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Academics' Scientific Attitude Levels

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Abstract

This descriptive study is aimed to determine the scientific attitude levels of academics who are working in different fields at universities. The Scale of Instructors' Scientific Attitudes was used in order to obtain data. The research population is 6807 academics working at four public universities and two foundation universities in Izmir/Türkiye. The research sample includes 678 in total, 341 women, 337 men at these universities. The SPSS Statistics 23 program was used for analysis. The data has been analyzed by using arithmetic mean, standard deviation, t- Test, and One-Way ANOVA hen the difference was found significant, and LSD Test of Significance were used in order to determine which groups create differences. Scientific attitude levels of academics vary according to titles, university type and their fields. Accordingly, while academic titles progress, the level of scientific attitude also increases. Regarding levels of scientific attitudes, the findings were discussed in favor of instructors working at state universities and in the fields of communication technology, natural sciences and mathematics.

Keywords: Academics, Science, Scientific attitude levels, Knowledge production

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Öğretim Elemanlarının Bilimsel Tutum Düzeyleri

Özet

Bu betimsel çalışmada üniversitelerde farklı alanlarda çalışmakta olan öğretim elemanlarının bilimsel tutum düzeylerinin belirlenmesi amaçlanmaktadır. Araştırmada verilerin elde edilme sürecinde Öğretim Elemanlarının Bilimsel Tutum Ölçeği kullanılmıştır. Araştırmanın evrenini İzmir'deki dört devlet üniversitesi ve iki vakıf üniversitesinde görev yapmakta olan öğretim elemanları oluşturmaktadır. Araştırma örneklemi 341'i kadın 337'si erkek olmak üzere toplam 678 öğretim elemanından oluşmaktadır. Veriler SPSS 23 istatistik paket programı kullanılarak analiz edilmiştir. Verilerin analizinde aritmetik ortalama, standart sapma, t- Test ile One Way ANOVA Testi yapılmıştır. Anlamlı farklar bulunduğu zaman, farklılığın hangi gruplar arasında olduğunu saptamak için LSD Anlamlılık Testi kullanılmıştır. Araştırmada öğretim elemanlarının bilimsel tutum düzeylerinin unvanlarına, çalıştıkları üniversitenin türüne ve alanlarına göre farklılık gösterdiği bulunmuştur. Buna göre öğretim elemanları akademik unvanlarda ilerledikçe bilimsel tutum düzeyleri de yükselmektedir. Bilimsel tutum düzeyi bakımından devlet üniversitelerinde görev yapmakta olan öğretim elemanları ile iletişim teknolojileri, doğa bilimleri ve matematik alanlarında çalışan öğretim elemanlarının lehine bir bulgu ele edilmiştir.

Anahtar Kelimeler: Öğretim elemanları, Bilim, Bilimsel tutum düzeyleri, Bilgi üretimi

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1. Introduction

The world has been experiencing the scientific and technological revolution that took place in the mid-1980s and is called the third technological revolution and third industrial revolution. With this revolution, which has become evident mainly as the application of microelectronics and computers to production, almost all countries are trying to transform into an information economy/society. In this environment where the importance and value of knowledge are increasing, nations have been struggling to make a difference in the fields of research and development (R&D). Innovation and creativity have become the most important competitive element on the international platform (Kalkınma Bakanlığı, 2013). All of these processes are parallel with science and scientific developments. Science is not a concept that human beings have collided with recently. It is thought that since the beginning of history, mankind has tried to solve the problems encountered in nature by trial-and-error method. The purpose of controlling the power of nature and survival has resulted in the emergence of science. In other words, the need to control nature and the purpose of survival combined with the curiosity of human beings. As a result of this, people have entered a process that they have been asking and seeking answers to these questions. Science is the intellectual and practical process of seeking reliable and valid knowledge through systematic methodology including testing of hypotheses, observation, and experiment (Lewins, 1992).

