic regression analysis model stages applied by Eranıl, Özcan and Özek (2019) were followed and the dependent variable should be divided into three or more categories. These categories should be gradually sorted from low to high. Dependent variables were divided into categories by two-stage clustering analysis. When there is no preliminary information regarding the number of the clusters and that can include categorical and continuous variables in process, two-stage clustering analysis is used. In this analysis technique, the optimum number of clusters is determined by the method. To determine the optimum number of clusters automatically, BIC (Schwarz's Bayesian Information Criterion) or AIC (Akaike's Information Criterion) information criteria were used (Schieopu, 2010: 66-75; as cited in Giray, 2016). BIC divided dependent variables into categories in this study. In Figure 1 below, results of BIC technique were submitted.

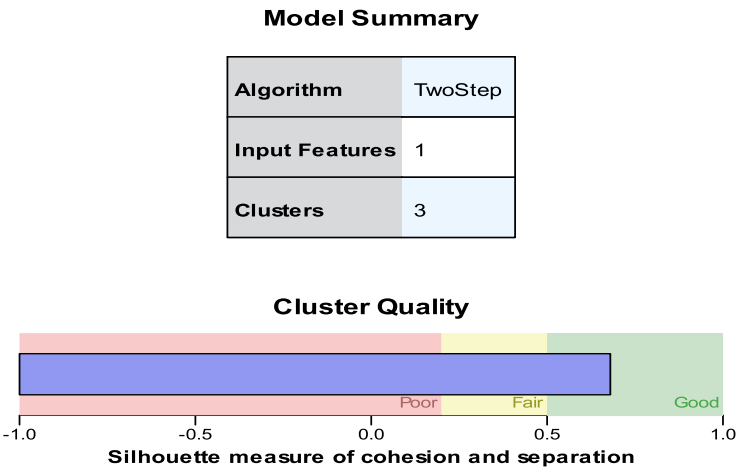

Figure 1: BIC (Schwarz's Bayesian Information Criterion) results

According to figure 1, three categories were formed by dividing dependent variable of the study. These categories are low, moderate and high. 2 stage clustering analyses were submitted. BIC analysis, 86 of the pre-service teachers (17.7%) have high level attitudes towards scientific research. 197 of them (40.5%) have a moderate and 204 of them (41.9%) have a low level of attitudes towards scientific research.

In ordinal logistic regression analysis, a suitable link function should be selected among five different link functions which are logit, complementary log-log, negatively log-log, probit and cauchit. Logit, probit and complementary log-log functions are extensively used (Long, 1997). Categories' cumulative likelihood values did not suddenly differ. Logit function is advised to be applied in similar cases but at information table regarding fit of the model that came to exist in the analysis and -2 log-likelihood (-2LL) value for the model formed without independent variables and the model formed when independent variables were included. Significant difference was found between the model formed with independent variables and the starting model formed without independent variables (X^2=629.626-536.615=93.010, p=.000). With regard to analyse result, there is a relation between dependent and independent variables

In order to test the fit of the model formed (logit), chi-square model fit test was submitted in Table 2 below.

Table 2. Chi-square model Goodness of Fit Test

	X^2	s.d	p
Pearson	405.304	438	867
Deviance	404.262	438	.874

H_0=Model is not suitable as of the data.

H_1=Model is suitable as of the data.

According to Table 2, ordinal logistic regression model related with the logit function was found convenient (p=0.867>.05). H_1 hypothesis explaining the model is in a harmony with the data accepted. Rest of the processes were resumed via logit function.

Categories formed by dividing the dependent variable should ensure 'parallel curves' hypothesis which is one of the ordinal logistic regression hypotheses. Parallel curves should be seen in straight lines which are divided into categories. In other words, in each category the parameters need to be even to each other. Chi-square test results implemented to investigate parallelism hypothesis were submitted in Table 3 below.

Table 3. Parallel Curves

Model	-2 LL	X^2	df	p
Null Hypothesis	536.615	17.165	12	.143
General	519.450			

**Link Function: Logit*

H_0= Parameter estimates pass through different cut of the points.
H_1= Parameter estimates pass through the same cut of the points.

