Assessment of science and technology teachers' perceptions towards active learning

Article *in* International Journal of Academic Research · April 2015

DOI: 10.7813/2075-4124.2015/7-3/A.2

3 authors, including:

Meryem Nur Aydede
Ömer Halisdemir University
31 PUBLICATIONS **132** CITATIONS

SEE PROFILE

ASSESSMENT OF SCIENCE AND TECHNOLOGY TEACHERS' PERCEPTIONS TOWARDS ACTIVE LEARNING

Halil Ibrahim Ozturk[1], Meryem Nur Aydede Yalcin[2]

[1]Cukurova University, Faculty of Education, Adana
[2]Nigde University, Faculty of Education, Nigde **(TURKEY)**
mnaydede@hotmail.com

DOI: 10.7813/2075-4124.2015/7-3/A.2

Received: 16 Dec, 2014
Accepted: 04 Mar, 2015

ABSTRACT

The main aim of this study was to present whether science and technology teachers' active learning perception scores significantly changed regarding different variables (gender, age, the region where the teacher works, accommodation unit in which teacher works, years the teacher has been working and the higher education institution from which the teacher graduated). In the study, a general survey model was used. Survey sampling consisted of 430 secondary school science and technology teachers working in the 12 different regions of Turkey. Active learning perception scale was developed by researchers as a data collection tool and applied to research group. Exploratory and confirmatory factor analysis techniques were used for development of the scale and t-tests and ANOVA analysis techniques also used in the data analysis process of the study. As a result of the analysis, male teachers have a higher perception scale scores than female teachers. In addition, there is a significant difference in active learning perception scale scores of science and technology teachers regarding the accommodation unit that they work in and their service year.

Key words: Active Learning, Perception, Science Education, Science And Technology Teachers

1. INTRODUCTION

It is required for teachers, who take an active role in growing the next generation in a way that they will be able to accommodate with the changes and developments in the world, to provide students a learning environment in which they will have access to knowledge and be able to apply what they learned (Akkurt, 2007). A teacher is a knowledge transmitter, giving feedback. The person in the centre of course, therefore, is active in the course of traditional learning. In active learning, the teacher has a role of guiding to students. Teachers should not make decisions for the student, but should guide them (Palut, 2006). At the beginning of the year 2000, active learning became a topic of great interest, both in theory and in educational applications. The reason why active learning was one of the most discussed topics was that it enabled students to make arrangements they desire in the learning process beyond only playing the roles of passive listener and note-taker (Jayawardana, Hewagamage & Hirakawa, 2001; Lorenzen, 2001). As a result of the discussions, it is believed that students are required to play active and responsible roles during the learning process in active learning (Euge`ne, 2006; Lunenberg & Volman, 1999; Mattson, 2005). In other words, in active learning, students take responsibility for reaching their education and research strategies, and academic goals (Jayawardana et al., 2001; Lee, 1999). In this way, in active learning environments, the responsibility of learning is shared by the teacher and student (Lee, 1999): the teacher is also required to have an important role in active learning.

There is more than one reason why science and technology teachers are interested in active learning. First, they are aware that active learning applications prepare students for lifelong learning. Another reason is the policies that educational authorities developed on active learning in some countries. Besides, teachers are aware that they can apply the knowledge they gained in educational programmes to their own professional understanding, therefore, developing their professional life toward lifelong learning. Moreover, based on their knowledge about how people learn, teachers also recognised the efficiency of active learning on students' learning (Aydede, 2009). This is because constructive learning was emphasised as a result of the studies done in the last century by Piaget in cognitive psychology, Vygotsky in social psychology, and their followers. According to constructive learning, students form their own knowledge based on previous knowledge (Stern & Huber, 1997). Therefore, active learning, which was based on the idea that students construct knowledge on their own previous knowledge, can be said to be one of the most effective ways for students to construct their own knowledge.

Teachers are unique tools that give students the opportunity to develop positive attitudes towards science and that facilitate the learning process in the application of active learning into science and technology courses (Dufresne, Gerace, Leonard, Mestre & Wenk, 1996). The role of the teacher in active learning is not to answer all the students' questions, but to help them to solve the problems that they face as individual learners (Euge`ne, 2006; Mabrouk, 2005). Changing the a teachers' role that was a "knowledge transmitter in class" into a "facilitator of learning" increases the teacher' responsibility in class during the active learning process (Broad, Matthews & Mcdonald, 2004). In the active learning process, science and technology teachers are supposed to take on the role of guiding instead of explaining, showing and making corrections (Lunenberg & Volman, 1999).

In classes where active learning was applied, the change in student and teacher roles also affected teaching methods and techniques. Active learning provides the chance to share knowledge based on the research of the teacher and student together, facilitate modelling (ranging from answering questions to problem solving), develop creativity and to use all teaching methods and techniques to develop cooperative learning (Phillips, 2005).

As active learning affects the teaching programme and the quality of the learning environment, the first applications of this method may not be easily admitted by students. Differences in teachers' understanding of certain learning approaches will affect the concepts that students learn, their attitudes towards learning and learning outputs (Kember, Leung & Mcnaught, 2008). In addition, according to Candlin & Mercer (2001) most innovations are probably of this kind like active

learning and, indeed, most definitions of innovation make particular reference to adopters' perceptions. For this reason, it should be important for researchers to know how science teachers' perceptions change in terms of different situations to apply active learning.

There were lots of studies that focus on to determine effect of different variables on science teachers' affective domain skills like perceptions. When we searched them, the most researched variables are gender (Duztepeliler, 2006; Inonu, 2006; Stewart, Houghton & Rogers, 2012), age (Erguven, 2011; Aslan-Efe, 2013; Ciftcioglu, 2009; Inonu, 2006; Polat, 2008; Ustun, 2011), accommodation unit in which teacher works (Eskici, 2013; Ciftcioglu, 2009; Duzkaya-Kucuk, 2008), years the teacher has been working (Elyildirim, 2006; Akuzum, 2006; Bozkurt, 2012; Demiralp, 2010; Duzkaya-Kucuk, 2008; Eskici 2013; Karaoglu, 2013; Polat, 2008; Ustun, 2011) and the higher education institution from which the teacher graduated (Ciftcioglu, 2009; Duztepeliler, 2006; Erguven, 2011; Karadag, 2010; Kilinc, 2010; Kuzu, 2011; Oner, 2007 and Talaz, 2013). Therefore, we thought that these variables mentioned above may influence the teachers' perceptions towards to active learning and were searched in the study.

