

Full Length Research Paper

The teachers' research self-efficacy and attitudes towards scientific research based on different parameters: A case study of Agri Province

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The purpose of this study is to develop competencies of teachers, the coordination of the education, learning activities; in having access to innovations, developments and scientific studies in the literature. In addition, the purpose is to determine how teachers' scientific research self-efficacy and attitude towards the scientific research change based on the parameters such as gender, age and branch. Three different data collection tools were used in the study. The study group consists of 44 teachers working in Agri in different disciplines. The study was carried out by using mixed (including qualitative and quantitative methods) method. Teachers were provided a 12-week training for two hours a week with the purpose of improving their scientific research skills and their continuous attendance was ensured. Significant differences were observed in the research attitude scores of the teachers included in the study. During quantitative analysis of the study, majority of the teachers stated that they do not have any knowledge on scientific codes of conduct, how to conduct scientific research and how to review the literature and they showed no interest towards scientific research before the recent study.

Key words: Scientific research, self-efficacy, teacher.

INTRODUCTION

It is important to understand fully the scientific content of our life today. Teachers assume the responsibility of educating students starting from young ages to comprehend scientific developments and make the necessary evaluations. The students raised to have such competencies will gain self-confidence and they will have the knowledge on how to utilize scientific research in fulfilling their social responsibilities.

Scientific research is an enlightening process of using scientific methodology steps, finding solutions to

problems with the purpose of understanding the unknown. Research is the vital point of individuals and the society in modern societies (Karasar, 2007). Research gains importance only when it is in compliance with the scientific methodology steps. Gulbahar et al. (2004) describe scientific research as "converting a subject that is required to be understood into a problem and attempting to find an answer and publishing the conclusion with the purpose of announcing to others", while Balci (2009) describes it as "collecting data with

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specific purposes and through systematic processes and analysis of the collected data"; Ekiz describes it as "a study conducted in a planned and sometimes controlled manner with the purpose of obtaining scientific information on social and physical phenomenon". In brief, it would not be wrong to say that a research is the rediscovery of new information through certain processes (Tasdemir and Tasdemir, 2011).

Academic studies can be described as determining a problem, making observations, collecting data, developing a hypothesis and finding the ways of solving the problem in question. If we are to describe it in a different way, it is about the discovery, identification of a problem, hypothetical estimations, development of research methodology, collecting and analysing the data, making a decision and interpreting the results (Tasdemir and Tasdemir, 2011).

Scientific research skills can be attained through education and learning (Buyukozturk, 1994). This is because skills of accessing the information, organizing the information and establishing communication via information are considered as fundamental skills that may be instilled to individuals through education (Koseoglu et al., 2007).

According to Karasar (2007), it makes it compulsory to have a research policy in the country with high level of validity, providing a consistent "research education" and meeting other requirements, thus creating a "research-oriented society". This does not only encumber educational institutions with important duties but also requires researcher scientists to assume important responsibilities (cited from Tasdemir and Tasdemir, 2011). Research education is an education aimed at providing various scale of research information and culture required by almost everyone, from an ordinary citizen to managers and enforcers from various levels, academicians and to the highest-level scientists. Research education is aimed at adapting the scientific methodology into life. Accordingly, objective of research education is to raise individuals that possess the attitude and behaviours required by a researcher and capable of reflecting all of them into the daily life.

In the literature, research education, individual characteristics and socio-cognitive factors are shown as factors affecting the scientific research activities (Linden et al., 2015). Studies conducted in Turkey showed that teachers working as a part of the education system do not have sufficiently developed scientific research culture and requirement, and methods of access to scientific information used by teachers are usually limited with the media (Kurt, 2014). On the other hand, there are studies indicating that confidence of teacher candidates with respect to research self-efficacy is at medium-levels (cited from Ipek et al., 2010). In this case, it has been thought that the present study is very important with

respect to contributing to the literature. Scientific research skills attained by teachers and their competences on critical thinking and independent research constitute a very important dimension that may have affected the social development as a direct consequence of their occupational development and the influence they create on their students.

Objective of the study

The objective of the present study is to determine how teachers' scientific research self-efficacy and attitude towards the scientific research change based on the parameters such as gender, age and branch.

