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INVESTIGATION OF TEACHER SCIENCE DISCIPLINE SELF-CONFIDENCE ABOUT THEIR TECHNOLOGICAL PEDAGOGICAL CONTENT KNOWLEDGE (TPACK)

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Abstract:
The aim of this study is to determine about the Technological Pedagogical Content Knowledge (TPACK) self confidence level of physics, chemistry, biology and science teachers and to analyze if the level of self–confidence changes according to gender, joining to a technological education before, branch, education level, worked institution and service period. Scanning method is used for the research. Working group of this research consists of 87 teachers from different institutions and branches. For data collection, "Technological Pedagogical Content Knowledge Self–Confidence Scale (TPACKSC), which is adapted to Turkish from original scale by Graham, Burgoyne, Cantrell, Smith & Harris (2009) and tested for validity and reliability by Timur & Tasar (2011), is preferred. As a result of the study, it is stated that teachers' TPACK level is very high. On the other hand, it is seen that self-confidence level of teachers joined to research does not have a statically logical ($p>0.05$) difference according to their sex, worked institution, joining to a technological education before and they have a statistical logical ($p<0.05$) difference related with the branch, service period and education level.

Keywords: technological pedagogical content knowledge (TPACK), science teacher, technology and pedagogy, self–confidence

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Introduction

Drastically improvements on technology during 21st century became the reason for various innovations for Turkey or for other countries on education and training areas. This situation made the profiles of teacher training institutions, school administrators, teachers, students and parents change. When the innovations of technology are analyzed, it is seen that they are on the areas of pedagogy, human and performance (Fording, 2006). It is stated that positive results that technology will bring to education are not only enough with technological changes (Koehler & Mishra, 2005), but also this situation of teachers' using technology has the potential to change the education (Carr, Jonassen, Litzinger & Marra, 1998). Quality, experience and efficiency of instructors on planning and applying in-class teaching activities have a huge importance (Demir & Bozkurt, 2011). According to Shulman (1987) ''*teacher efficiencies should have information headings like field information, pedagogic information, pedagogic field information, curriculum information, teacher quality information, educational context information, educational prints, aims, values, philosophical and historical bases*.'' Koehler and Mishra (2005) by incorporating the concept of technological competence of the teachers have formed the framework of Technological Pedagogical Content Knowledge. According to the description by Mishra and Koehler (2006), TPACK is a kind of information that is more than the blend of technology, pedagogy and field; is an improving information type. With a wider description, TPACK is "*A pack of information about showing concepts with technology; using technology positively in order to teach information with pedagogical techniques; what makes concepts easy or hard and what kind of technology will help to students for solving the problems that they encounter; learners' pre information and information theories; how can technology be used in order to improve new information theories with depending on existing information or strengthen old information*" (Mishra & Koehler, 2006; Koehler & Mishra, 2009). TPACK concept puts the concepts that teacher information should include in order to create an effective integration of technology and education (Ovez & Akyüz, 2013).

TPACK; is created with three main knowledge; Technological Knowledge (TK), Pedagogical Knowledge (PK), Content Knowledge (CK) and relationship components of these knowledge.

TK is knowledge about various Technologies from the most basic lesson materials to mostly improved digital technologies (Pamuk, Ülken & Dilek, 2012). PK is the knowledge that includes how to teach a knowledge domain to a student, lesson plan, class management and teaching strategies (Wetzel, Foulger & Williams, 2008-2009). CK is the knowledge about what is the teacher going to teach about the subject

domain to learners (Mishra & Koehler, 2006; Wetzel & et al., 2008-2009; Baran, Chuang & Thompson, 2011).

PCK is the knowledge about strong similarities; drawings, examples, explanations and visuals that teacher uses during teaching subject field (Shulman, 1986). TCK is the knowledge that enables teachers to transmit the subject into technological platform by using technological tools (Koehler & Mishra, 2009; Kereluik, Mishra & Koehler, 2011; Pamuk et al., 2012). TPACK frame that explains the relationship between TPACK and its dimensions is given as Figure 1 (Koehler & Mishra, 2005).