The main aim of the study was to present whether science and technology teachers' active learning perception scale scores significantly changed regarding assorted variables (gender, age, the region where the teacher works, accommodation unit in which teacher works, years the teacher has been working and the higher education institution from which the teacher graduated). Within this aim, the research questions follow:

- ✓ Is there a significant difference in secondary school science and technology teachers' active learning perception scores regarding their gender?
- ✓ Is there a significant difference in secondary school science and technology teachers' active learning perception scores regarding their age?
- ✓ Is there a significant difference in secondary school science and technology teachers' active learning perception scores regarding the region in which they work?
- ✓ Is there a significant difference in secondary school science and technology teachers' active learning perception scores regarding the accommodation unit that they work in?
- ✓ Is there a significant difference in secondary school science and technology teachers' active learning perception scores regarding their teaching service period or years that they have been working?
- ✓ Is there a significant difference in secondary school science and technology teachers' active learning perception scores regarding the higher education institution from which they graduated?

2. METHODOLOGY

In this research, a general survey model was used. According to Karasar (2010) a survey model is a research approach that aims to describe the cases that happened in the past or cases currently happening and how they happened (Karasar, 2010). Survey sampling consisted of 430 secondary school science and technology teachers working in Turkey. This study was carried out in the 2012–2013 educational year in Turkey. In the study, at first, the number of science and technology teachers working in cities in Turkey was demanded via official correspondence from the Ministry of Education in order to get research permission and estimate sampling. Then, according to information that the researcher got from the Ministry of Education, the features of the research population and sampling were defined. Then, the "Active Learning Perception Scale" was developed. Finally, the scale was applied to science and technology teachers.

2.1. Research Population and Sampling

The research population consisted of 26,218 secondary school science and technology teachers working in Turkey in 2013 (according to information the researchers obtained from the Turkish Ministry of Education). The teachers were working in 12 regions at the level of Turkish Statistical Institute Level 1. The researchers believed that there should be a group representing Turkey; therefore, we aimed to obtain a sample group that consisted of maximum variety and to reach secondary school science and technology teachers from all regions of Turkey. Within this aim, Turkey was stratified according to a research population stratified sampling method by using the data of Economic and Social Developmental Level 1. According to the data, Turkey is grouped into 12 regions: Northeastern Anatolia, Middle East Anatolia, Southeastern Anatolia, Istanbul, Western Marmara, Aegean, Eastern Marmara, Western Anatolia, Mediterranean, Middle Anatolia, Western Black Sea and Eastern Black Sea. These groups were created based on their economic, social, cultural and geographical similarities, while also considering the population growth of cities. After choosing stratified sampling, we tried to take samplings at the same ratio from secondary school science and technology teachers working in each stratum that was defined by the Turkish Statistical Institute by using the proportional sampling method. In order to define whether the research sample was large enough, the sampling size table for α= 0.05 that was developed by Yazicioglu and Erdogan (2004) was used. According to the table created by Yazicioglu and Erdogan (2004), the minimum number of samples that was needed was 381 for the 26,218 science and technology teachers working in Turkey. According to the proportional sampling method, in order to define the number of secondary school science and technology teachers working in each region (as defined by the Turkish Statistical Institute) needed to participate in the study, the following calculation was used: region population/total population x 381.

According to the calculation above, at the end of the study, 430 (Northeastern Anatolia (19), Middle East Anatolia (28), Southeastern Anatolia (54), Istanbul (42), Western Marmara (16), Aegean (48), Eastern Marmara (34), Western Anatolia (47), Mediterranean (62), Middle Anatolia (38), Western Anatolia (25), Eastern Black Sea (17)) secondary school science and technology teachers joined to study.

2.2. Data Collection Tool

In order to survey secondary school science and technology teachers' perceptions towards active learning the 'Active Learning Perception Scale', developed by researchers, was used. Scale development studies consisted of preparing scale items, taking expert opinions for content validity, test application, construct validity (exploratory factor analysis and confirmatory factor analysis) and reliability analysis.

2.2.1. Preparing the Scale Items

First, in order to create an item pool for the scale, the following were examined in terms of data collection tools: the article "Trainers' Attitudes on E-Learning and Face to Face Learning Towards Active Learning" by Pundak, Herscovitz &

Shacham (2010), the article "The Effect of Active Based Learning on Turkish Science Teacher Candidates' Concepts of Nature of Science" by Celik and Bayrakceken (2012), the article "Transfer of Learning Strategies Between Teacher Training Class and PreK-12 Class" by Pepper, Blackwell, Monroe & Coskey (2012), the article "The Effect of Using Active Learning Techniques in Science Courses on Perception of Undergraduate Students" by Welsh (2012), the study "The Effect of Using Instant Messaging Software in a Post Graduate Teacher Training Course for Facilitating Simultaneous Online Course Interaction" by Wang & Morgan (2008) and the study "Active Learning Perception of Students in a Big Interdisciplinary Class" by Machemer & Crawford (2007). Using the book, "Active Learning", written by Acikgoz (2009), interactions between these studies were examined. Finally, 22 positive and 13 negative (35) items that define secondary school science teachers' perceptions towards active learning were created. At the end, these items were formed as scale items.

2.3. Content Validity

In order to ensure content validity of the scale, Lawshe technique which was based on expert's opnions was used. Five experts from the Department of Primary Education Science Education, an expert from the Department of Educational Programs and Teaching and two experts from the Department of Turkish Language Teaching were sought for necessary, not necessary and should be corrected for the 35 items. Some items were added regarding experts' opinions and suggestions, some items were rearranged and some items were eliminated. As a result, 34 draft items, which were improved according to experts' opinions, d. In addition each items' Lawshe points were higher than 0.51.

