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Analysis of TPACK Self-Efficacy Perception Levels of Social Studies Teachers and Pre-Service Teachers

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Abstract

The purpose of this research is to examine the self-efficacy technological pedagogical and content knowledge (TPACK) of the social studies teachers and pre-service teachers. TPACK scale which is developed by the researcher in this respect is applied to 113 social studies teachers and 919 social studies pre-service teachers. The method of the research has been patterned by the monitoring method. In accordance with the obtained data, the consistency index values are found by calculation of structural equity path coefficients (path analysis). The data has been classified with SPSS program and has been analyzed with AMOS (Analyses of Moment Structures) program. In the study, while the relation level between other components and the technological knowledge teachers and pre-service teachers are seen in low and middle level, the relation level between the content knowledge and pedagogical knowledge has been found in higher level. Consequently, the necessity has occurred for the integration of the technological pedagogical and content knowledge of the social studies teachers and pre-service teachers with each other.

Key words: TPACK, Social Studies, Technology, Pedagogy

Introduction

The rapid changes and developments in the knowledge and communication technologies in our day which we named as knowledge area reflect on the education. The individual has to use the technology efficiently for keeping up with this change and development (Kurt, 2013). Turkey which is not indifferent to this issue has started Increasing Opportunities in Education and Technology Reformation Movement (FATİH) project with the cooperation of Ministry of National Education and Ministry of Communication. The technological pedagogical and content knowledge perception which is presented by Mishra and Koehler (2006) in this respect has been united with technology and education has been tried to be more efficient by being integrated within education processes.

Theoretical Framework: TPACK

The components of technological, pedagogical and content knowledge consists of seven components as technological knowledge, pedagogical knowledge, content knowledge, technological pedagogical knowledge, technological content knowledge, content pedagogical knowledge and technological pedagogical content knowledge.

Technology Knowledge (TK): Technology with the widest meaning has been identified as the changes made by the humans on the nature for their needs (Pearson & Young, 2002). When consider the technology in terms of education, Kurt (2013) has showed the efficient usage of the software tools like operating system, computer hardware, word processors, spreadsheet programs, web browser and e-mail in addition to book, chalk and blackboard. The technologies which are developed in present oblige the technology usage skills of the teachers (Koehler & Mishra, 2009). The constant change of the technology causes the changing of the nature of the technology (Mishra & Koehler, 2005; Yigit, 2014).

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Content Knowledge (CK): Mishra and Koehler (2006) have explained the content knowledge as expressing the knowledge which takes part in this content and the knowledge to be taught in this content. The content knowledge is the knowledge which is given to the student through courses. The knowledge content of the course which is taught shall be known in outstanding level in this respect (Kurt et al., 2013).

Pedagogical Knowledge (PK): Harris et al. (2009) has identified the pedagogical knowledge as the knowledge of the method of teaching a subject. Yelken et al. (2013) have explained the pedagogical knowledge as the subjects like learning, evaluation of learning, development practices, course planning, class management, regulation the class environment and intramural communication. Saltan (2013), identifies this subject as the course designs which are in conformity with the cognitive levels, development level, learning types and interest of the student groups during the course process. Incekapı (2013) considers pedagogical knowledge as knowing how to teach a course

Pedagogical content knowledge (PCK): PCK idea was first presented by Shulman (1986). Pedagogical content knowledge is related with the teaching method of a specific content, the types of the education strategies. PCK, is the education with different strategies, method and techniques for each subject (Mishra & Koehler, 2006). PCK is the combination of the pedagogy and content and the implementation of them. PCK is the knowledge of, showing how to teach any subject to the student in a specific discipline (Cox & Graham, 2009; Jimoiannis, 2010; Yigit, 2014). There is strong relation between the pedagogy and content knowledge. This relation shows us to teach each subject with different teaching strategies (Sahin, 2011).

Technological and Content Knowledge (TCK): TCK is the knowledge about the integration of technology with content. The teachers need to know the new technological applications as well as the subjects to be taught (Mishra & Koehler, 2006). Kılıç (2013), defines the technological content knowledge as a knowledge type which is associated with each other. The technological content knowledge is to know the conformity of the new technology to the teaching at the same time. We have to know which subject is in conformity with which technology (Kurt et al., 2013). The teacher must know to select the appropriate technology for enriching the content of the course because a technology which does not conform to its purpose is ineffective in reintegrating the terminal behavior.