Scientific knowledge is subject to change by new observations and experiments or new comments on current observations (Schwartz, Lederman & Crawford, 2004). Depending on a certain type of methodology and changing over time, science casts aside all mystical and supernatural definitions and acceptances. Just as science is not only a process of obtaining knowledge, but also a process of discovery, it is connected with the natural way of discovering in a systematic way (Setiawaty, 2017). In this discovery process, the developments in R&D have made the role of universities stronger in public life. Because there is no any doubt that universities play a crucial role in the production of knowledge (Godin and Gingras, 2000). Therefore, academics' ideas, thoughts, feelings, and attitudes about science also have a crucial importance in generating new scientific knowledge at universities. As it is known, universities aim to enable their students to understand science and gain a scientific perspective.

It seems that producing new scientific and academic knowledge and transferring it to the new generations are the main roles of academic at tertiary institutions. Jung (2020, p. 135) states the same point that "the role of higher education is particularly crucial as a core actor of knowledge production". Välimaa and Hoffman (2008) got a global point of view and pointed out that the role of higher education institutions in a global knowledge economy is more crucial than ever. In higher education knowledge is produced through research programmes which also contribute efficiency of higher education. Cortese (2003) also emphasized the responsibility of higher education and stated that universities have a profound responsibility to create just and sustainable future by increasing awareness, knowledge, skills, and values. Therefore, research programmes and knowledge production are inseparable components of university education (Metcalfe and Fenwick, 2009).

It has been possible to create science and technology in today's known level as a result of human beings' innate ability of questioning. Because of the ability of questioning, people can ask questions before they acquire scientific knowledge. Therefore, in all scientific fields, scientists can start any study by forming a question at the first stage of the research process. Everybody conducting research finally presents their findings depending on their initial questions and research process. Emergence of scientific research, R&D, and creativity may require a type of attitude towards science. Such an attitude is based on an intellectual basis that every opinion may change and scientific knowledge cannot be accepted as dogmatic views. An opposite approach brings to mind that scientific knowledge is static or does not change. If scientific findings were considered not to be changed, there would not be any necessity to do further research to create new knowledge. It also means that the efficiency of higher education declines.

Since the academic staff are responsible for doing scientific research and training future doctors, engineers, teachers, lawyers, and so on, their scientific attitude levels have a crucial impact on society. Thus, this study is aimed to find out the scientific attitude levels of academics. As it is understood that this paper approaches scientific attitude from the perspectives of academic staff and tries to answer the following research questions.

Research Questions

1. What is the scientific attitude level of academic staff?

2. Do the scientific attitude levels of academic staff vary significantly in terms of their academic titles?
3. Do the scientific attitude levels of academic staff vary significantly in terms of the type of universities in which they are working?
4. Do the scientific attitude levels of academic staff vary significantly in terms of their fields of study?

1.1. Literature Review

It is understood that the emergence of R&D, innovation and creativity may require an attitude that does not accept all information as true, discusses discuss it or an attitude which is open to change current knowledge. This type of attitude can be called as "scientific attitude" that does not have a single definition in the relevant literature. The studies including scientific attitude make a list of some characteristics of this concept. For instance, Byrne and Johnstone (1987) indicate curiosity, open-mindedness, critical-mindedness, objectivity, caution in concluding weighing evidence, loyalty to truth, and existence of cause-and-effect relationships as components of scientific attitude. Gardner (1995, p.284) thinks "curiosity", "rationality" and "open-mindedness" are scientific attitudes. In other words, scientific attitudes are an intricate blend of a want to know and understand, a critical eye toward all claims, a look for data and their significance, a demand for proof, a respect for logic, a study of premises, and a consideration of consequences (Osborne, Simon & Collins, 2003). Another description of scientific attitude is "the motivation needed to convert knowledge and skills into scientific procedures and engagement" (Fives, Huebner, Binbaum & Nicolich, 2014, p.555). People with a scientific mindset are open-minded, focused on doing experiments, and methodical in their approach. (Wildan, Hakim, Siahaan and Anwar, 2019). Pitafi and Farooq (2012, p.383) indicated "curiosity, rationality, willingness to suspend judgment, open-mindedness, critical mindedness, objectivity, honesty and humility" as the components of scientific attitudes. Suryawati, Osman and Meerah (2010, p.1720) stated that seven important aspects which build scientific attitude are "responsibility, curiosity, cooperation, punctuality and accuracy, discipline, tolerance, and self-confidence".