Then, items were formed according to five point Likert-type as "totally agree" (5), "Agree" (4), "Neutral" (3) "Disagree" (2) "strongly disagree" and were applied to 10 secondary school science and technology teachers. During this application, teachers were asked if they had difficulty understanding any items. If so, these items were noted and corrected. Later, these items were applied to 230 secondary school science and technology teachers working nationwide during the 2012–2013 educational years.

2.4. Construct Validity

In order to ensure construct validity, both exploratory and confirmatory factor analysis were used in the study. Factor analysis is a statistical term that aims to explain assessing the variables that assess the same construct and quality by rounding them up (Buyukozturk, 2010). The construct validity of tools that were developed to assess an affective feature in behaviouristic sciences can be examined by using factor analysis (Buyukozturk, 2002). Exploratory factor analysis was used to reveal the factor construct of the scale, which was based on relationships between variables. In addition, Cronbach's Alpha was calculated. Confirmatory factor analysis was used to examine model-data cohesion and to test hypotheses regarding the relationship between variables (Fletcher, Simpson, & Thomas 2000; Ercan & Kan, 2004). During confirmatory factor analysis, the chi-squared statistics (x^2), goodness of fit (GFI), comparative fit (CFI) and root-mean-square error (RMSA) fit indexes were used.

Firstly, 34 items were applied to 230 secondary school science and technology teachers and data were transmitted to the SPSS (Statistical Package for the Social Sciences) package programme. Then, exploratory factor analysis was applied, and an unrotated principle component analysis was done. In order to assess the sufficiency of sampling, the samples were examined with KMO (Kaiser-Meyer-Olkin) and BTS (Barlett's) test. With the principal component analysis that was done as a result of the factor analysis, the KMO value of the scale was 0.93 and the BTS result was 0.000. KMO and BTS values that were obtained were allowed to be used in this study for applying factor analysis because the KMO test was bigger than 0.50, and the BTS test was highly (99% confidence interval) significant (Buyukozturk, 2002). When the eigenvalue line chart was examined as a result of the analysis, it was seen that the eigenvalue line chart could be constituted as a sole factor. The diagram below indicates (possible) factor construct, whose eigenvalue was bigger than one for "Active Learning Perception Scale"

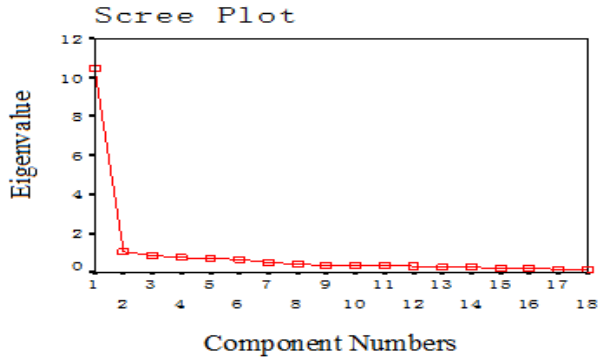

Fig. 1. *Eigenvalue-Component Numbers*

As seen in Diagram 1, the first change in eigenvalue-component numbers was at the first factor. As a result of the analysis, it was considered that factor load point should not be under.45, and the difference between item load points of the two factored scale should not be less than.10 (Buyukozturk, 2010); the items that did not comply with this rule were eliminated from this scale and factor analysis was renewed. As a result of the renewed factor analysis, KMO = 0.96 and BTS =.000 of the scale. Factor analysis results of the scale are presented in Table 1.

Table 1. Factor analysis results of active learning perception scale

Items	Factor Loads	$\overline{X}$	SS
33. Courses in which active learning applications are used are fun.	.885	1.84	1.15
7. Active learning develops my students' lifelong learning skills.	.878	1.76	1.12
2. I guide my students for their construction of knowledge.	.855	1.91	1.03
9. I support my students' research; therefore, they learn in this way.	.848	2.00	1.05
3. I encourage my students to take more responsibility for their own learning activities.	.837	1.95	1.03
8. I support my students' assessment of their own skills.	.832	2.02	1.07
6. During the active learning process, students acquire new knowledge more efficiently by using their previous knowledge and experience.	.828	1.12	1.11
25. I give opportunities to my students to communicate and interact with each other in an active learning environment.	.802	2.14	1.07
27. In active learning classes, students can easily express their opinions based on their experiences about course subjects.	.795	1.96	1.11
18. Discussions in the class environment about course subjects and the exact acquisition of course achievements play an important role for my students.	.784	2.15	1.07
34. I think my students have acquired course achievements with active learning applications.	.780	2.10	1.00
29. During the active learning process, students can use high-level thinking skills.	.752	2.07	1.09
10. I give my students opportunities to apply course achievements to daily life.	.744	2.11	1.02
***11.**Active learning cannot provide students the ability to reach new information by using their previous knowledge.	.652	2.02	1.26
30. I think teaching activities that are done with groups are more helpful than activities including all of the class.	.648	2.36	1.08
26. In an active learning environment, students create their own learning material.	.612	2.51	.9321
15. I support my students in assessing their own weaknesses.	.566	2.46	1.0296
***31.**The effort that I make during active learning applications is more than the effort I make for traditional learning.	.490	2.41	1.2151

** indicates negative statements.*

As a result of the analysis, it was concluded that the scale has a sole factor and consists 18 items, and that the scale was both valid in terms of content and construct as there is at least one item for each explanation stated in the table of specification after comparing the rest of the items to the table of specification. The scale loads, consisting of 18 items and sole factor load, were found to change between.49 and.88. Besides, arithmetic average, standard deviation, median and the highest and lowest values were found and described. Descriptive values gathered are presented in Table 2.

Table 2. Descriptive values of the active learning perception scale

Factor	Item Number	N	$\overline{X}$	Ss	Minimum Score	Maximum Score
F1	18	230	37.86	15.00	18	90

When Table 2 is examined, it can be seen that the average mean of the scale that consisted of 18 items was 87.86, and the standard deviation of the scale was 15.00. The minimum score gained from the sole factor was 18 and the maximum score was 90.