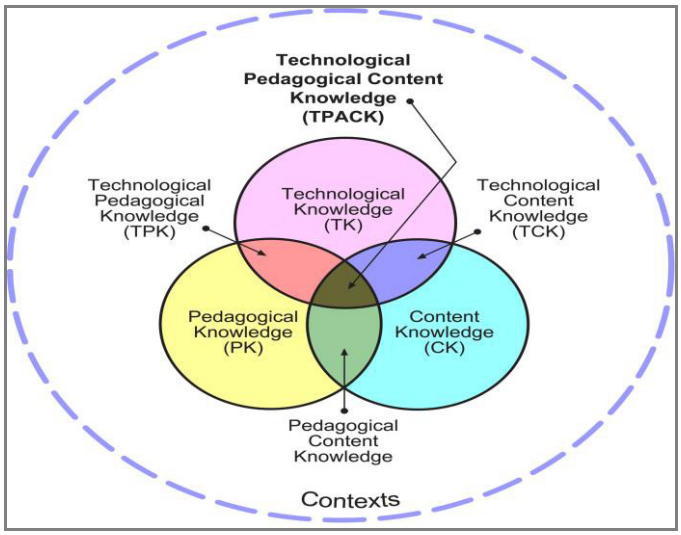

Figure 1: Technological Pedagogical Content Knowledge (TPACK Model)

It is seen that during recent years in Turkey, many investments are performed to technological infrastructure of schools in order to integrate technological developments with the field of education. Yet, as a result of performed researches, it is stated that education technologies are not integrated into education process efficiently (Çiftçi, Taşkaya & Alemdar, 2013; Kayaduman, Sırakaya & Seferoğlu, 2011). For the solution of this problem, the importance of application and research studies come forward for teacher candidates on teacher education programs and working instructors to integrate technology to their branches efficiently (Baran & Canbazoglu Bilici, 2015).

Because of the contributions to teacher qualifications on TPACK's integration to education; when the field literature is analyzed, its seen that researches are mostly about teacher candidates (Canbazoğlu Bilici, 2012; Ozgen, Narlı & Alkan, 2013; Tokmak, Konakman & Yelken, 2013; Ovez & Akyüz, 2013; Meriç, 2014; Açıkgül & Aslaner, 2015). On the other hand, it is clear that there are also studies on scale improvement for TPACK (Doğan, 2010; Sahin, 2011; Canbazoglu Bilici & Yamak, Kavak

& Guzey, 2013; Pamuk & et al., 2013) and scale adaptation (Timur & Tasar, 2011; Altun, 2013; Bal & Kandemir, 2013; Oztürk & Horzum, 2011). Also, it is noticed that researches about individuals that work as a teacher actively are missing. It is defined that analysis is done mostly according to the variables of sex and class level.

Starting from this point, the TPACK self-confidence level of physics teachers, chemistry teachers, biology teachers and science teachers is analyzed.

Aim of the study

On this research, it is aimed to determine the teachers' technological and pedagogical self-confidence level and with which variables is this level related. For the frame of this aim, answers are tried to be found to the questions below.

- Does the TPACK self-confidence of teachers show difference according to the gender?
- Does the TPACK self-confidence of teachers show difference according to the teachers according to the teachers' participation in technological courses?
- Does the TPACK self-confidence of teachers show difference according to the education level?
- Does the TPACK self-confidence of teachers show difference according to the branch?
- Does the TPACK self-confidence of teachers show difference according to the service period?
- Does the TPACK self-confidence of teachers show difference according to the worked institution?

Method

Scanning Design, which is one of the quantitative methods, is used for this research. Scanning Design is to describe the environment's attitude, tendency or opinions through the analysis on samples that are chosen from the environment of the research (Bursal, 2014, 155).

Working group

Environment of the research consists physics teachers, chemistry teachers, biology teachers and science teachers that has been working at Kahramanmaras. Samples of the research are 87 teachers that are chosen through suitable sample method. Suitable

sample method is the one that stops the loss of factors like time, work force and money (Buyukozturk, et al., 2015). Distribution of teachers that attended to research according to their demographic characteristics is given on Table 1.