Due to the vital role of academics in the production of knowledge, the importance of their scientific qualifications is increasing. In this study, the reason why the academics are included

in this research is based on the assumption that their main task is to carry out scientific research, R&D and innovation and to teach young generations. In addition to conducting individual research projects, academics also provide master's and doctoral thesis consultancy in postgraduate education programmes. They make invaluable contributions to knowledge production in the thesis advisory process (Baptista, 2011; Denicolo, 2004). Therefore, the level of scientific attitude can be considered as one of the leading qualifications of academics.

The success of any higher education system means that more qualified graduates join economic, social, and professional life. The quality and efficiency of university education depend on scientific and academic characteristics of lecturers. The academic staff whose scientific attitude level is higher can contribute both to the quality of university education and its graduates (Lee & Kuzhabekova,2019). As a result of more qualified university education, the scientific attitude levels of all occupations such as doctors, teachers, judge and so on will increase, which is going to help to develop the scientific attitude level of all society.

Covid-19 global pandemic has revealed the significance of science and scientific studies. Individuals who obey doctors' and scientists' warnings to avoid Coronavirus are successful in not to getting infected. However, the ones ignoring all warnings or precautions get infected or even pass away. So, it can also be stated that every member of society needs a certain level of scientific attitude to live healthily.

An important reason for this study is that a study on scientific attitude levels of academic staff in literature cannot be found. It is thought that this study may contribute to researches to improve the qualifications and efficiency of academics in Turkey. Some studies which are not related to academics on scientific attitude can be found in the literature. For example, Flegg and Hukins (1973) conducted a study to measure the scientific attitude-curiosity level of high school students. Jones and Butts (1983) conducted a study called to measure the level of 7–10-year-old students in New South Wales Secondary School to have scientific attitudes specified in the affective goals of the science curriculum. Moore and Foy (1997) conducted a study in which they studied the scientific attitudes of middle and high school students. Pitafi and Farooq (2012) aimed to measure the scientific attitude levels of high school students in Pakistan. The common aspect of those studies is that they were conducted with high school or secondary school

students and they focused on the scientific attitudes in science courses. Studying the concept of scientific attitude only with students can be considered a deficiency in the literature.

2. Method

This paper is a descriptive study with a survey model. Descriptive survey research aims to reveal a large group of people's opinions, perceptions, or beliefs about an issue; therefore, it is more suitable for exploratory or explanatory purposes and it enables the researcher to describe a large population which would be impossible to do directly (Rubin and Babbie, 2011). This paper is based on quantitative study conducted in Izmir/Türkiye. Data was collected from 6 universities located in Izmir. These universities are the state universities which are Dokuz Eylul University, Ege University, Izmir Katip Celebi University, Izmir Institute of Technology, and two foundation universities which are Izmir University of Economics and Yasar University.

2.1. Population

The research population consists of 6807 academics working at the aforementioned universities in Izmir.

2.2. Sample

The sample was determined with stratified sampling which "involves dividing the population into homogenous groups, each group containing subjects with similar characteristics" (Cohen, Manion & Morrison, 2005: 101). First, faculty members from both state and foundation universities are represented by 10% in the sample of this study. As it was impossible to reach all the instructors in these universities, the researchers tried to include the academic staff in the sample according to their gender, study fields and academic titles. The sample was formed according to the type of university in which they were working, their gender, academic titles, and their fields of study. Table 1 provides the information about distribution of academic staff according to their gender in the study sample.

Table 1.

Distribution of academic staff according to their gender in the study sample.

Gender	Population*	%	Sample	%
Woman	3347	49	341	51
Man	3460	51	337	49
Total	6807	100	678	100

Source: Higher Education Information System (https://istatistik.yok.gov.tr/)

According to the data in Table 1, the population included 6807 instructors in total. 49% of them were women and 51% were men. The sample is consisting of 678 academic staff in total, 51% of them were women and 49% were men. Table 2 shows the distribution of academic staff according to their academic titles.

Table 2.

The distribution of academic staff according to their academic titles.