Cronbach's Alpha coefficient was calculated based on item analysis in order to define the reliability of the scale (Buyukozturk, 2002). Cronbach's Alpha was found to be 0.96 for the sole factor. It was discovered that the scale met 58.22% of the total variance. Confirmatory factor analyses based on a structural equation model in order to test the relevancy of one-dimensional structure, reached by exploratory factor analysis, were carried out. Confirmatory factor analyses were used with the aim of confirming how the structure of the scale is, based on results obtained from an assessment instrument that was created to assess an unknown theoretical structure (Erkus, 2003). Within this aim, confirmatory factor analyses were carried out using the LISREL programme on 18 of the scale items that were applied to 120 teachers. In Table 5, fit indexes, gathered as a result of confirmatory factor analysis, are presented.

Table 3. Confirmatory factor analysis fit indexes of the scale

x^2	Df	*p*	x^2/Df	GFI	CFI	RMSA
198.81	132	.000	1.506	.80	.94	.076

When we look at fit indexes of the model created for confirmatory factor analysis for total sampling, it can be seen that it has an acceptable fit: the x^2 value was 198.81 (df:132; p<0.000), the x^2 / *df* value was below three, and, as the GFI value was 0.80, the CFI value was.94 and the RMSEA value was.076. The path diagram indicates standardised coefficients between item latent variable and latent variables.

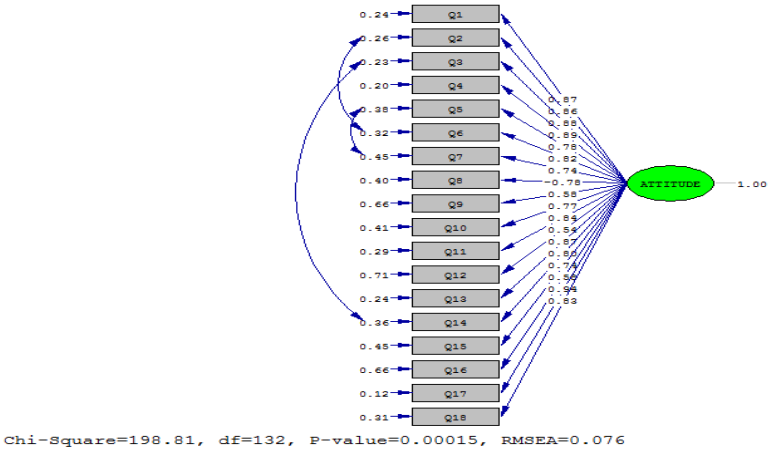

Fig. 2. *Path Diagram Regarding Confirmatory Factor Analysis*

In Diagram 1, standardised values belonging to the perception survey regarding active learning were indicated. Standardised analysis values give us opinions on how good a representative was the own latent variable of each item (observed variable). When we take a look at the parameter value standardised in the diagram, question 33 (courses in which active learning applications are used are fun) was the item that most affected attitude factor with a.88 factor load. The least affecting factor was question 31 (the effort that I make during active learning applications is more than the effort I make for traditional learning), with a.53 factor load.

2.5. Data Analysis

Whether data gathered for each variable indicated a normal distribution or not was examined and analysed with Shapiro-Wilk and Kolmogorov-Smirnov tests. As a result of the examination, all variables (in construct and application phases) were found to indicate a normal distribution ($p \geq .05$), and parametric tests were used. Lawshe technique was used for the content validity phase. Exploratory and confirmatory factor analysis techniques were used for development of the "Active Learning Perception Scale", which was developed during the study. T-tests and ANOVA analysis techniques also were used in the study. The analysis was carried out with SPSS and LISREL (linear structural relations) analysis programmes.

3. FINDINGS

Findings are presented according to research questions below.

Differences in ALP (Active Learning Perception) towards Gender Scores

Data that was obtained as a result of the t-test that was developed to define the perceptions of the secondary school science and technology teachers towards active learning regarding gender, which is the first sub-problem of the research, are presented in Table 4.

Table 4. Arithmetic average, standard deviation values and t-test results of active learning perception scale

Gender	N	$\overline{X}$	Ss	Sd	T	*p*
Female	204	37.64	11.86	428	2.795	.019
Male	226	41.17	14.06			

It was found that there is a significant difference (p=.019) between female and male science and technology teachers regarding their active learning perception scale scores; these differences are in favour of male teachers.

Differences in ALP towards Age Scores

Data that was obtained as a result of the ANOVA that was developed to state the perceptions of secondary school science and technology teachers towards active learning regarding age, which is the second sub-problem of the research, are presented in Table 5.

Table 5. Arithmetic average and standard deviation values of active learning perception scale regarding age

Age Range	N	$\overline{X}$	Ss
21–25	51	40.5686	16.03653
26–30	146	39.3219	12.87228
31–35	89	39.8539	13.31570
36–40	60	37.2667	9.05326
41–45	33	35.4545	10.00653
46–50	20	40.5000	13.50828
51–55	31	45.4839	16.67707
Total	430	**39.4953**	**13.16751**

When table 5 was examined, it was found that the highest average score of the scale belongs to ages of 51 and 55 years old teachers, and the lowest score belonged to the teachers between the ages of 41 and 45. In order to test whether the differences between the scores of the teachers in the research group regarding their ages in the perception scale were significant, ANOVA results are given in Table 6.

Table 6. ANOVA results for perception scale scores regarding age

Source of Variance	Total of Squares	SD	Average of Squares	F	*p*
Between groups	2043.353	6	340.559	1.991	.066
Within groups	72338.138	423	171.012		
Total	**74381.491**	**429**			

It is understood that the main group effect is not significant according to the result of the ANOVA that is given in Table 6 [F(6–423)=1.991, *p*>.05]. In other words, there is no significant difference between the average scores of the scale and ages of the teachers towards active learning perception.

Differences in ALP towards the Region that the Teachers Work in

Data that were obtained as a result of an ANOVA that was developed to state whether there was a significant difference between the perception of secondary school science and technology teachers towards active learning regarding the region in which they work, which is the third sub-problem of the research, are presented in Table 7.