According to Table 3, the dependent variable of three categories' regression coefficients are same (low, moderate, high) and parallel curves hypothesis is ensured and p probability is .143. As the value is p>.05, H_0 hypothesis is approved.

As hypotheses related to dependent variable were ensured, hypotheses related to the independent variables were needed to be ensured. In this regard, variables not serving to the aim of the research should be taken out of analyse. Inappropriate variables make the model complicated and difficult to comment the model. As data variables have an effect on the dependent variable, it can also cause a misconstruction (Baydemir, 2014). Additively, the amount of participants in the independent variables was considered (Table 1). The quantity of participants in each independent variable should be minimum 20 and minimum 60 in total (Çokluk, 2010).

The tolerance and the variance inflation factor (VIF) values were investigated to determine if there is a problem of multicollinearity among the predictor variables. VIF value of the research under 10 and that tolerance value over 0.2 indicate that there is not a problem of multicollinearity (Field, 2009).

When Tolerance and VIF values are examined, it is seen that Tolerance value is over .02 and that VIF value is under 10. According to this result, it is observed that the problem of multicollinearity does not exist. Necessary hypotheses for ordinal logistic regression model were provided for this research

Findings

The level of attitudes of faculty of education students towards the scientific research and the findings obtained as a result of forming the model are presented in this section.

The classroom management competence level of faculty of education students is presented in Table 4 below.

Tablo 4. Faculty of education students' attitude level towards scientific research

	N	$\bar{X}$	Med	Mod	K_y	B_S	Ss
Attitude towards scientific research		3.58	107.07	93.00	-.702	.253	15.69

*67 missing data- scale forms that ordinal logistic regression were taken out of research and the analysis was performed with 487 participant data.

According to Table 4, students' attitude towards scientific research level of 487 students of faculty of education is 3.58 out of 5.

The independent variables of the research explain 19% of the dependent variable according to Cox and Snell, 22% according to Nagelkerke and 10% according to McFadden. In other words, independent variables highly predict dependent variable. Table 5 below presents the ordinal logistic regression analysis that indicates whether the average score of attitude towards scientific research level of faculty of education students is predicted. In addition, based on the Wald statistical results, an odd ratio is obtained by taking of the Wald

statistics in order to interpret the model. In the process of taking "e exponent" is stable and it is equal to 2.718 (Çokluk, 2010).

Table 5. Investigation of significances of the model's parameters

	Variables	**Estimations**	**Std.Error**	**Wald**	**.d**	**p**	**e$^{\beta}$**
	Dependent Variable						
Threshold	*Scientific Research attitude (1)*	-3.409	.634	28.911	1	.000	-
	Scientific Research attitude (2)	-1.152	.617	3.483	1	.062	-
Location	**Independent Variables**						
Gender(1)		-.839	.246	11.601	1	**.001**	**0.43**
Gender (2)		0[a]	.	.	0	.	-
Accuracy of scientific research results (1)		-.642	.275	5.446	1	**.020**	**0.52**
Accuracy of scientific reseach results (2)		0[a]	.	.	0	.	-
Development of education system by science (1)		1.242	.308	16.265	1	**.000**	**3.45**
Development of education system by science (2)		1.070	.232	21.300	1	**.000**	**2.91**
Development of education system by science (3)		0[a]	.	.	0	.	-
Paying attention when filling a scale (1)		-1.261	.310	16.519	1	**.000**	**0.30**
Paying attention when filling a scale (2)		0[a]	.	.	0	.	-
Authority taking scientific researches seriously (1)		.409	.202	4.092	1	**.043**	**1.4**
Authority taking scientific researches seriously (2)		0[a]	.	.	0	.	-
Scientific research method course (1)		.205	.196	1.086	1	.297	**-**
Scientific research method course (2)		0[a]	.	.	0	.	-
Coming up problems with new ideas(1)		-.578	.346	2.790	1	.095	**-**
Coming up problems with new ideas (2)		0[a]	.	.	0	.	-
Level of following scientific researches (1)		.627	.322	3.787	1	.052	-
Level of following scientific researches (2)		.452	.233	3.756	1	.053	-
Level of following scientific researches (3)		0[a]	.	.	0	.	-
Being open to criticism(1)		-.357	.293	1.487	1	.223	-
Being open to criticism (2)		0[a]	.	.	0	.	-
Thinking of being an academician (1)		-.057	.200	.081	1	.775	-
Thinking of being an academician (2)		0[a]	.	.	0	.	-