Titles	**Population**	**%**	**Sample**	**%**
Prof. Dr.	1792	26,4	163	24,1
Associate Prof	1082	15,8	117	17,3
Assistant Prof	1119	16,4	104	15,4
Instructor	1235	18,2	94	13,8
Research Assist.	1579	23,2	200	29,4
Total	6807	100,0	678	100,0

As can be seen in Table 2, the aim was to ensure that the academics were represented in the research sample by preserving their proportions in the population. For instance, the rate of assistant professors is 16% in the population and similarly the rate of assistant professors is 15% in the study sample.

Table 3 indicates the distribution of academic staff according to type of universities in which they are working.

Table 3.

The distribution of academic staff according to their type of universities

Type of university	Population	%	Sample	%
State	6092	89	609	%89
Foundation	715	11	69	%11
Total	6807	100	678	%100

Table 3 represents the rate of academic staff in the population according to the type of universities in the sample. The rate of academic staff working in state universities is the same in population and sample. The rate of academics working in state universities and foundation universities is so close in the population and sample.

The study fields of academic staff are also examined. Table 4 presents the distribution of academic staff according to their fields.

Table 4.

The distribution of academic staff according to their study fields

Type of Field	Population	%	Sample	%
Information and Communication Technologies Natural Sciences, Mathematics and Statistics	543	8,0	55	8,1
Education, Services	963	14,1	100	14,7
Business, Administration and Law Arts and Humanities Social Sciences	1455	21,4	146	21,5
Engineering; Manufacturing and Construction Agriculture	1767	26	184	27,1
Health	2079	30,5	193	28,4
Total	6807	100	678	100

As it is seen in Table 4, approximately 28% of the teaching staff participating in the research sample are in the field of health; 27% in engineering, manufacturing, construction, and agriculture, about 22% in social science, arts and humanities; about 15% of them work in education and 8% in the fields of information and communication technologies, natural sciences, mathematics and statistics.

2.3. Data Collection Instrument

The Scale of Instructors' Scientific Attitudes developed by the author (2021) was used to obtain data for the research. The scale is a five-point Likert-type scale and there are 23 items ranging as "I completely agree; I mostly agree, I am neutral; I mostly disagree, I totally disagree". This scale has two subscales; The Attitude about Scientific Principles including 19 items and The Attitude about Scientific Details and Differences including 4 items. The validation of scale was provided by construct validity and criterion validity. The Kaiser-Meier-Orkin (KMO) coefficient for the scale used in this study was .92 (>0.60) and the results of the Barlett sphericity test (X^2 = .6658 $p<0.01$) were found to be significant (Büyüköztürk, 2011). Cronbach's alpha reliability coefficient was also calculated for both the total of The Scale of Instructors' Scientific Attitudes of and its subscales. According to the results of reliability of analysis, the total Cronbach's alpha coefficient is .92. The Attitude about Scientific Principles subscale's

Cronbach's alpha coefficient is .91 and The Attitude about Scientific Details and Differences' is .63 (Güçer, 2021).

2.4. Data Collection Process and Data Analysis

The scales were delivered to the academics and collected by the researchers themselves. During the data collection process, the units of all universities in Izmir were visited regularly on certain days of every week. In these visits, the answered scales were taken, and in each visit, it was tried to reach the academics individually as much as possible. For this purpose, appointments were arranged in advance in order to reach as many academics as possible on the day of the visit. In order to make a statistically significant analysis, reaching 10% of the population was achieved in a period exceeding one and a half years. The reasons for this situation were that some academics could not be reached despite all of the efforts, the majority of the academics answered the scales late and although some scales were answered in a short time, the delivery was delayed or not delivered at all, and some scales were answered without being read incompletely or randomly. At the end of the data collection process, 10% of the research population was reached and data was obtained from the intended sample group.

The research sample is sufficiently large (n=678) that the skewness values are within the range (± 1) and can be interpreted as normally distributed (Büyüköztürk, 2011). For these reasons, the t-test from parametric statistics, one-way ANOVA, LSD test in multiple comparisons, and arithmetic mean and standard deviation were used to analyze the data in the SPSS Statistics 23.

2.5. Research Ethics

This research was carried out with the approval of Dokuz Eylul University, Institute of Education Ethics Committee for Researches on Educational Sciences with the decision numbered "02" in the session dated 22.02.2018.