Table 7. Arithmetic average and standard deviation values of active learning perception scale regarding the region in which teachers work

Age	N	$\overline{X}$	Ss
Northern Anatolia	19	45.2500	17.92472
Middle Anatolia	28	41.0833	15.17124
Southeastern Anatolia	54	40.0833	12.86234
Istanbul	42	42.9545	16.50246
Western Marmara	16	41.6667	17.24336
Aegean	48	37.4167	13.94493
Eastern Marmara	34	39.5161	11.30154
Western Anatolia	47	37.5132	8.44826
Mediterranean	62	38.0323	13.20080
Middle Anatolia	38	39.6557	12.98574
Western Black Sea	25	35.5882	8.33711
Eastern Black Sea	17	48.8824	18.39117
Total	430	**39.4953**	**13.16751**

When Table 7 was examined, it was found that the highest average score belonged to teachers in the Eastern Black Sea region, and the lowest score belonged to teachers in the Western Black Sea region. In order to test whether the differences between the scores of the teachers regarding the region in which they work were meaningful or not, an ANOVA results are given in Table 8.

Table 8. The results of the ANOVA for active learning perception scale regarding the region in which teachers work

Source of Variance	Total of Squares	SD	Average of Squares	F	*p*
Between Groups	3192.136	11	290.194	1.704	.070
Within groups	71189.355	418	170.309		
Total	**74381.491**	**429**			

It is understood that the main group effect is not significant regarding the result of the ANOVA in Table 8 F(11–418)=1.704, *p*>.05]. In other words, there is no significant difference between the average scores of the teachers regarding active learning and the region in which they work.

Differences in ALP towards Accommodation Unit

An ANOVA analysis was used to state the perception of secondary school science and technology teachers towards active learning regarding the accommodation unit that they work in, which is the fourth sub-problem of the research. The results are presented in Table 9.

Table 9. Arithmetic average and standard deviation values of active learning perception scale regarding teachers' accommodation unit

Accommodation Unit	N	$\overline{X}$	Ss
City (Centre)	171	38.1988	10.77340
City (County in the Centre)	60	39.3167	12.71392
County	118	38.3644	13.04212
District	17	46.0000	18.90106
Town	12	44.2500	19.99602
Village	52	43.3077	15.91095
Total	**430**	**39.4953**	**13.16751**

When Table 9 was examined, it was found that the highest average score belonged to the teachers whose accommodation units were in a district, and the lowest scores belonged to the teachers whose accommodation units were in the city (centre). In order to test whether the differences between the scores of the teachers in the research group according to their accommodation unit in the perception scale are significant or not, ANOVA and a Bonferroni test results are given in Table 10.

Table 10. The results of the ANOVA for active learning perception scale regarding the accommodation unit in which teachers work

Source of Variance	Total of Squares	SD	Average of Squares	F	*p*	Bonferroni
Between Groups	2186.610	5	437.322	2.568	.026	City-District
Within Groups	72194.881	424	170.271			City-Village
Total	**74381.491**	**429**				County-District
						County-Village

It is understood that the group main effect is significant according to the results of the ANOVA that is given in Table 10 [F(5–424)=2.568, $p<.05$]. In other words, there is a significant difference between the average scores of the teachers in the research group regarding active learning and the accommodation unit in which they work. When considering the Bonferroni test, the results showed that these differences resulted in favour of the district when we compared the city and the country. When we compared the city and the village, the results were in favour of the village. When comparing the county and the district, the results are in favour of the district. When comparing the village and the county, they were in favour of the village.

Differences in ALP towards Service Duration

An ANOVA analysis was used to discover the perception of secondary school science and technology teachers towards active learning concerning their service duration in the teaching profession, which is the sixth sub-problem of the research. Data are presented in Table 11.

Table 11. Arithmetic average and standard deviation values of active learning perception scale regarding their service duration

Service Duration	N	$\overline{X}$	Ss
1–5 years	153	38.6340	12.41749
6–10 years	100	41.8200	16.16105
11–15 years	69	38.4058	9.62277
16–20 years	47	35.9574	9.70871
21–25 years	27	38.2963	12.36252
26–30 years	11	48.0000	18.78297
31+	23	42.9565	14.33203
Total	430	**39.4953**	**13.16751**

When Table 11 was examined, it was found that the highest average score belonged to the teachers in service between 26 and 30 years, and the lowest scale score belonged to the teachers that were in service between 16 and 20 years. In order to test whether the differences between the scores of the teachers in the research group regarding their service duration are significant or not, an ANOVA and a Bonferroni test were used. Results are given in Table 12.

Table 12. The results of the ANOVA for active learning perception scale scores regarding the service duration in their teaching profession

Source of Variance	Total of Squares	SD	Average of Squares	F	*p*	Bonferroni
Between Groups	2434.089	6	405.681	2.385	.028	1–5 and 26–30 years
Within groups	71947.402	423	170.088			6–10 and 16–20 years
						11–15 and 26–30 years
Total	**74381.491**	**429**				16–20 and 26–30
						31+ years

It is understood that the main effect is meaningful according to the results of the ANOVA in Table 12 [F(6–423)=2.385, $p<.05$]. In other words, there is a significant difference between the active learning perception scale average scores of the teachers and learning and their service duration in their teaching profession. When Bonferroni test results are examined, this difference resulted in favour of the teachers that were in service between 26 and 30 years, as compared with the teachers that were in service between 1 and 5 years. When we compare the teachers that were in service for 6–10 years with the teachers that were in service for 16–20 years, the results are in favour of the teachers that were in service for 6–10 years. When we compared the teachers that were in service for 11–15 years with teachers that were in service for 26–30 years, the results were in favour of the teachers that were in service for 26–30 years. When we compared the teachers that were in service for 16–20 years with 31+ years, the results are in favour of the teachers that were in service for 31+ years.

Differences in ALP towards the Graduation Case of Undergraduate

An ANOVA analysis was used to find the perception of secondary school science and technology teachers towards active learning regarding the higher education institution from which the teacher graduated, which is the sixth sub-problem of the research. Data are presented in Table 13.

Table 13. Arithmetic average and standard deviation values of active learning perception scale scores regarding the higher education institution from which the teacher graduated

Type of Faculty	N	$\overline{X}$	Ss
Education Faculty	347	39.2622	12.94309
Science- Literature	33	37.2727	10.94667
Science-Literature + Pedagogic Training	25	39.5600	12.57338
Education Institute	25	45.6000	17.88388
Total	**430**	**39.4953**	**13.16751**

When Table 13 was examined, it was found that the highest average score belonged to the teachers that graduated from an education faculty, and the lowest score belonged to the teachers that graduated from a science literature faculty. In order to test whether the differences between the scores of the teachers in the research group regarding the higher education institution from which the teacher graduated in the perception scale were significant, an ANOVA was used. The results are given in Table 14.