RESEARCH METHODOLOGY

The study was conducted using a Mixed (Qualitative-Quantitative) method. A single-item data collection tool was applied to teachers who participated in the study before and after the application aimed at determining the scientific research self-efficacy and attitudes of teachers towards scientific research as well as their relevant opinions. The aforementioned item says "*Please evaluate your concerns and opinions in connection with conducting a scientific research as well as your attitude towards scientific research*". The resultant data were analysed and presented in the form of a frequency table. Teachers were provided a 12-week training for two hours a week and their continuous attendance was ensured. The study was completed in 14 weeks including the 2-week scale application and interviews.

Topics of the training provided to teachers in the implementation stage of the study are as follows:

- 1-Nature of Science, History and Philosophy of Science,
- 2- Scientific knowledge and research-Access to Scientific Knowledge,
- 3-Scientific Codes of Conduct and Research Ethics,
- 4- Basic Concepts in Research and Scientific Research Methods, patterns and Data Collection Tools,
- 6- Introduction to Research and Research Plan,
7. Modelling in Research,
8. Data Analysis, Validity-Reliability,
9. Application procedure for national- international congress, National-International project development,
11. How to use SPSS software package, application procedure for Postgraduate Study Programs.
12. Academic Writing- Reporting trainings were provided by academicians who are experts in the relevant disciplines.

Data collection tools

Three different data collection tools were used in the research. One of the scales was that of Bieschke et al. (1993) Research Self-Efficacy Scale translated into Turkish by Ipek et al. (2010) who also obtained the licenses for use. In our study reliability factor of the self-efficacy scale was selected as Cronbach's Alpha 0.0954. Cronbach's alpha reliability factor indicates the reliability of the scale (Buyukozturk, 2002; Gorsuch, 1983). The second data collection tool is "Attitude Scale for Scientific Research" developed

by Korkmaz et al. (2011). Cronbach's alpha reliability factors vary between 0.765 and 0.851. Accordingly, high value of internal consistency factors and Cronbach alpha reliability factor of 0.70 and above are considered as indicators of the reliability of the scale (Buyukozturk, 2002; Gorsuch, 1983). Reliability factor of the attitude scale for research was calculated as Cronbach's Alpha 0.943. The third data collection tool is a single-item tool developed by us, used in a pilot study and validated for the purpose of the scope by three branch experts. Teachers were asked to express their opinions in writing so they can express their opinions comfortably (Yildirim and Simsek, 2000; Balci, 2009). The Quantitative Analysis of the study was made by using software package IBM SPSS-22. Wilcoxon Signed Ranks Test, MANN-Whitney U test and Kruskal Wallis Test were used in the analysis. Qualitative data were analysed by using content analysis.

Study group

Data provided in Table 1 show that, among the teachers who participated in the study, 28 are males and 16 are females. The study group consists of 15 teachers in the age of 20-24, 18 teachers in the age of 25-29, 8 teachers in the age of 30-34 and 2 teachers in the age of 35 and above. However, recode feature was utilized in SPSS data analysis and the group was considered as group above the age of 30.

Table 2 shows that 23 teachers are Science and Technology teachers, 11 teachers are Mathematics teachers, 6 teachers are Chemistry teachers; the remaining branches were coded as other branches using the recode feature of IBM SPSS-22 software. This method was used considering that it would not be possible to carry out a reliable analysis with branches having one teacher only.

FINDINGS

Wilcoxon Signed Ranks Test, one of the non-parametric tests, was used since the analysis of frequency distribution tests conducted on Preliminary Test and Final Test data from the Attitude Scale for Scientific Research and research self-efficacy test did not reveal normal distribution (Kalaycı, 2006).

Analysis of the data presented in Table 3 shows that attitude scores of all teachers towards the scientific research reveal significant differences in many items before and after the application. A positive increase was observed in the attitude scores of the teachers participated in the study towards research after the completion of the study.

Analysis of the data presented in Tables 4 and 6 shows a significant difference only in item 11 of the scale with respect to the preliminary attitude scores when attitudes of the teachers participated in the study towards scientific research are taken into consideration based on the gender parameter. The aforementioned item is in the favour of females and encompasses the wording "A scientist is a honest, knowledgeable, productive, straightforward person who also shows respect to other scientists". As there are two groups for the gender parameter, MANN-Whitney U test was used for the

Table 1. Age and gender distribution of the study group.