Technological and Pedagogical Knowledge (TPK): TPK occur from the integration of the technology and formation knowledge (Mishra & Koehler, 2006). Kılıç (2013), expresses that there are different technologies used in teaching and learning environment and to know their specialities. This knowledge can also be expressed as the usage method of the technology in teaching environment (Yurdakul & Odabası, 2013). A teacher can have technological knowledge but we cannot consider education efficiency in efficient level when he cannot integrate this with the pedagogical knowledge in education environment. One of the reasons of the failure of many educations given with technology does not know how to give technology with pedagogy (Bozkurt et al., 2013).

Technological, Pedagogical and Content Knowledge (TPACK): TPACK is the knowledge which consists of the components of technology, pedagogy and content knowledge. This knowledge is different from the general pedagogical knowledge which is used by the teacher, from the technology which needs a specific expertise, discipline. TPACK establishes the base of a good teaching with technology (Mishra & Koehler, 2006). As mentioned in Figure 1, TPACK is an integration which is formed by the technology pedagogy and content knowledge. However TPACK shall be considered as a situation which is used in the education environment at the same time. In other words, to teach a subject, a course by using technology, does mean that the teacher uses TPACK (Kurt, 2013). Technology pedagogy and content knowledge shall not be given as independent from each other but shall be given as integration (Sahin, 2011).

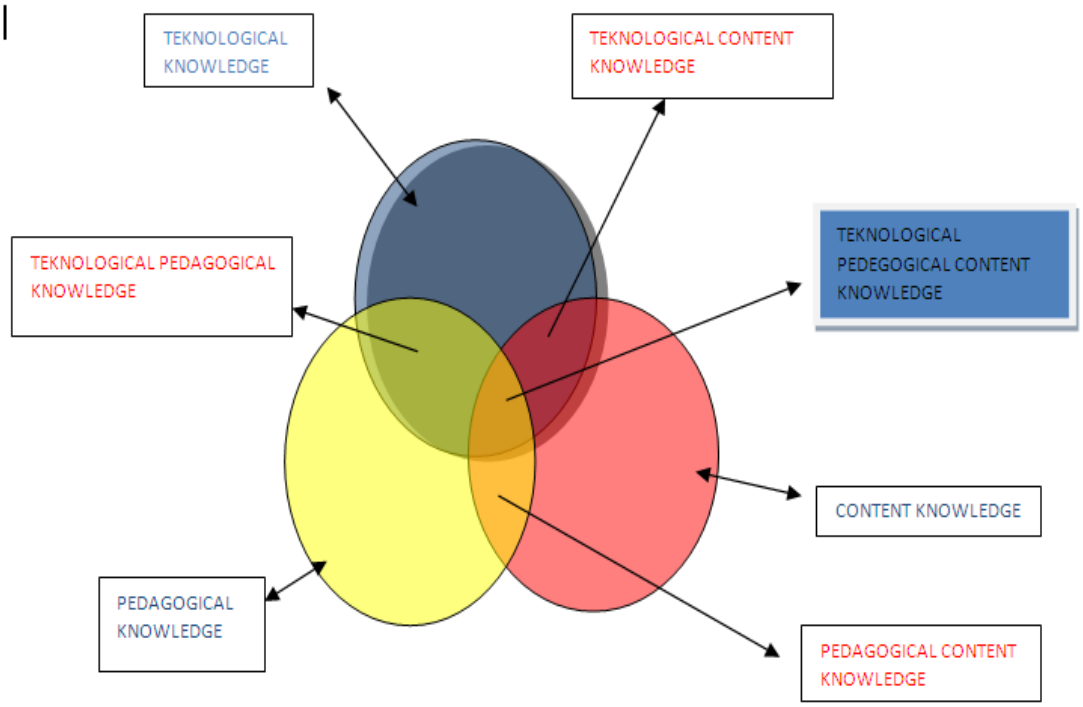

Figure 1. Technological, Pedagogical and Content Knowledge Components

This study is made for determining TPAB levels of teachers and pre-service teachers of social studies. As different from other studies, it is a study which is specific for social sciences content. The scale which is developed by the researcher is prepared only for determining the TPACK level of the teachers and pre-service teachers of social studies. Answers are searched for the below questions in this respect.