Table 14. The results of the ANOVA for the active learning perception scale scores of teachers in the research group regarding the higher education institution from which the teacher graduated

Source of Variance	Total of Squares	SD	Average of Squares	F	*p*
Between Groups	1113.650	3	371.217	2.158	.092
Within Groups	73267.841	426	171.990		
Total	**74381.491**	**429**			

It is understood that the main effect is not significant according to the results of the ANOVA in Table 15 [F(3–426)=2.158, *p*>.05]. In other words, there is no significant difference between the active learning perception scale average scores of the teachers and the higher education institution from which the teacher graduated.

4. DISCUSSION

In this study, which aimed to assess secondary school science and technology teachers' perceptions towards active learning, firstly, teachers' perception scores for active learning were examined according to their gender. As a result of the analysis, it was discovered that there is a significant difference between female and male science and technology teachers' active learning perception scale scores regarding active learning. According to data gathered, it can be said that male secondary school science and technology teachers have a higher perception in terms of active learning when compared to female secondary school science and technology teachers. This result means that gender has an impact on perceptions of secondary school science and technology teachers towards active learning, and this impact is also on male variance. For this reason female teachers should be supported to use active learning and Ministry of Turkish education should give priority of female teachers in active learning based in-service education programs in Turkey. In literature reviewed for this finding, Duztepeliler (2006) concluded that male English teachers received higher scores when compared to female English teachers regarding the use of active learning strategies. Inonu (2006) and Stewart, Houghton & Rogers (2012) discovered that there was a meaningful significance in terms of gender of teachers or teacher candidates.

Perceptions of science and technology teachers' towards active learning change regarding their age range was another research topic of the study. As a result of the analysis carried out, it was ascertained that there was no significant difference in active learning perception scale scores of science and technology teachers regarding their age range. Regarding this finding, Erguven (2011) found that age did not have an impact on teachers' reflective thinking skills. Hazari, Brown & Rutledge (2013) concluded that age did not affect perception in their study about students' active learning perception. Aslan-Efe (2013), Ciftcioglu (2009), Inonu (2006), Polat (2008) and Ustun (2011) found that there was not a significant difference in their studies on teachers' ages. Based on these results, it can be said that age does not have an impact on perceptions of secondary school science and technology teachers towards active learning.

Regarding whether there was a significant difference concerning perceptions of secondary school science and technology teachers towards active learning or not, it was concluded that there was no significant difference in active learning perception scale scores of science and technology teachers regarding the region that they work. Based on this result, it can be said that the region that teachers work does not have an impact on perceptions of secondary school science and technology teachers towards active learning. For this reason we can conclude that active learning can be applied everywhere when teachers want. Inadequacy of the school conditions cannot be a barrier to apply active learning.

Another research topic in the study was whether there was a significant change in perception of science and technology teachers towards active learning regarding their accommodation unit in which they work. As a result of the analysis carried out, it was concluded that there was a significant difference in active learning perception scale scores of science and technology teachers regarding their accommodation unit in which they worgk. In a literature review made regarding this finding, Eskici (2013) found that there was a significant difference in self-efficacy perception of teachers towards a constructivist approach regarding the accommodation unit in which they work. In addition, Ciftcioglu (2009) and Duzkaya-Kucuk (2008) concluded that there was a significant difference in terms of teachers' accommodation unit in terms of different affected domain variables. Based on these results, it can be said that the accommodation unit that teachers work in has an impact on perceptions of secondary school science and technology teachers towards active learning. The most successful accommodation units were district, village and town.

It was also researched whether there was a significant difference in the perception of secondary school science and technology teachers towards active learning regarding their service period. As a result of the analysis, it was concluded that there was a significant difference in active learning perception scale scores of science and technology teachers regarding their service year. In the literature review for this finding, Elyildirim (2006) found that there was a statistically significant difference in average grades of teachers' sufficiency in the usage of teaching methods regarding their professional seniority. In addition, Akuzum (2006) concluded that there was a significant difference in opinions about the convenience of professional seniority to teacher trainee programmes in terms of aim and content. Moreover, Bozkurt (2012) concluded that

teachers significantly differed in terms of their experience according to their perception of sufficiency. In addition, Demiralp (2010), Duzkaya-Kucuk (2008), Eskici (2013), Karaoglu (2013), Polat (2008) and Ustun (2011) concluded in their study that teachers' professional seniority changed according to the research topic studied. Based on these results, it can be said that the service period of teachers has an impact on perceptions of secondary school science and technology teachers towards active learning.

Another variable that was researched during this study was active learning perception scale scores of science and technology teachers according to their higher education profile. It was determined that there was no significant difference in active learning perception scale of science and technology teachers regarding the variable of higher education graduation. In the literature review, Ciftcioglu (2009), Duztepeliler (2006), Erguven (2011), Karadag (2010), Kilinc (2010), Kuzu (2011), Oner (2007) and Talaz (2013) concluded that there was no significant difference in teachers' higher education graduation regarding active learning. Based on these results, it can be said that higher education graduation does not have an impact on perceptions of secondary school science and technology teachers towards active learning.

5. SUGGESTIONS

When perceptions of secondary school science and technology teachers towards active learning were examined in terms of different variables, possible suggestions emerged:

- ✓ The study can be carried out in different fields (social sciences, mathematic etc.) or educational departments.
- ✓ The research can be conducted again after 5–6 years in order to determine if there was a change in perceptions in the new generation of secondary school science and technology teachers towards active learning.
- ✓ The research was carried out during the 2012–2013 educational year. Research durations that are longer can also be carried out. Therefore, more teachers can be reached.
- ✓ In this study, the 'Active Learning Perception Scale' was used. Teachers' opinions can be sought with structured or semi-structured interview forms in order to expand the study.
- ✓ The number of the female teachers for in-service training programs based on active learning should be increased.
- ✓ Teachers works in the cities should be encouraged to utilize active learning in their classrooms.