Gender	Percent	Frequency
Male	28	63.6
Female	16	36.4
Total	44	100
Age	percent	Frequency
20-24	15	34.9
25-29	18	41.9
30-34	8	18.6
35 and Above	2	4.7
Total	43	100

Table 2. Distribution of the study group based on branches.

Department/ Branch	f	%
Science	23	52.3
Mathematics	11	25.0
Chemistry	6	13.6
Analysis and Func..	2	4.5
Class	1	2.3
Computer	1	2.3
Total	44	100.0

analysis (Buyukozturk, 2007). No differences were found in final test scores of attitudes towards scientific research with respect to gender parameter.

Analysis of the data presented in Tables 5 and 6 shows that research self-efficacy scale preliminary test scores of teachers reveal higher scores for females under item 38 and 47 when compared with males. Research Self-Efficacy Scale Item 38 is "Ability to develop a computer program for data analysis" and item 47 is "Ability to present research outcomes orally before a group". No differences were found in the research self-efficacy final test scores based on the genders.

Analysis of the data presented in Table 7 revealed differences under item 18 and 24 in consideration of the preliminary test attitude scores based on the age parameter. Kruskal Wallis test was used for analysis purpose as there were more than two age parameters. These items provide the wording "finding research results unreliable and boredom felt about conducting a research". Teachers get bored about scientific research and they find research results unreliable as they get older.

Analysis of the attitude scores of the final test conducted after the application showed that there is a significant difference in item 18 of the attitude test in both preliminary test and final test scores (Table 8). This item

Table 3. Attitude scale ranks before and after the application (Wilcoxon Signed Ranks Test).

	finT1- preT1	finT2- preT2	finT3- preT3	finT4- preT4	finT8 - preT8	finT9- preT9	finT10- preT10	finT13- preT13	finT16- preT16	finT18- preT18	finT19- preT19
Z	-4,976 ^b	-5,133 ^c	-5,321 ^b	-5,441 ^c	-5,061 ^b	-4,755 ^c	-4,828 ^b	-5,237 ^c	-5,135 ^b	-3,219 ^c	-4,921 ^c
Sig. (2-tailed)	,000*	,000*	,000*	,000*	,000*	,000*	,000*	,000*	,000*	0,001*	,000*
	finT22 preT22-	finT23 - preT23	finT24 - preT24	finT25 - preT25	finT27 - preT27	finT28 - preT28	finT29 - preT29		finT30 - preT30		
Z	-4,402 ^b	-4,910 ^c	-4,755 ^b	-4,556 ^c	-5,197 ^c	-5,207 ^b	-3,137 ^b			-4,296 ^b	
Sig. (2-,tailed)	,000*	,000*	,000*	,000*	,000*	,000*	0,002*			,000*	

*p<0.005 a. Wilcoxon Signed Ranks Test, b. Based on negative ranks. c. Based on positive ranks. finT: Post-Application Attitude Test Score, preT: Pre-Application Attitude Test Score.

Table 4. Preliminary test attitude scores of teachers based on genders (Mann Whitney Test).

Gender	N	Mean Rank	Sum of Ranks
*Pre Attitude Test 11			
Male	28	19.41	543.5
Female	15	26.83	402.5

*Pre-application attitude test score.

Table 5. Research self-efficacy scores of teachers based on genders (Mann-Whitney Test).

	Gender	N	Mean rank	Sum of ranks
Research self-efficacy scale preliminary test item 38	Male	26	24.38	634
	Female	16	16.81	269
	Total	42		
Research self-efficacy scale preliminary test item 47	Male	17	12.26	208.5
	Female	12	18.88	226.5
	Total	29		

shows that teachers *do not rely on* scientific research. Training activities organized by us did

not prove effective outcomes in changing such attitudes of teachers.

Results of the study based on the age parameter showed that teachers do not rely on

Table 6. Self-efficacy scores and attitude preliminary test scores of teachers based on genders.

	Pre Attitude 11	**Pre Self Efficacy 38	**Pre Self Efficacy 47
Mann-Whitney U	137.500	133.000	55.500
Asymp. Sig. (2-tailed)	,028*	,041*	,033*

*p<0.005. **Research Self-Efficacy Preliminary Test.