1. What kind of a relation are there between the perception of the social studies teachers to technological, pedagogical and content knowledge components?
2. What kind of a relation are there between the perception of the social studies pre-service teachers to technological, pedagogical and content knowledge components?

Method

This section of the research mentions the model of the research, nature/sample, sampling type, data collection tools, analysis and commenting the data.

Model of the research

By using TPACK model in this research, it is aimed to examine the technological pedagogical and content knowledge level of the pre-service teachers of social studies in faculty of education and social studies teachers working in secondary schools. This study is patterned by using monitoring model.

Participants

Sampling.1 (Application 1 – pre-service teachers): This study is carried out in all regions of our country. The nature of the pre-service teachers is formed by the fourth grade students in social studies education in whole faculty of education in our country. Our sampling group consists of 919 pre-service teachers in total who are selected by the nature based sampling method.

Sampling.2 (Application 2 - teachers): the nature of the teacher consists of the social studies teachers working within the body of Konya Provincial National Education Directorate. The sampling of the research is carried out by 113 teachers who are selected from this nature.

Data Collection Tools

Accordingly, seven sizes have been determined in the scale which is issued by the researcher (Akman, 2014; Akman & Guven, 2015). These are; size of technological knowledge (TK), pedagogical knowledge size (PK), size of content knowledge (CK), size of pedagogical and content knowledge (PCK), size of technological and pedagogical knowledge (TPK), size of technological and content knowledge (TCK), size of technological, pedagogical and content knowledge (TPACK).

The scale which is issued has been formed in the type of five points Likert scale. 1-2-3-4-5 numbers are located across the articles of the scales. Respectively the numbers are given the meaning as; I do not know, I know in low level, I know in middle level, I know in good level, I know in very good level. Validity and reliability studies are made for the obtained data. According to the reliability studies made, the reliability coefficient of Alpha Cronbach of the scale has been found as 0.977. Affirmative factor analyses are made on the obtained data.

Data Collection and Application: The data of the study is collected from the teachers and pre-service teachers. The scale which is distributed for being applied to the teachers is 230 and the collected scale is 120. However, some teachers have marked the scale without reading so seven of them are deducted and the data collected from 113 teachers is taken as a basis. The feedback rate in pre-service teachers is seventy percent (distributed scale: 1450; collected: 1113). However, some teachers have marked the scale without reading so 919 of them are taken to evaluation.

Data Analysis

According to results, the consistency index values are found by calculation of structural equity path coefficients (path analysis). The data has been classified with SPSS program and has been analysed with AMOS (Analyses of Moment Structures) program. In this study, structural equity model is used in order to determine factors and their relations and it is found how those relations are conformed with real data.

There are some index types which are confronted regularly in literature. These are: X^2/df, CFI, RMSEA, GFI, AGFI, NFI, NNFI, SRMR indexes (Karademir & Erten, 2013; Karademir & Erten, 2014).

Table 1.Criterion references for fit indices of linear factor analysis

Index Types	***χ^2 / df***	***RMR***	***GFI***	***CFI***	***RMSEA***
Index Values	1,398	0,038	0,853	0,918	0,050
Perfect fit	< 3	0 ≤ RMR ≤ 0,05	0,95≤GFI≤1	0,97≤ CFI ≤ 1	0≤ RMSEA ≤ 0,05
Acceptable fit	< 5	0,05 ≤ RMR ≤ 0,10	0,90≤GFI≤0,95 veya 0,80≤GFI≤0,89	0,90≤CFI≤0,95 veya 0,80≤GFI≤0,89	0,05≤ RMSEA ≤ 0,10

Results

In this section of the research, structural equity model outputs are mentioned for understanding the relation level between teachers and pre-service teachers and TPACK components.