Note: This study includes findings reached in a section of Halil Ibrahim OZTURK's Higher Education Thesis Study.

ACKNOWLEDGMENTS

We give thanks to the Turkish Ministry of Education as they made it easier for us to get a large enough research sample for the study. In addition, we thank Sami Pektas for his help in data analysis during the scale development stage of research.

REFERENCES

1. Acikgoz-Un, K. (2009). *Aktif ogrenme.* (11th baski). Izmir: Bilis Publication.
2. Akkurt, N. D. (2007). *Aktif ogrenme tekniklerinin lise birinci sinif ogrencilerinin ekoloji ve cevre kirliligi konusunu ogrenme basarilarina ve cevreye yonelik tutumlarina etkisi.* Unpublished Master Thesis, Gazi Universitesi, Egitim Bilimleri Enstitusu, Ankara.
3. Akuzum, C. (2006). *Ogretmen yetistirme geleneginin guncel durusuna iliskin ogretmen / ogretim elemani goruslerinin degerlendirilmesi*. Unpublished Master Thesis, Dicle Universitesi Sosyal Bilimler Enstitusu, Diyarbakir.
4. Aslan-Efe, H. (2013). *Turkiye ve isvicre'deki fen alanlari ogretmen adaylarinin ogretim teknolojilerine yonelik kaygi, tutum ve oz yeterlilik acisindan karsilastirilmalari.* Unpublished PhD Thesis, Dicle Universitesi Fen Bilimleri Enstitusu, Diyarbakir.
5. Aydede, M. N. (2009). *Aktif ogrenme uygulamalarinin ogrencilerin kendi kendine ogrenme ve elestirel dusunme becerileri ile oz yeterlilik inanclarina ve erisilerine etkisi*. Unpublished PhD Thesis, Dokuz Eylul Universitesi Egitim Bilimleri Enstitusu, Izmir.
6. Bandiera, M., & Bruno, C. (2006). Active/cooperative learning in schools. *Journal of Biological Education*, *40*, 130-134.
7. Broad, M., Matthews, M., & Mcdonald, A. (2004). Accounting education through an online-supported virtual learning environment. *Active Learning in Higher Education*, *5*(2), 135-151.
8. Bozkurt, I. (2012). *Ilkogretim ogretmen ve ogretmen adaylarinin matematik ogretimi yeterlik algilarinin bir karsilastirmasi*. Unpublished Master Thesis, Erzincan Universitesi Fen Bilimleri Enstitusu, Erzincan.
9. Buyukozturk, S. (2002). Faktor analizi: Temel kavramlar ve olcek gelistirmede kullanimi. *Kuram ve Uygulamada Egitim Yonetimi Dergisi*, *32*, 470-483.
10. Buyukozturk, S. (2010). *Sosyal bilimler icin veri analizi el kitabi.* (12th baski). Ankara: Pegem Akademi.
11. Candlin, C & N. Mercer. (2001). *English Language Teaching in its Social Context*. New York : Routledge.
12. Celik, S., & Bayrakceken, S. (2012). The influence of an activity-based explicit approach on the Turkish prospective science teachers' conceptions of the nature of science. *Australian Journal of Teacher Education*, *37*(4), 75-95.
13. Ciftcioglu, R. (2009). *Ilkogretim besinci sinif fen ve teknoloji dersi ogretim programinin uygulanmasina yonelik ogretmen goruslerinin incelenmesi*. Unpublished Master Thesis, Kahramanmaras Sutcu Imam Universitesi Sosyal Bilimler Enstitusu, Kahramanmaras.
14. Demiralp, D. (2010). *Ilkogretim birinci kademe programlarinin ogrencilerin yansitici dusunmelerini gelistirmeye etkisine yonelik ogretmen gorusleri (Elazig ili ornegi).* Unpublished Master Thesis, Firat Universitesi Sosyal Bilimler Enstitusu, Diyarbakir.
15. Eskici, M. (2013). *Ilkogretim ogretmenlerinin yapilandirmaci yaklasima iliskin oz yeterlik algilari ile tutumlari*. Unpublished PhD Thesis, Abant Izzet Baysal Universitesi Egitim Bilimleri Enstitusu, Bolu.