Table 1: Demographic characteristics of teacher

		N	%
Gender	Famele	40	54.0
	Male	47	46.0
Branch	Science teacher	33	37.9
	Physics teacher	17	19.5
	Chemistry teacher	14	16.1
	Biology Teacher	23	26.4
Education Level	Graduate	70	80.5
	P. Graduate	17	19.5
Having Technological Training	Yes	43	49.4
	No	44	50.6
Working Period	0-5 yıl	24	27.6
	6-10 yıl	14	16.1
	11-15 yıl	14	16.1
	>15 yıl	35	40.2
Worked Institution	Govern	70	80.5
	Private Coll.	10	11.5
	Private Ins.	7	8.0

When data on table 1 is analyzed, it can be seen that the sample of research include 37.9% (n=33) science teachers, 19.5% (n=17) physics teachers, 26.4% (n=23) biology teachers and 16.1% (n=14) chemistry teachers. 46% (n=40) of these teachers are females and 54% (n=47) of these teachers are males.

Data collection tool

Scientific research, which can be described as the process of gathering scientific knowledge, is a systematic period that is consisted of steps or activities following each other (Buyukozturk, 2009, 6). On this research, it is aimed to determine the Technological Pedagogical Content Knowledge self-confidence. As data collection tool, "Technological Pedagogical Content Knowledge Self–Confidence Scale (TPACKSC), which is adapted to Turkish from original scale by Graham, Burgoyne, Cantrell, Smith & Harris (2009) and tested for validity and reliability by Timur & Tasar (2011), is preferred. Scale includes 31 items totally. While Timur et al. found reliability coefficient as 0.92, the reliability coefficient of scale is determined as 0.95 on this study. The scale

that is 6-point Likert scale originally is adapted as 5-point Likert scale by Timur & Tasar (2011). On the scale, 1= I don't trust at all, 2= I trust a little, 3= I trust on an average level, 4= I trust greatly 5= I trust completely, 0= I don't know these Technologies (only for items 16th , 17th , 18th , 19th and 20th) are the numbered levels. Technological Pedagogical Content Knowledge Self–Confidence Scale (TPACKSC) is consisted of four (4) factors as Technological Pedagogical Content Knowledge (TPACK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK) and Technological Knowledge (TK). Reliability Coefficient value (Cranach alpha) of these factors is given on table 2.

Table 2: Technological Pedagogical Field Information Self-Confidence Scale Sub-Dimensions Reliability Coefficient Values

Test Sub-Dimensions	**Reliability Coefficient Values**
TPACK	.906
TCK	.900
TPK	.917
TK	.933
TPACKSCS	**.950**

When the data on table 2 is analyzed, it's seen that reliability coefficient values of TPACKSCS (.950), and four factors TPACK (.906), TCK (.900), TPK (.971) and TK (.933) are high.

Analysis of data

Information that are gathered from teachers that form the sample of the research is analyzed by the help of IBM SPSS-21 statistic programme. While evaluating the gathered data, individual-t test, one-way variance analysis (Anova) test is performed. On the situation that there is no homogeneity during data evaluation, Mann-Whitney test is used. On the other hand, data on the research is evaluated with 0.05 relevance and percent, frequency, average and standard deviation values are also given.

In order to explain the comparison of the points about TPACKSCS and sub-dimensions (TPACK, TCK, TPK, TK) that create the scale, each scale's total points are divided to item number and changed into 6-point rating. For the explanation of these points, self-confidence level according to point ranges is given on table 3.

Table 3: TPACKSCS and sub-dimensions, point ranges used for explaining the points

Point Range	Trust Level
0-0.85	I don't trust at all
0.86-1.68	I trust a little
1.69-2.51	I trust on an average level
2.52-3.34	I trust greatly
3.35-4.17	I trust pretty much
4.18-5.00	I trust completely

Findings

On this section, findings that are gathered by analyzing the science teachers, physics teachers and biology teachers' technological, pedagogical content knowledge are presented. The minimum, maximum, average and standard deviation value and trust for the used scale and sub dimensions is presented at table 4.

Table 4: Descriptive statistics and confidence level values related with TPACKSCS and sub dimensions

Test Sub Dimensions	N	Min	Max	$\bar{X}$	SS	Self Con. Level
TPACK	87	1.88	5.00	3.38	0.74	I trust greatly
TCK		1.86	5.00	3.45	0.76	I trust greatly
TPK		0.00	5.00	3.09	1.24	I trust pretty much
TK		1.36	5.00	3.22	0.90	I trust pretty much
TPACKSCS	**87**	**1.71**	**5.00**	**3.29**	**0.71**	**I trust pretty much**

When data on table 4 is analyzed, it is seen that the highest point average for the teachers is the frequency TCK. When the trust levels are examined, while teachers are self-confident greatly on dimensions TPACK and TCK, they are self-confident pretty much on dimensions TPK and TK.