**Linking Function: Logit*

In order to interpret Table 5, some variables and the meanings they signify need to be explained. In this context, six independent variables and their meanings that take place in the table are presented below.

- Gender (1=female, 2=male)
- Do you believe in the accuracy of scientific research results? (1=Yes, 2=No)
- What is your level of belief towards our country's educational system's development by scientific researches on education? (1=low, 2=moderate, 3=high)
- What is your level of following scientific research? (1=low, 2=moderate, 3=high)
- Do you pay necessary attention while filling a scale? (1=Yes, 2=No)
- Do you think that scientific research results on education are taken seriously by authorities? (1=Yes, 2=No)
- Have you taken a scientific research course? (1=Yes, 2=No)
- Can you come up with new ideas for problems? (1=Yes, 2=No)
- Do you think that you are open to criticism (1=Yes, 2=No)
- Do you think of being an academician? (1=Yes, 2=No)

To explain Table 5, significance value and reference category should be considered. According to Table 5, six values are significant. Bold values refer to this explanation in the table. In the 'independent variables' part, reference categories were written in italics. While interpreting the odd ratio, that the odd value is over 1

is related to the inflation rate coming out at the end; that the odd value is below 1 is related to the rate of decrease coming out at the end (Field, 2009).

When significant values are interpreted according to odd ratio (**e^{β}**) female faculty of education students' attitudes towards scientific research is 0.43 higher than male students. The attitude of the group believing in the accuracy of scientific research result is 0.52 higher than the group not believing. The attitude towards scientific research of the group having a low level of belief that scientific research develops country's education is 3.45 higher than the group having a high level of belief that scientific research develops country's education. The attitude towards scientific research of the group paying attention ~~to~~ while filling scales is 0.30 higher than the group not paying attention. The attitude towards scientific research of the group believing that scientific results are taken seriously by authorities is 1.4 higher than the group not believing.

Results, Discussion and Suggestions

According to the result of the research, the attitudes of faculty of education students were found to be 3.58 out of 5. This result is in the 'I agree' range of the scale. In other words, it can be said that the attitudes of faculty of education students towards scientific research are in a good level however it needs to be developed. According to Semerci (1999), the most important component of educational institutions is the teacher and the future roles and the current roles of the teachers will be quite different from each other. Hence, one of these tasks and responsibilities will be having the ability to think and developing thinking.

If the faculty of education students loses his / her ability to think scientifically in the process, the importance he / she attaches to it may also decrease. In fact, according to Sezer (2016), making students gain scientific thinking skills is not included among the task priorities of school principals. In order for this case to be solved in faculties of education, Taşdere, Kır and Yiğit (2014) emphasize that teaching methods (project-based learning, problem-based learning, etc.) and techniques which reflect the nature of science, in which scientific process skills are used and which will offer scientific thinking and scientific logic should be taught especially in pedagogical field courses that pre-service teachers take. According to Ceylan, Ercan and Akpınar (2017), textbooks continue to be the main resource for most teachers and students despite developing technology. The texts in these books have an important role in bringing up individuals who can use Turkish accurately and effectively, can express themselves, can communicate, think scientifically, investigate, criticize, question and interpret. Similarly, Yakar and Saracaloğlu (2016) emphasize that "Science Implementation" which is a lesson that MoNE added to the education programs as a selective course in the beginning of 2013-2014 academic year in Turkey is an extremely important lesson in terms of developing students' scientific thinking skills. Developing students' scientific thinking skills is not only linked to the practices done in faculties of education but also the quality of the education that they would take before. Unless some measures are taken in this regard, it is possible to encounter negative outcomes. In this context, Akbaba, Kaymakcı, Birbudak and Kılcan (2016) state that the biggest percentage (%12.2) regarding the fact that the objectives of Ataturk's Principles and History of Revolution course are not achieved at all is related to its contribution to the individuals moral development. It is stated that another important point regarding the fact that the objectives of this course are not achieved at all is the statement regarding its contribution to gaining scientific thinking skill (%11). In this context, it is not possible for students to have scientific thinking skills only through courses or practices given at the faculty of education however scientific thinking skills can be developed step by step with practices that will be done in preschool-elementary school age and that after. Practices such as making trips to science art centres, creating rich learning environments, creating mini interactive science museums in schools develop students' scientific thinking skills (Crowley et al., 2001; Gerber and Marek 2001; Rix and McSorley 1999; as cited in Bodur and Yıldırım, 2018). A faculty of education students who is aware of what will develop students' scientific thinking skills will contribute to the development of their own and students' scientific thinking skills.