3. Findings

3.1. Findings related to the first research question

Table 5 indicates the distribution of scientific attitude levels of academic's according to subscales.

Table 5.

Distribution of scientific attitude levels of academics' according to subscales (arithmetic mean and standard deviation)

Subscale	$\bar{x}$	SD
The attitude about scientific principles	3,84	1,09
The attitude about scientific details and differences	4,55	0,66
Scientific Attitude Levels in General	3,96	1,02

The first research question of this study was "What is the scientific attitude level of academic staff?". Depending on the analysis of data, the level of scientific attitude levels of academics can be accepted at higher level ($\bar{x}$=3,96). The mean scores of "the attitude about scientific details and differences subscale" ($\bar{x}$=4,55) is higher than the mean scores of "the attitude about scientific principles subscale" ($\bar{x}$=3,84) The academics scored the 16th item "I support different points of views to emerge" at the highest level (totally agree, $\bar{x}$=4,66) generally and in "the attitude about scientific principles subscale" The academics also scored the 7th item "Problems can be solved in different ways" (totally agree, $\bar{x}$=4,63) and 10th item "It is reasonable to evaluate different point of views before making a decision" (totally agree, $\bar{x}$=4,63) in "the attitude about scientific details and differences subscale".

3.2. Findings related to the second research question

The second research question of this study was stated as follows; "Do the scientific attitude levels of academics vary significantly in terms of their academic titles?" To analyze this question, mean scores and standard deviations of academics' scientific attitude levels were calculated in terms of their academic titles. Whether the scientific attitude levels differ significantly or not according to the titles, one-way analysis of variance (one-way ANOVA) was

carried out. LSD Test of Significance is used in order to determine which groups differ significantly The results of one-way ANOVA and LSD test are presented in Table 6.

Table 6.

Results for one-way ANOVA and LSD tests carried out to reveal the academic staff's scores for scientific attitude levels in terms of their academic titles.

Subscales	Titles	n	$\bar{x}$	SD	df	F	P	Difference
The attitude about scientific principles	1.Res. Assist.	200	69,77	12,42	4	20,26	0,00*	4-1
	2.Instructor	94	69,71	10,95	673			4-2
	3.Assist.Prof.	104	71,13	12,25				5-1
	4.Assoc.Prof.	117	74,22	13,29				5-2
	5.Prof.	163	80,09	11,14				5-3
								5-4
	Total	678	73,22	12,73	677			
The attitude about scientific details and differences	1.Res. Assist.	200	17,90	2,27	673	4,29	0,00*	4-1
	2.Instructor	94	18,22	1,91				4-3
	3.Assist.Prof.	104	17,93	2,03				5-1
	4.Assoc.Prof.	117	18,45	1,38				5-3
	5.Prof.	163	18,58	1,23				
	Total	678	18,21	1,85	677			
Scientific Attitude Levels in General	1.Res. Assist.	200	91,18	14,12	673	21,61	0,00*	4-1
	2.Instructor	94	91,65	12,17				4-2
	3.Assist.Prof.	104	91,87	13,99				4-3
	4.Assoc.Prof.	117	96,13	15,02				5-1
	5. Prof.	163	103,11	12,10				5-2
								5-3
								5-4
	Total	678	95,07	14,35	677			

*P<.05

As can be seen in Table 6 the academic staffs' scientific attitude level scores vary significantly in terms of their academic titles (p=0,00) in both two dimensions and scale in general. The scientific attitude level scores of professors and associate professors are higher than research assistants, instructors, and assistant professors.

3.3. Findings related to the third research question

The third research question of this study was stated as follows; "Do the scientific attitude levels of academic staff vary significantly in terms of type of their universities in which they are working?" In order to analyse this question, mean scores and standard deviations of academics' scientific attitude levels were calculated in terms of type of their universities in which they are working. To find out the scientific attitude levels are significant or not according to the university type, t test was carried out. Table 7 shows the results -t test results.

Table 7.