Table 7. Preliminary test attitude scores of teachers based on Age (Kruskal-Wallis Test).

New age	N	Mean rank	
**preT14	Age of 20-24	15	27.01
	Age of 25-29	18	23.19
	Age of 30 and Above	11	15.18
	Total	44	
**preT24	Age of 20-24	14	20.14
	Age of 25-29	18	27.17
	Age of 30 and Above	11	15.91
	Total	43	
Chi-Square			
	**preT18	**preT24	
Chi-Square	6.182	6.894	
Asymp. Sig.	0.045	0.032	

*p<0.005. **Pre-application attitude test score.

Table 8. Self-efficacy and attitude final test scores of teachers based on age (Kruskal-Wallis Test).

Age	N	Mean rank	
*finT22	Age of 20-24	15	23.73
	Age of 25-29	14	22.25
	Age of 30 and Above	10	11.25
	Total	39	
*finT18	Age of 20-24	15	23.93
	Age of 25-29	14	21.71
	Age of 30 and Above	10	11.70
	Total	39	
*finT23	Age of 20-24	15	22.77
	Age of 25-29	14	22.89
	Age of 30 and Above	10	11.80
	Total	39	
**finO22	Age of 20-24	15	20.03
	Age of 25-29	14	24.75
	Age of 30 and Above	10	13.30
	Total	39	

*Final test attitude scores. ** Research self-efficacy final test scores.

Table 9. Self-efficacy and attitude preliminary test scores of teachers based on branches (Kruskal-Wallis Test).

		N	%
**preT14	Science	22	23.14
	Mathematics	11	16.09
	Chemistry	6	26
	Other	4	26
	Total	43	
***preO12	Science	23	24.33
	Mathematics	11	18.64
	Chemistry	6	14.58
	Other	4	34.5
	Total	44	
		preT14	preO12
Chi-Square		7.951	8.118
Asymp. Sig.		0.047*	0.044*

*p<0.005. **(preT) Preliminary test attitude scores, ***(preO) Research self-efficacy preliminary test scores.

the research results as the information is collected in a restricted sphere. The present study leads to positive effects particularly on teachers in the age of 30 and above with respect to finding research outcomes unreliable. Furthermore, teachers displayed involuntary attitude about providing assistance to the scientific research (Item 15). In addition, with respect to the self-efficacy, the present study revealed the fact that teachers show unwillingness about preparing reports as they get older.

Analysis of the data presented in Table 9 revealed significant differences among teachers based on the branches with respect to "continuous self-development as a scientist (preliminary attitude item 14)". We determined that Science and Technology teachers have the highest level of desire towards continuous self-development. No significant differences were observed in the test scores after the application.

Analysis of the data presented in Table 10 revealed significant difference with respect to research self-efficacy test scores of teachers under item 14 (Synthesizing the Literature) and 22 (Being open to criticism in scientific researches) based on the branches upon completion of the study.

Findings obtained from qualitative data analysis

Teachers who participated in the study were applied a single-question data collection tool before the study. The aforementioned item says "Please evaluate your concerns and opinions in connection with conducting a

Table 10. Research self-efficacy final test scores of teachers based on branches (Kruskal-Wallis Test).

		N	%
**finO14	Science	21	22.29
	Mathematics	10	12.15
	Chemistry	5	24.8
	Other	3	22.17
	Total	39	
**finO22	Science	21	24.95
	Mathematics	10	12
	Chemistry	5	17.6
	Other	3	16
	Total	39	
Chi-Square	finO14	finO22	
Chi-Square	7.885	10.225	
Asymp. Sig.	0.048*	0.017*	

*p<0.005. **Research self-efficacy final test scores.

scientific research as well as your attitude towards scientific research". The obtained data were analysed and shown in the form of a frequency table (Table 11).

The majority of the teachers stated that they do not have any knowledge on scientific codes of conduct (f=9), how to conduct a scientific research (f=20) and how to review the literature (f=9) and they showed no interest towards scientific research (f=9) prior to the present study.

Teachers who participated in the study were applied a single-question data collection tool following the completion of the study. The aforementioned item says "Please evaluate your concerns and opinions in connection with conducting a scientific research as well as your attitude towards scientific research". Obtained data were analysed and shown in the form of a frequency table (Table 12).