16. Dufresne, J. R., Gerace, W. J., Leonard, W. J., Mestre, J. P., & Wenk. L. (1996). Classtalk: A classroom communication system for active learning. *Journal of Computing in Higher Education*, *7*, 3-47.
17. Duzkaya-Kucuk, N. (2008). *Ilkogretim II. kademe fen ve teknoloji dersi ogretmenlerinin egitim - ogretim surecinde yeterliklerinin bazi degiskenlere gore incelenmesi*. Unpublished Master Thesis, Cukurova Universitesi Sosyal Bilimler Enstitusu, Adana.
18. Duztepeliler, Z. (2006). *Ingilizce ogretmenlerinin derse baslamada etkin ogrenme stratejilerini uygulama durumlari*. Unpublished Master Thesis, Anadolu Universitesi, Eskisehir.
19. Elyildirim, U. Y. (2006). *Ilkogretim okullarinda gorev yapan ogretmenlerin ogretim yontemlerini kullanma yeterlilikleri (Kars ili ornegi)*. Unpublished Master Thesis, Kafkas Universitesi Sosyal Bilimler Enstitusu, Kars.
20. Erguven, S. (2011). *Ogretmenlerin yansitici dusunme becerilerinin cesitli degiskenler acisindan incelenmesi*. Unpublished Master Thesis, Nigde Universitesi Sosyal Bilimler Enstitusu, Nigde.
21. Euge`ne, C. (2006). How to teach at the university level through an active learning approach? *Consequences for Teaching Basic Electrical Measurements, 39*(10). 936-946.
22. Ercan, I., & Kan, I. (2004). Olceklerde guvenirlik ve gecerlik. *Uludag Universitesi Tip Fakultesi Dergisi*, *30*(3), 211-216.
23. Erkus, A. (2003). *Psikometri uzerine yazilar.* Ankara: Turk Psikologlar Dernegi Yayinlari
24. Fletcher, G. J. O., Simpson, J. A., & Thomas, G. (2000). The measurement of perceived relationship quality components: A confirmatory factor analytic study. *Personality and Social Psychology Bulletin, 26,* 340-354.
25. Hazari, S., Brown, C. O., & Rutledge, R. (2013). Investigating marketing students' perceptions of active learning and social collaboration in blogs. *Journal of Education for Business*, *88*(2), 101-108.
26. Inonu, Y. (2006). *Tarih Ogretmenlerinin yansitici ogretmen ozelliklerine sahiplik duzeyi (Van ornegi).* Unpublished Master Thesis, Yuzuncu Yil Universitesi Sosyal Bilimler Enstitusu, Van.
27. Jayawardana, C., Hewagamage, K. P., & Hirakawa, M. (2001). Personalization tools for active learning in digital libraries. *The Journal of Academic Media Librarianship, 8*(1), 1-19.
28. Karadag, M. (2010). *Sosyal bilgiler ogretmenlerinin yansitici dusunme duzeylerinin incelenmesi (Sanliurfa ili Ornegi)*. Unpublished Master Thesis, Cukurova Universitesi Sosyal Bilimler Enstitusu, Adana.
29. Karasar, N. (2010). *Bilimsel arastirma yontemi*. (21st baski). Ankara: Nobel Yayin Dagitim.
30. Karaoglu, A. (2013). *Ilkogretim II. kademe teknoloji ve tasarim dersine iliskin ogretmen, ogrenci gorusleri ve beklentileri (Batman ili ornegi)*. Unpublished Master Thesis, Marmara Universitesi Fen Bilimleri Enstitusu, Istanbul.
31. Kember, D., Leung, D.Y.P., & Mcnaught, C. (2008). A workshop activity to demonstrate that approaches to learning are influenced by the teaching and learning environment. *Active Learning in Higher Education*, *9*, 43-56.
32. Kilinc, H. (2010). *Ilkogretim birinci ve ikinci kademe ogretmenlerinin yansitici dusunme egilimleri (Elazig ili ornegi)*. Unpublished Master Thesis, Firat Universitesi Sosyal Bilimler Enstitusu, Diyarbakir.
33. Kuzu, S. (2011). *Fen bilgisi ogretmenlerinin yansitici dusunmeye iliskin goruslerinin degerlendirilmesi (Sirnak ili ornegi)*. Unpublished Master Thesis, Dicle Univ.,i Sosyal Bilimler Enstitusu, Diyarbakir.
34. Lee, J. A. N. (1999). *Incorporating active-learning into a web-based ethics course.* 29th Annual Frontiers in Education Conference Proceedings, Blacksburg, VA.
35. Lorenzen, M. (2001). Active learning and library instruction. *Michigan State University*. Retrieved from http://www.libraryreference.org/activebi.html
36. Lunenberg, M. L., & Volman. M. (1999). Active learning: Views and actions of students and teachers in basic education. *Teaching and Teacher Education, 15*, 431-445.
37. Mabrouk, P. A. (2005). Addressing faculty objections to the implementation of active learning strategies in the analytical chemistry course. *ABCs of Teaching Analytical Science*, *383*, 365–367.
38. Machemer, P. L., & Crawford, P. (2007). Student perceptions of active learning in a large cross-disciplinary classroom. *Active Learning in Higher Education*, *8*(1), 9-30.
39. Mattson, K. (2005). Why "active learning" can be perilous to the profession. *Academe*, *91*(1), 23-26.
40. Palut, Z. O. (2006). *Fen ogretiminde aktif ogrenmenin kavram yanilgilarini gidermeye etkisi.* Unpublished Master Thesis, Marmara Universitesi Egitim Bilimleri Enstitusu, Istanbul.
41. Pepper, K., Blackwell, S., Monroe, A., & Coskey, S. (2012). Transfer of active learning strategies from the teacher education classroom to prek-12th grade classrooms. *Current Issues in Education*, *15*(3), 1-23.
42. Pundak, D., Herscovitz, O., & Shacham, M. (2010). Attitudes of face-to-face and e-learning instructors toward "active learning". *European Journal of Open, Distance and E-Learning*. Retrived from http://www.eurodl.org/?p=current&article=412
43. Polat, H. (2008). *Ilkogretim I. kademe ogretmen, ogrenci ve velilere gore egitim, okul, ogrenci, ogretmen, cocuk kavramlarina iliskin goruslerin yapilandirmaci egitim anlayisina gore degerlendirilmesi.* Unpublished PhD Thesis, Marmara Universitesi Egitim Bilimleri Enstitusu, Istanbul.
44. Stewart, A. C., Houghton S. M., & Rogers, P. R. (2012). Instructional design, active learning and student performance: Using a trading room to teach strategy. *Journal of Management Education, 36*(6), 753-776.
45. Talaz, G. (2013). *Sinif ogretmenlerinin fen ve teknoloji dersinde aktif ogrenme etkinliklerini uygulama durumlari*. Unpublished Master Thesis, Dokuz Eylul Universitesi Egitim Bilimleri Enstitusu, Izmir.
46. Oner, A. (2007). *Sinif ogretmenlerinin matematik derslerinde aktif ogrenme etkinliklerini uygulama durumlari*. Unpublished Master Thesis, Osmangazi Universitesi Sosyal Bilimler Enstitusu, Eskisehir.
47. Ustun G. (2011*). Sinif ogretmenlerinin yansitici dusunme egilimleri ile demokratik tutumlari arasindaki iliskinin incelenmesi*. Unpublished Master Thesis, Marmara Universitesi Egitim Bilimleri Enstitusu, Istanbul.
48. Welsh, A. J. (2012). Exploring undergraduates' perceptions of the use of active learning techniques in science lectures. *Journal of College Science Teaching*, *42*(2), 80-87.
49. Wang, L. C. C., & Morgan W. R. (2008). Student perceptions of using instant messaging software to facilitate synchronous online class interaction in a graduate teacher education course. *Journal of Computing in Teacher Education*, *25*(1), 15-21.
50. Yazicioglu, Y., & Erdogan, S. (2004). *Spss uygulamali bilimsel arastirma yontemleri.* Ankara: Detay Publication.