On this study, the effect of gender, branch, education level, period of service, quality of the worked institution, the situation that attending to a technological education is analyzed for technological pedagogical content knowledge self confidence level. Firstly, an answer for the question "*Does the technological pedagogical content knowledge self-confidence level of teachers that attended to this research change according to their gender?*" is searched and the results of levee homogeneity and Mann-Whitney U test is given at table five.

Table 5: Mann-Whitney U test analysis results according to gender

	Levene	Gender	N	Line Av.	U	p
TPACK	0.01	Male	47	46.77	810.0	.267
		Female	40	40.75		
TCK	0.04	Male	47	46.02	845.0	.418
		Female	40	41.63		
TPK	0.389	Male	47	44.80	902.5	.749
		Female	40	43.06		
TK	0.01	Male	47	44.34	924.0	.891
		Female	40	43.60		
TPACKSCS	**0.02**	**Male**	**47**	**45.79**	**856.0**	**.474**
		Female	**40**	**41.90**		

*p<0.05

When the Mann-Whitney U test results that are given on table t is analyzed, it became clear that the points from technological pedagogical content knowledge self-confidence scale (U=856.0; p>0.05) and other frequencies that create the scale does not show a logical difference according to the gender. Yet, when the line average is examined, it is seen that male teachers' points are on a higher level.

On the research, an answer for the question "*Does the technological pedagogical content knowledge self-confidence level of teachers that attended to this research show a logical change according to the situation that teachers attended to a previous technology course?*" is searched and results gathered from individual t-test are presented on table 6.

Table 6: T test results according to the situation that teachers attended to a technology course before

Test Sub Dimensions	Course	N	$\bar{X}$	sd	t	p
TPACK	Yes	43	3.40	85	.217	0.829
	No	44	3.37			
TCK	Yes	43	3.47	85	.262	0.794
	No	44	3.43			
TPK	Yes	43	3.25	85	1.213	0.229
	No	44	2.93			
TK	Yes	43	3.33	85	1.106	0.272
	No	44	3.11			
TPACKSCS	**Event**	**43**	**3.37**	**85**	**.960**	**0.340**
	Hayır	**44**	**3.22**			

*p<0.05

When the independent t-test results are analyzed, it is seen that there is no logical change on points of teachers' technological pedagogical content knowledge self-confidence scale (t (85) = .960; p>0.05) and other dimensions that create the scale according to the situation that teachers attended to a technological course before.

On the research, an answer for the question "*Does the technological pedagogical content knowledge self-confidence level of teachers that attended to this research change according to their education level?*" is searched and the results of Levene homogeneity and Mann-Whitney U test is given at table 7.

Table 7: Mann-Whitney U test analysis results which is performed according to education level

	Levene	**Education Level**	**N**	**Line Av.**	**U**	**p**
TPACK	.109	Graduate	70	40.26	333.5	.005*
		P. Grad.	17	59.38		
TCK	0.264	Graduate	70	40.34	338.5	.006*
		P. Grad.	17	59.09		
TPK	0.948	Graduate	70	44.14	585.0	.914
		P. Grad.	17	43.41		
TK	0.003	Graduate	70	39.33	268.0	.000*
		P. Grad.	17	63.24		
TPACKSCS	**0.01**	**Graduate**	**70**	**39.94**	**310.5**	**.002***
		P. Grad.	**17**	**60.74**		

*p<0.05

When the results of Mann- Whitney U test results on table 7 are analyzed, it is seen that there is a statistical relevance on the level of 0.05 for the benefit of post graduate teachers from the technological pedagogical content knowledge self-confidence scale (U=310.5; p<0.05) and dimensions TPACK (U=333.5; p<0.05), TCK (U=338.5; p<0.05) and TK (U=268.0; p<0.05).

On the research, an answer for the question "*Does the technological pedagogical content knowledge self confidence level of teachers that attended to this research show a logical change according to their branches?*" is searched and gathered frequency, average point, standard deviation and one direction variance analysis (Anova) test results are shown at tables 8 and 9.