Results for -t test carried out to reveal the academic staff's scores for scientific attitude levels in terms of type of their universities in which they are working

Subscales	Uni. Type	n	$\bar{x}$	SD	df	-t	P
The attitude about scientific principles	State	582	73,81	12,52	676	0,03	0,00*
	Foundation	96	69,64	13,45			
The attitude about scientific details and differences	State	582	18,19	1,88	676	-0,59	0,55
	Foundation	96	18,31	1,64			
Scientific Attitude Levels in General	State	582	95,70	14,12	676	0,05	0,00*
	Foundation	96	91,25	15,17			

* P<.05

It can be observed in Table 7 the academic staff's scientific attitude level scores vary significantly in terms of the type of their universities in which they are working in one dimension and scale in general (t=0,05; p<0,05) according to -t test carried out to understand whether the scientific attitude levels are significant or not. The scientific attitude level ($\bar{x}$ = 95,70) of academics working at state universities is higher than the scientific attitude level ($\bar{x}$ =91,25) of the ones working at foundation universities.

The academic staff's scientific attitude level scores vary significantly (t=0,03; p<,05) in terms of type of their universities in which they are working in the dimension called as the attitude about scientific principles. In this dimension it is calculated that the scientific attitude level ($\bar{x}$=73,81) of academics working at state universities is higher than the scientific attitude level ($\bar{x}$=69,64) of the ones working at foundation universities.

According to the findings of Table 7, the academic staff's scientific attitude level scores do not vary significantly in terms of type of their universities in which they are working in the subscale about the attitude about scientific details and differences.

3.4. Findings related to the fourth research question.

The fourth research question of this study was stated as follows; "Do the scientific attitude levels of academic staff differ significantly in terms of their field of study" In order to analyze this question, mean scores and standard deviations of academics' scientific attitude levels are

calculated in terms of their scientific fields. To decide the scientific attitude levels differ significantly or not according to the scientific fields, one-way analysis of variance (One-way ANOVA) is carried out. LSD Test of Significance is used in order to determine which groups create differences. The results of one-way ANOVA and LSD tests are given in Table 8.

Table 8.

Results for one-way ANOVA and LSD tests carried out to reveal the academic staff's scores for scientific attitude levels in terms of their scientific attitude levels.

Subscales	Scientific Fields	n	$\bar{x}$	SD	df	F	P	Difference
The attitude about scientific principles	(1) Info.Com.Tech. Natural Sciences Math. Stats.	55	83,11	4,00	4 673	254,66	0,00*	1-2 1-3 1-4
	(2) Edu. and Services	100	67,55	11,92				4-2 4-3
	(3)Business,Adm., Law, Arts and Humanities, Social Sciences	146	57,53	7,66				5-2 5-3 5-4
	(4) Engr. and Agri.	184	74,83	10,00				
	(5) Health	193	83,67	3,17				
	Total	678	73,22	12,73	677			
The attitude about scientific details and differences	(1) Info.Com.Tech. Natural Sciences Math. Statistics	55	18,85	0,84	673	19,37	0,00*	1-2 1-3 1-5 4-2
	(2) Edu. and ,Services	100	18,20	1,89				4-3 4-5
	(3) Business, Admin., Law, Art and Humanities, Social Sciences	146	17,16	2,83				5-2 5-3
	(4) Engr. and Agri	184	18,76	1,11				
	(5) Health	193	18,30	1,23				
	Total	678	18,20	1,85	677			
Scientific AttitudeLevels in General	(1) Info.Com.Tech. Natural Sciences Math. Stats.	55	106,71	4,29	673	249,62	0,00*	1-2 1-3 1-4
	(2) Edu. and Services	100	89,34	13,44				4-2 4-3
	(3) Business, Adm., Law, Art and Humanities, Social Sciences	146	77,03	8,98				5-2 5-3 5-4
	(4) Engr. and Agri.	184	97,33	11,12				
	(5) Health	193	106,23	3,90				
	Total	678	95,07	14,35	677			

P<.05

As seen in Table 8 the academic staff's scientific attitude level scores differ significantly in terms of their scientific fields (p=0,00) in both two dimensions and scale in general. According to the findings in Table, the scientific attitude level scores of academics working in the fields of information-communication technologies, natural sciences and mathematics are calculated higher than the scientific level scores of academics who are doing researches in the fields of education, services, business, administration, law, arts and humanities, social sciences. In addition, the academics in engineering and agriculture have higher scores in scientific attitude than the academics in the fields of education, services, business, administration, law, arts and humanities, social sciences.