Similar to this conclusion the relationship between scientific thinking skill and different disciplines was encountered in literature. According to the study done by Erkol and Ugulu (2014), the skills of pre-service biology teachers regarding scientific research are needed to be developed. Jaleel and Premachandran (2017) state that there is a positive relation between scientific thinking and the success in chemistry lesson in their study with middle school students. Realistic cognition plays an important role for students to think scientifically in the future and this is an important skill that students of psychology department should acquire (Soyyılmaz, Griffin, Martín, Kucharský, Peycheva, Vaupotič and Edelsbrunner, 2017). Learning the methods of scientific thinking is important for preschool students in terms of both acquiring scientific knowledge and adapting to the environment based on the scientific knowledge (Polat, 2006). The use of simulations and animations in the science courses is thought to contribute to the scientific thinking skills of eighth grade students (Öztürk, Akdeniz and Bakırcı, 2017). In addition, scientific thinking skill is an important concept that should be applied by students and teachers in teaching science (Osman, Wahidin and Mohd, 2013). When the results of the research are examined, it is seen that scientific thinking skills have an important place for the faculty of education students who study in different disciplines and developing this is emphasized.

In this research, the attitude of faculty of education female students towards scientific research is found to be 0.43 higher than the male students. The number of female students in faculties of education has been increasing compared to males day by day and the teaching profession is on the way to becoming a woman profession. This result may be closely related to the interest in the teaching profession. It is seen that scientific thinking skill is at many points of the requirements of teaching profession (Seferoğlu, 2004; Şişman, 2009). In this respect, it can be said that the female students who are high in number have a high interest in the teaching profession (Doğan and Çoban 2009; Gürbüz, Kışoğlu 2007). When the research results in the literature are examined, there are findings in parallel with this research. Gündoğdu (2001) found that female students had higher scientific thinking skills than male students in his study. According to the study of Kurt, İzmirli, Fırat and İzmirli (2011), female students have a more favorable view of the scientific research methods course than male students.

Studies directly regarding the other independent variables in the research were not encountered in literature. However, it is thought that as the number of studies conducted on this field increase, different points regarding scientific research will also be detected. In this respect, the attitude of the group believing in the accuracy of scientific research result is 0.52 higher than the group not believing. According to this finding, it can be concluded that teacher education is done scientifically, that faculty of education students understand the importance of scientific thinking and that scientific research gives reliable results.

The attitude of the group paying attention while filling scales towards scientific research is 0.30 higher than the group not paying attention. According to this result, it can be said that believing in the accuracy of scientific studies and contributing to science by filling the scales by paying attention have an important role to have a high attitude towards scientific research. In this respect, the level of belief and care towards scientific research should be increased. This can be done by ensuring that students are directed to scientific research and follow scientific studies.

The question “What is your level of belief towards our country’s educational system’s development by scientific researches on education?” was asked to the faculty of education students in this research. In the scope of this question, the attitude of the group having a low level of belief towards scientific research was found to be 3.45 higher than the group having a high level of belief. According to these results, the faculty of education students whose attitudes towards scientific research are high may think that the proficiency and the quality of the researches done in the field of education should be increased. This may reveal the necessity for scientific studies to be pragmatic and to draw attention to a solution.