Table 8: Frequency, average point and standard deviation values according to branch

Branch		TPACK		TCK		TPK		TK		TPACKSCS	
	N	$\bar{X}$	SS	$\bar{X}$	SS	$\bar{X}$	SS	$\bar{X}$	SS	$\bar{X}$	SS
Science(1)	33	3.37	0.72	3.58	0.77	2.82	1.29	3.34	0.96	3.32	0.68
Physics (2)	17	3.41	0.86	3.42	0.82	3.51	1.03	3.33	1.01	3.40	0.89
Biology (3)	23	3.65	0.69	3.59	0.69	3.32	1.37	3.36	0.72	3.48	0.57
Chem. (4)	14	3.94	0.52	2.94	0.60	2.82	1.04	2.59	0.66	2.80	0.59
All	**87**	**3.38**	**0.74**	**3.45**	**0.76**	**3.09**	**1.24**	**3.22**	**0.90**	**3.29**	**0.71**

Table 9: One direction variance analysis (Anova) results according to branch

Test Sub Dimensions		Sum of Squares	sd	Average of Squares	F	p	Relevance (Tukey)
TPACK	Between groups	4.424	3	1.475	2.826	.044*	3-4
	In-Group	43.309	83	.522			
	All	47.732	86				
TCK	Between groups	4.617	3	1.539	2.791	.045*	1-4
	In-Group	45.759	83	.551			
	All	50.376	86				
TPK	Between groups	7.631	3	2.544	1.668	.180	-
	In-Group	126.593	83	1.525			
	All	134.224	86				
TK	Between groups	6.738	3	2.246	2.929	.038*	1-4
	In-Group	63.656	83	.767			
	All	70.394	86				
TPACKSCS	Between groups	4.475	3	1.492	3.144	.029*	3-4
	In-Group	39.381	83	.474			
	All	43.856	86				

*p<0.05

When the one direction variance analysis (Anova) test results are analyzed, it is seen that there is a statistical relevance of 0.05 for teachers' technological pedagogical content knowledge self-confidence scale [F (3,83) =3.144; p<0.05] and sub - dimensions TPACK [F (3,83) =2.826; p<0.05], TCK [F (3,83) =2.791; p<0.05] and TK [F (3,83) =2.929; p<0.05] that create the scale itself. On the result of Tukey Relevance Analysis, which is performed in order to reveal from which branches does this relevance is created, it is seen that the points of biology teachers on the general scale (TPACKSCS) and dimension TPACK, and science teachers on the TCK and TK dimensions are more relevant than the points of chemistry teachers.

On the research, an answer for the question "*Does the technological pedagogical content knowledge self-confidence level of teachers that attended to this research change according to the worked institution?*" is searched and gathered results from the test

(Anova) in terms of frequency, average points, standard deviation and one direction variation are presented on tables 10 and 11.

Table 10: Frequency, average point and standard variation values according to worked institution

Worked Institution		TPACK		TCK		TPK		TK		TPACKSCS	
	N	$\bar{X}$	SS	$\bar{X}$	SS	$\bar{X}$	SS	$\bar{X}$	SS	$\bar{X}$	SS
Govern.(1)	70	3.32	0.74	3.37	0.76	3.08	1.16	3.19	0.91	3.24	0.71
Private Coll.(2)	10	3.77	0.83	3.94	0.73	2.52	1.67	3.48	1.06	3.50	0.86
Private Ins.(3)	7	3.50	0.48	3.48	0.65	4.02	0.94	3.20	0.57	3.47	0.48
All	**87**	**3.38**	**0.74**	**3.45**	**0.76**	**3.09**	**1.24**	**3.22**	**0.90**	**3.29**	**0.71**

Table 11: One direction variance analysis (Anova) results according to worked institution

Test Sub- Dimensions		Sum of Squares	sd	Average of Squares	F	p	Relevance (Tukey)
TPACK	Between groups	1.879	2	.940	1.721	.185	-
	In-Group	45.853	84	.546			
	All	47.732	86				
TCK	Between groups	2.786	2	1.393	2.459	.092	-
	In-Group	47.590	84	.567			
	All	50.376	86				
TPK	Between groups	9.422	2	4.711	3.171	.047*	3-2
	In-Group	124.802	84	1.486			
	All	134.224	86				
TK	Between groups	0.743	2	.371	.448	.640	-
	In-Group	69.651	84	.829			
	All	70.394	86				
TPACKSCS	Between groups	0.827	2	.414	.808	.449	-
	In-Group	43.028	84	.512			
	All	43.856	86				

*p<0.05

When the one direction variance analysis (Anova) test results are analyzed from the table 11, it is seen that there is a statistical relevance of 0.05 for teachers' technological pedagogical field information self-confidence scale's sub-dimension TPK [F (3,83)=3.171; p<0.05]

On the research, an answer for the question "*Does the technological pedagogical content knowledge self confidence level of teachers that attended to this research change according to the working period?*" is searched and gathered results from the test (Anova) in terms of frequency, average points, standard deviation and one direction variation are presented on tables 12 and 13.