In the subscales "The attitude about scientific principles" and "The attitude about scientific details and differences", the academics of information-communication technologies, natural sciences and mathematics get higher scientific attitude level scores than the academics in the fields education, services, business, administration, law, arts and humanities, social sciences.

4. Discussion and Conclusion

This study was conducted to determine academics' scientific attitude levels. Considering findings of the overall scale and both dimensions, it is seen that the three highest-scored items are about different perspectives, solutions, and opinions. Accepting differences and different views, solutions, opinions, and approaches and even supporting their development can be explained by the tolerant and open-minded characteristics of the scientific attitude. Tolerance generally means acceptance of different beliefs, attitudes, or behaviours -i.e., the otherness, that you may not agree with and what is negatively evaluated -that is not acceptable to a person or social grouping (Kanisaukas, 2010).

Supporting the development of different ideas also recalls being open-minded, which is another characteristic of the scientific attitude. Being open-minded fosters a readiness to challenge conventional wisdom, be attentive to new possibilities, share ideas, and take into account opposing viewpoints (Navarro & Carion, 2008). Emphasizing the tolerance and open-mindedness shows that the academics are open to different approaches and perspectives. These characteristics are compatible with the behaviours of scientific attitude.

According the findings of the second research question (Do the scientific attitude levels of academics vary significantly in terms of their academic titles?), professors get the highest scientific attitude scores. In other words, while academic staff rise in the academic pyramid, their scientific attitude levels are also developing. In Turkiye, The Law on Higher Education, (law number:2547) defines the responsibilities in connection with education, research, teaching staff, students, and other personnel of institutions of higher education and their governing bodies. According to this law (article 13), "professor is a teaching staff member holding the highest academic title". An individual who aims at academic career starts his career journey as a research assistant or an instructor. They should constantly study on writing theses, papers, book chapters and so on to progress along academic career path. As academics progress in academic life, their scientific attitude level also develops in parallel. It is seen that the level of scientific attitude develops simultaneously in the process of producing scientific knowledge. Munoz (2016) mentions research efficiency as one of the efficiencies at higher education institutions. Gralka, Wohlrabe and Bornmann (2019) states that number of publications are related to efficiency of higher education. Depending on these facts, academics' production of knowledge can also be considered to contribute efficiency at higher education. Furthermore, one can accept that more efficiency may result in higher scientific attitude level.

When a lecturer becomes an associate professor or professor, he or she does not have to deal with the bureaucratic affairs and work loads of the department. This makes them more interested in academic research. That is why, it can be thought that when academics concentrate on scientific studies, their intrinsic motivation and creativity increase. If people have an internal chain of causality, they attribute the consequences of their actions to themselves and are intrinsically motivated (that is, when driven or dependent on external factors), intrinsic motivation is weak (Auger and Woodman, 2016). Because of this, it is possible to conclude that the academics who have the highest positions in the academic pyramid have "internal causality chain" in their studies resulting high scientific attitude level.

The higher scientific attitude levels of the academics working at state universities can be explained by the demographic characteristics. While the rate of academic staff in the 25-34 age range from state universities is 30%, this rate is 37% in foundation universities. The rate of academic members aged 55 and above participating in the research from state universities is 15% whereas 11% in foundation universities. Considering the seniority, the ratio of those

working at state universities in the range of 1-10 years is 28%; The ratio of those working at foundation universities in the same seniority year is 37%. Considering these ratios, it is seen that the lecturers working in foundation universities are younger and have less experience.