Majority of the teachers stated that they started to attach value to scientific research (f=16), learnt how to conduct scientific research (f=13), had their horizons broadened about being scientific individuals (f=11) and learnt about the importance of codes of conduct in connection with the scientific research (f=7) and how to review the literature upon completion of the study.

Conclusion

Differences were found in the attitudes of teachers towards scientific research before and after the study. There have been significant increases in the attitude scores of teachers who participated in the study towards research following the completion of the study. Analysis of the attitude scores of the teachers who participated in

Table 11. Preliminary interview results of teacher candidates participated in the survey.

	Theme	f
1	Lack of knowledge on how to conduct a scientific research	20
2	I do not know how to review the literature	9
3	Lack of knowledge on scientific codes of conduct	9
4	Lack of interest in scientific research	5
5	Considering scientific research as unnecessary (finding it simple)	5
6	The fear of failing with the scientific research	5
7	Lack of knowledge on how to report on the research	4
8	Struggling in determining the subject of the research	3

Table 12. Final interview results of teacher candidates participated in the survey.

	Theme	f
1	I started attaching value to scientific research	16
2	I learnt how to conduct a scientific research	13
3	My horizon about being a scientific person has been broadened	11
4	I understood the importance of codes of conduct on scientific research	9
5	My interest in scientific research increased	7
6	I learnt how to review the literature	7
7	I realized the difficulties and my concerns increased as I learnt about scientific research	6
8	I improved my self-confidence about scientific research	7
9	My concerns about scientific research have been solved	3
10	I found the education beneficial	1
11	I learnt how to present scientific research results	1

the study towards scientific research based on the gender parameter revealed significant difference in preliminary attitude scores only under one item of the scale and this item saying "*A scientist is an honest, knowledgeable, productive, straightforward person who also shows respect to other scientists*" is in the favour of females. No differences were observed in the attitude scores with respect to the gender parameter following the completion of the study.

Differences were observed under two items in preliminary test attitude scores of teachers who participated in the study based on the age parameter. These items are finding research results unreliable and boredom felt about conducting a research. Teachers get bored about scientific research and they find research results unreliable as they get older.

Analysis of the attitude scores of the final test conducted after the study showed that there is a significant difference only in item 18 of the attitude test in both preliminary test and final test scores. Results of the study based on the age parameter showed that teachers do not rely on the research results as the information is

collected in a restricted sphere. The present study leads to positive effects particularly on teachers in the age of 30 and above with respect to finding research outcomes unreliable. Furthermore, teachers displayed involuntary attitude about providing assistance to the scientific research.

In consideration of the gender parameter, research self-efficacy scale preliminary test scores of teachers revealed higher scores for females under item 38 and 47 when compared with males. Research Self-Efficacy Scale Item 38 is "*Ability to develop a computer program for data analysis*" and item 47 is "*Ability to present research outcomes orally before a group*". No differences were found in the research self-efficacy final test scores based on the genders. Although self-efficacy level of the male teacher candidates was higher than the female students, this difference was not considered significant in a study of Chaplain (2000). This result is in conflict with our study.

Significant difference was found based on the branches with respect to the continuous self-development of teachers as scientists (preliminary attitude item 14). We

determined that Science and Technology teachers have the highest level of desire towards continuous self-development. No significant differences were observed in the test scores after the application based on the branches.

Before the application, the self-efficacy results revealed that teachers show unwillingness about preparing reports as they get older. There are studies in the literature supporting our study and the findings obtained (Karagul, 1996; Karasar, 1984).

The majority of the teachers stated that they do not have any knowledge on scientific codes of conduct (f=9), how to conduct a scientific research (f=20) and how to review the literature (f=9) and they showed no interest towards scientific research (f=9) prior to the present study.

The majority of teachers stated that they started to attach value to scientific research (f=16), learnt how to conduct scientific research (f=13), had their horizons broadened about being scientific individuals (f=11) and learnt about the importance of codes of conduct in connection with the scientific research (f=7) and how to review the literature upon completion of the study.

Following the completion of the study, research self-efficacy test scores of teachers showed that significant differences were found under items being open to criticism in scientific research and synthesizing the literature. Different literature data support the data of this study (Karagul, 1996).

Conflict of Interests

The author(s) have not declared any conflict of interests.

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