In the last finding of the research, the attitude of the group believing that scientific results are taken seriously by authorities towards scientific research was found to be 1.4 higher than the group not believing. In line with this result, it can be said that the idea that scientific research results are taken seriously by authorities increases the attitudes of faculty of education students towards scientific research.

REFERENCES

Akbaba, B., Kaymakcı, S., Birbudak, T. S., and Kılcan, B. (2016). Üniversite öğrencilerinin uzaktan eğitimle Atatürk ilkeleri ve inkılâp tarihi öğretimine yönelik görüşleri. *Kuramsal Eğitimbilim Dergisi, 9*(2), 285-309.

Baydemir, M. B. (2014). *Lojistik regresyon analizi üzerine bir inceleme* (Yayınlanmamış yüksek lisans tezi), İnönü Üniversitesi, Sosyal Bilimler Enstitüsü, Malatya.

Bodur, Z., and Yıldırım, M. (2018). Sınıf dışı etkinliklerinin ortaokul yedinci sınıf öğrencilerinin akademik başarıları ve bilimsel süreç becerileri üzerine etkisi. *Eğitim Bilimleri Dergisi, 47*(47), 125-140.

Ceylan, Z., Ercan, A. N., and Akpınar, Ş. (2017). Investigation of informative texts in 5th-8th grade Turkish textbooks in terms of themes and genres. *International Journal of Language Academy, 5*(6), 296-306.

Çokluk, Ö. (2010). Lojistik regresyon analizi: Kavram ve uygulama. *Kuram ve Uygulamada Eğitim Bilimleri, 10*(3), 1357-1407.

Doğan, T. and Çoban, A. E. (2009). Eğitim fakültesi öğrencilerinin öğretmenlik mesleğine yönelik tutumları ile kaygı düzeyleri arasındaki ilişkinin incelenmesi. *Eğitim ve Bilim*, *34*(153), 157-168.

Dunbar, K. and Fugelsang, J. (2005). Scientific thinking and reasoning, K.J. Holyoak and R. G. Morrison (Ed.), *The Cambridge handbook of thinking and reasoning* (s. 705-725). New York: Cambridge University Press.

Eranıl, A. K., Özcan, M., and Özek, B. Y. (2019). Examination of Classroom Management Competencies of Faculty of Education Students. *Kuram ve Uygulamada Egitim Yönetimi Dergisi*, *25*(1), 119-138.

Erkol, S. and Ugulu, I. (2014). Examining Biology Teachers Candidates' Scientific Process Skill Levels and Comparing These Levels in Terms of Various Variables. *Procedia Social and Behavioural Sciences, 116,* 4742-4747.

Field, A. (2009). *Discovering statistics using Spss.* London: Sage publications.

Giray, S.(2016). İki aşamalı kümeleme analizi ile hükümlü verilerinin incelenmesi. *İstanbul Üniversitesi İktisat Fakültesi Ekonometri ve İstatistik Dergisi, (25),* 1-31.

Grinnell, F., Dalley, S., Shepherd, K. and Reisch, J. (2018). High school science fair: Student opinions regarding whether participation should be required or optional and why. *PloS One, 13*(8), 1-16.

Gündoğdu, M. (2001). *Üniversite Öğrencilerinin Bilimsel Düşünme Becerilerinin Yordanması* (Yayımlanmış doktora tezi). Hacettepe Üniversitesi, Sosyal Bilimler Enstitüsü, Ankara.

Gürbüz, H. and Kışoğlu, M. (2007). Tezsiz yüksek lisans programına devam eden fen-edebiyat ve eğitim fakültesi öğrencilerinin öğretmenlik mesleğine yönelik tutumları (Atatürk Üniversitesi örneği). *Erzincan Üniversitesi Eğitim Fakültesi Dergisi, 9*(2), 71-83.