Table 12: Frequency, average point and standard variation values according to working period

Working Period		TPACK		TCK		TPK		TK		TPACKSCS	
	N	$\bar{X}$	SS	$\bar{X}$	SS	$\bar{X}$	SS	$\bar{X}$	SS	$\bar{X}$	SS
1-5 years(1)	24	3.52	0.71	3.64	0.65	3.19	1.50	3.65	0.68	3.54	0.53
6-10 years (2)	14	3.61	0.74	3.84	0.78	3.31	1.32	3.49	0.95	3.57	0.71
11-15 years (3)	14	3.36	0.47	3.58	0.50	3.04	0.99	3.20	0.77	3.30	0.59
16 and more years(4)	35	3.21	0.83	3.11	0.79	2.95	1.15	2.83	0.92	3.01	0.77
All	**87**	**3.38**	**0.74**	**3.45**	**0.76**	**3.09**	**1.24**	**3.22**	**0.90**	**3.29**	**0.71**

Table 13: One- direction variance analysis (Anova) results according to working period

Test Sub-Dimensions		Sum of Squares	sd	Average of Squares	F	p	Relevance (Tukey)
TPACK	Between groups	2.248	3	.749			
	In-Group	45.484	83	.548	1.368	.258	-
	All	47.732	86				
TCK	Between groups	7.437	3	2.479			
	In-Group	42.939	83	.517	4.792	.004*	1-4 2-4
	All	50.376	86				
TPK	Between groups	1.628	3	.543			
	In-Group	132.597	83	1.598	.340	.797	-
	All	134.224	86				
TK	Between groups	10.669	3	3.556			
	In-Group	59.725	83	.720	4.942	.003*	1-4
	All	70.394	86				
TPACKSCS	Between groups	5.348	3	1.783			
	In-Group	38.508	83	.464	3.842	.013	1-4
	All	43.856	86				

*p<0.05

When the one direction variance analysis (Anova) test results are analyzed from table 13, its seen that there is a statistical relevance on the level of 0.05 for the dimension TCK [F(3,83)=4.792; p<0.05] and TK [F(3,83)=4.942; p<0.05] that creates technological pedagogical content knowledge self-confidence scale and also for TPACKSCS [F(3,83)=3.842; p<0.05]. Tukey relevance is performed for this research in order to determine from which working periods this relevance occurs. According to this, the points of teachers with 1-5 years of working period are found relevant from the teachers with 16 years or more on the general of the scale (TPACKSCS) and TCK and TK dimensions. On the other hand, points gathered by teachers with working period of 6-10 years are found more relevant than teachers with 16 years or more on the TCK dimension.

Discussion and Results

On this study, it is aimed to determine the self-confidence perception of Physics teachers, Chemistry teachers, Biology teachers and Science teachers from Kahramanmaras about technological pedagogical content knowledge and these perceptions' change according to gender, previous technological courses, branch, education level, quality level of worked institution and working period.

For data collection, "Technological Pedagogic Content Knowledge Self–Confidence Scale (TPACKSC), which is adapted to Turkish from original scale by Graham, Burgoyne, Cantrell, Smith & Harris (2009) and tested for validity and reliability by Timur & Tasar (2011), is preferred and "Personal Knowledge Form" created by researchers and supported by experts' remarks is used. Gathered results' percentage, frequency, average, standard variation values are calculated. On the other hand, the effects of independent variables (gender, previous technological courses, branch, education level, quality level of worked institution and working period) to their technological pedagogical field information self confidence level is analyzed statistically through independent t-test, one direction variance analysis, Kruskal- Wallis H test and Mann-Whitney U.