The scientific attitude levels of the academic staff working in the fields of information and communication technologies, natural sciences, mathematics, and statistics are at the highest level according to findings of this paper. The higher scientific attitude levels of the academics working in the natural sciences can be explained by the positivist understanding of science which has been effective for many years. As it is known, positivism is a philosophical movement developed by Auguste Comte in the 19th century and assumes that what can be known is only facts. Positivism refers to the philosophical attitude of the natural scientist, which involves working with observable social reality to produce legitimate generalizations (Mathotaarachchi and Thilakarathna, 2021). Science explains observable phenomena from the point of view of the positivist philosophy of science (Lane, 1996). Positivism is a paradigm that argues that facts can emerge through methods of experimentation and observation and logical analysis. The positivist understanding accepts science in a conceptual hierarchy. This hierarchy starts with physics and ends with chemistry, biology, psychology and sociology respectively (Fırat, 2006). It has been understood that physics is the owner of the summit. Historically, steam-powered machines were invented, especially as a result of studies in the field of physics. Thus, the industrial revolution was experienced and the technology that facilitates the daily lives of people has developed, along with the advances in engineering and the tendency to control nature. Society benefits from the product aspect of science with the help of the technological developments. For example, people can talk to a friend from a distant part of the world via video by using mobile phones. It is possible to reach long distances in a much shorter time by means of airplanes and high-speed trains compared to transportation vehicles in the past. Today, none of us can even imagine a life without computers and internet. Therefore, as perceptually positivism presents the sciences to people by embodying them through technology, the superiority of physics and other natural sciences has begun.

According to the results of this study, the scientific attitude levels of the academics was determined at a high level in Turkey. This situation is important in terms of showing the tendency of the quality of education in higher education to rise to a higher level. This is important in terms of both the development of academics' qualifications and the participation

of qualified individuals trained by them in social and professional life in the future. The fact that the academics attach importance to different thoughts, approaches and solutions shows that they do not adopt a static point of view. This finding can be interpreted as academics are open to change and development, which can be seen as a prerequisite for scientific progress.

Another important result of the study is that academics' scientific attitude levels develop as they rise to professorship. The increase in the scientific publications of the academic staff, the rise of their titles and the development of their experiences require a labour-intensive knowledge production process. This shows that the scientific attitude progresses over time, in other words, it develops on a process-oriented basis. However, this may turn attention to another problem. There may be a lack of scientific perspectives of young academic candidates who have started their journey of academic career. Individuals who graduated from university in Türkiye may not have developed enough scientific perspective at the end of their undergraduate education.

The reason why the scientific attitude levels of the academics working at state universities in the research sample are higher than those at foundation universities can be explained by the fact that the lecturers at state universities are more advanced in terms of age and seniority. When compared to state universities, foundation universities can be considered very young in terms of both institutional and academic staff, so this result may be considered normal in Türkiye.

Another finding of this study is that the scientific attitude levels of the academics working in the fields of social sciences were lower in the research sample. It can be thought that the positivist understanding of science influences the differentiation of the scientific attitudes of academics according to the fields they work in. There is a philosophical and historical background behind the academics working in the field of natural sciences. Today, the tendency of society to perceive only natural sciences as science continues. For instance, Donmez (2017) states that students at secondary schools accept their science teachers as a scientist. Such a deep-rooted past and a strong perception may lead us to think that the academic staff working in the aforementioned fields contribute to the increase in their scientific attitudes.

Science has been in a continuous progress in its historical development. This has been made possible by the fact that everyone working in science has qualities such as critical thinking,

curiosity, asking questions, open-mindedness, honesty and so on. It is seen that the concept of scientific attitude covers all of these features. The high scientific attitude levels of all academics working at universities may lead to an increase in the quality of higher education and the destruction of dogmatic beliefs that may still exist in society.

One can conclude that making necessary studies during the academic career develops the qualities expressed by the concept of scientific attitude. However, according to the findings of this study, the scientific attitude levels of research assistants and lecturers who are at the beginning of academic life are lower. For this reason, training on scientific attitude awareness might be given to the academics who have just started their academic career. It is possible for foundation universities to support the production of scientific knowledge with various incentive systems considering the financial opportunities they have and the rapid decision-making processes from the point of view of the private sector. Some measures can be considered to improve the scientific attitude levels of academicians working in social fields. For example, incentive and reward systems specific to these fields might be developed.

Although this study has been carried out in Türkiye, characteristics of scientific attitude and scientific attitude levels of academics can be considered as an international research project. Because, scientific attitudes and its characteristics can be considered as a common ground shared by academics from different disciplines in all countries. The scientific attitude levels of academics working in different countries can be compared. As a result of these studies, programs can be developed at universities to improve scientific attitudes among candidates of academics.

5. References

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