Jaleel, S. and Premachandran, P. (2017). A study on the relationship between scientific reasoning and achievement in chemistry of secondary school students. *Journal of Research in Humanities and Social Science, 5*(2), 4-8.

Kaçan, S. D. A (2015). Situatıonal study for the ıdentificatıon of pre-service science teachers' creatıve thinking and creative scientific thinking skills. *Journal of Education and Practice, 6*(27), 82-85.

Karasar, N. (2009). *Bilimsel araştırma yöntemi.* Ankara: Nobel Dağıtım.

Korkmaz, Ö., Şahin, A. and Yeşil, R. (2011). Study of validity and reliability of scale of attitude towards scientific research. *Elementary Education Online*, *10*(3), 961-973.

Kuhn, D. (2002). What is scientific thinking and how does it develop? U. Goswami (Ed.), *Handbook of childhood cognitive development* (s. 371-393). New York: Blackwell Press.

Kurt, A. A., İzmirli, Ö. Ş., Fırat, M. and İzmirli, S. (2011). Bilimsel araştırma yöntemleri dersine ilişkin bilgisayar ve öğretim teknolojileri eğitimi bölümü öğrencilerinin görüşlerinin incelenmesi. *Dumlupınar Üniversitesi Sosyal Bilimler Dergisi,* (30), 19-28.

Long, J. S. (1997). *Regression models for categorical and dependent variables*. London: Sage Publications.

Osman, K., Wahidin, M. and Mohd, S. (2013). Concept mapping in chemistry lessons: Tools for inculcating thinking skills in chemistry learning. *Journal of Baltic Science Education, 12*(5), 666-681.

Öztürk, M., Akdeniz, A. R. and Bakırcı, H. (2017). Bilgisayar destekli öğretim uygulamalarının ortaokul öğrencilerinin bilimsel düşünme becerilerine etkisi. *Yüzüncü Yıl Üniversitesi Eğitim Fakültesi Dergisi, 14*(1), 611-639.

Paul, R. and Elder, L. (2006). *The thinker's guide to understanding the foundations of ethical reasoning. Foundation Critical Thinking.* 20 Ekim 2018 tarihinde https://www.criticalthinking.org/store/get_file.php?inventories_id=169&inventories_files_id=379 adresinden erişildi.

Polat Unutkan, O. (2006). A study of pre-school children's school readiness related to scientific thinking skills. *Turkish Online Journal of Distance Education, 7*(4),78-85.

Seferoğlu, S. S. (2004). Öğretmen yeterlikleri ve mesleki gelişim. *Bilim ve Aklın Aydınlığında Eğitim, 58*, 40-45.

Semerci, N. (1999). Öğretmenin görevi: düşünmeyi geliştirmek. *Fırat Üniversitesi Sosyal Bilimler Dergisi, 9(1*), 209-216.

Sezer, Ş. (2016). School administrators' opinions on task priorities and the factors affecting their decision-making process, *İnönü Üniversitesi Eğitim Fakültesi Dergisi, 17*(3), 121-137.

Soyyılmaz, D., Griffin, L. M., Martín, M. H., Kucharský, Š., Peycheva, E. D., Vaupotič, N. and Edelsbrunner, P. A. (2017). Formal and informal learning and first-year psychology students' development of scientific thinking: A Two-Wave Panel Study. *Frontiers in Psychology*, *8*(133), 1-11.

Şişman, M. (2009). Öğretmen yeterlilikleri: Modern bir söylem ve retorik. *İnönü Üniversitesi Eğitim Fakültesi Dergisi*, *10*(3), 63-82.

Taşdere, A., Kır, M. and Yiğit, N. (2014). İlköğretim öğretmen adaylarının bilimsel bilginin doğası hakkındaki görüşleri. *Eğitim ve Öğretim Araştırmaları Dergisi*, *3*(3), 189-200.

Yakar, A., and Saracaloğlu, A. S. (2016). The Evaluation of Secondary School 5th Grade Science Applications Curriculum Implemented in 2013 According to Metfessel-Michael Curriculum Evaluation Model (Muğla Sample). *Eğitimde Kuram ve Uygulama, 12*(3), 769-796.