When the research results are analyzed, the averages of TPACKSCS ($\bar{X}$=3.29) and dimensions TPACK ($\bar{X}$=3.38), TCK ($\bar{X}$=3.45), TPK ($\bar{X}$=3.09), TK ($\bar{X}$=3.22) are gathered. When the self confidence levels of teachers attended to research it is seen that they trust themselves greatly on dimensions TPACK and TCK; they trust themselves pretty much on dimensions TPK, TK and general on scale (TPACKSCS).

As a result of the study by Acikgul & et al. (2015), Sancar Tokmak & et al. (2013), Ozgen et al. (2013) with teacher candidates, they mentioned that TPACK self - confidence is high. This result shows difference with the findings of this research.

On the study, it is understood that there is no statistical logical ($p>0.05$) difference between male and female physics, chemistry, biology and science teachers' TPACKSCS and sub dimensions (TPACK, TCK,TPK,TK). According to these results, it can be said that gender is not a factor that affects teachers' self-confidence about TPACK. This result overlaps with the results of researches by Acıkgül & et al. (2015); Kula (2015); Meriç (2014); Sancar Tokmak & et al. (2013); Kaya, Ozdemir, Emre and Kaya (2011); Oztürk (2013); Koh and Chai (2011); North and Noyes (2002). According to North & Noyes (2002), the reason for this situation is the fact that computer usage is becoming common in schools and equal opportunities are given to individuals to use technology. Yet, Koh and Tsai (2010) saw on their research that gender creates difference on the situation.

On the study, it is understood that there is no statistical logical ($p>0.05$) difference for physics, chemistry, biology and science teachers' TPACKSCS and sub dimensions (TPACK, TCK, TPK, TK) according to the situation of being attended to a technological course before. According to these results, it can be said that the situation of being attended to a technological course before is not a factor that affects teachers' self-confidence about TPACK.

Yet, when the point average of teachers is evaluated, it is seen that instructors attended to technology course before got a higher point average than the ones that did not attend to a technology course before. This situation shows that attending to courses about technology has a positive impact on TPACK self-confidence. That result overlaps with Ozturk's (2013) research about class teacher candidates.

On the study, it is understood that according to education levels, there is a statistical logical ($p>0.05$) difference for physics, chemistry, biology and science teachers' points of TPACKSCS and sub dimensions (TPACK, TCK, TK). It is analyzed that when the teachers' education levels increase to post graduate from graduate, the self-confidence shows an increase.

This situation can be evaluated as the idea that physics, chemistry, biology and science teachers' having a post graduate education can have a support on their self-confidence. This result showed difference with the research of Kho and Chai (2011).

On the study, it is understood that according to branches (physics, chemistry, biology and science) there is no statistical logical ($p>0.05$) difference for teachers TPACKSCS and sub dimensions (TPACK, TCK, TK). According to Tukey results that are given on table 9, on the general TPACKSCS and, the points of biology teachers on TPACK dimension and the points of science teachers on TCK and TK dimensions are more logical than chemistry teachers. This situation is because of the biology and science teachers' usage of technological materials during their teaching process. Ozgen & et al. (2013), Niess (2005)'s results support this research.

On the study, it is understood that according to worked place (government, private college, institution) there is no statistical logical ($p>0.05$) difference between male and female physics, chemistry, biology and science teachers' TPACKSCS and sub dimensions (TPACK, TCK, TK) according to the working period, but there is a statistical logical ($p>0.05$) difference on the dimension TPK. According to Tukey results presented on table 11, it is seen that points of teachers working at institutions are more logical than the ones working at private colleges.

On the study, it is understood that there is no statistical logical ($p>0.05$) difference between male and female physics, chemistry, biology and science teachers' TPACKSCS and sub dimensions (TCK, TK) according to the working period. According

to the Tukey results presented on table 13, points of teachers with 1-5 years of working period points are more logical than the points of the ones with 16 years or more on the general of scale (TPACKSCS) and TCK and TK dimensions. On the other hand, on TCK dimension, points of teachers with working period 6-10 years are more logical than the ones with 16 years or working period.

Conclusion

This study with physics teachers, chemistry teachers, biology teachers and science teachers show that results of the study supports the increase on self-confidence about TPACK with teachers' technology usage. Because of this, while planning the teaching techniques for teaching process, there should be an integration of technology to education and this will have a benefit for increasing teachers' TPACK self-confidence levels.

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