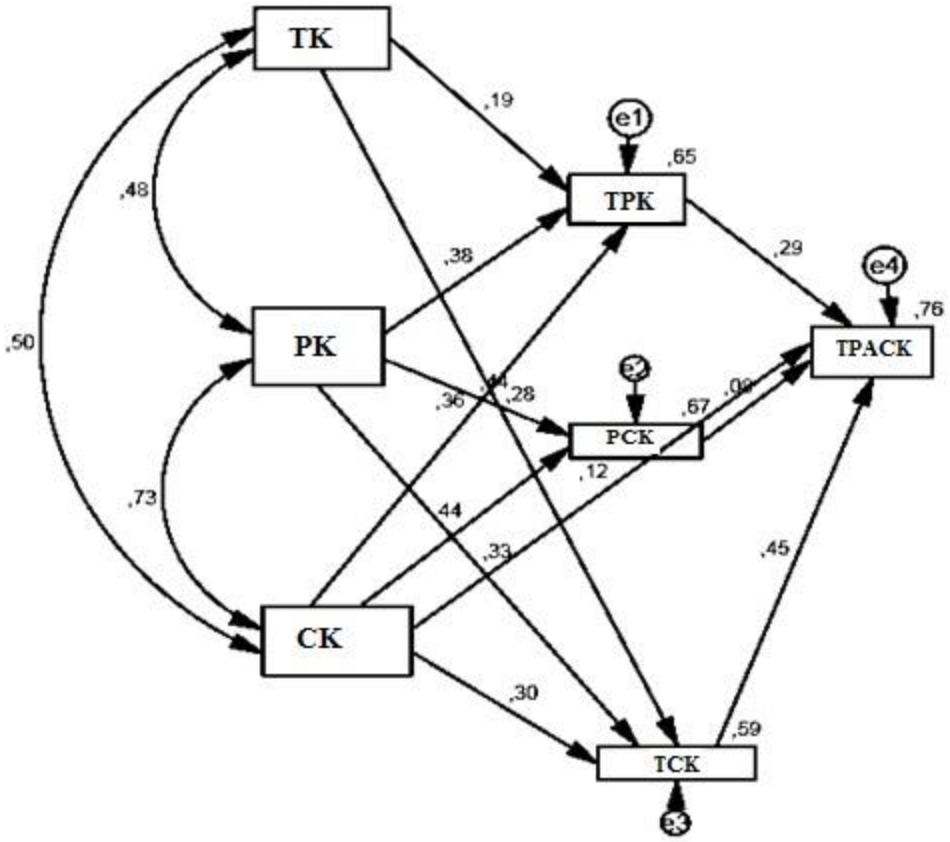

Figure 1. Findings showing the relation between the structural equity model and technological pedagogical content knowledge of the teachers

Fit Index Values: X2/df: 0.249, N: 113, RMSEA: 0.056, RMR: 0.149, GFI: 0.997, AGFI: 0.982, NFI: 0.998

The structural equation model outputs made with the teacher data related with TPACK are mentioned in Figure 1. Accordingly; it is determined that the adaptive value is in the acceptable level. Accordingly; there is medium level relation between the TK and CK (r=0.50), a medium level relation between TK and PK (r=0.48), there is high level relation between PK and CK (r=0.73). There is no direct relation between TPK and CK but there is low level direct relation between TPK and CK (β=0.33). There is very low relation between TK and TPK (β=0.19), low level relation between PK and TPK (β=0.38). The explanation percentage of TPK relation between these two factors is R^2=0.65. So 65 % of the TPK perception is explained by the TK and PK. There is a low level relation between PK and PCK (β=0.28). A medium level relation is detected between CK and PCK (β=0.44). The explanation percentage of PCK between these two factors is R^2= 0.67. So 67 % of the PCK perception is explained by the PK and CK. There is a low level relation between the TK and TCK (β=0.30) and a higher relation is detected between TK and TCK (β=0.44). The explanation percentage of TCK between these two factors is R^2=0.59. So 59 % of the TCK perception is explained by the TK and CK. There is a low level relation between TPK and CK (β=0.29), there is a very low relation between PCK and TPACK (β=0.08) and there is medium relation between TCK and TPACK (β=0.45). The explanation percentage of TPACK between these three factors is R^2=0.76. So 76 % of the TPACK perception is explained by these three factors. In figure 2, structural equity model and findings related with the pre-service teachers are mentioned.

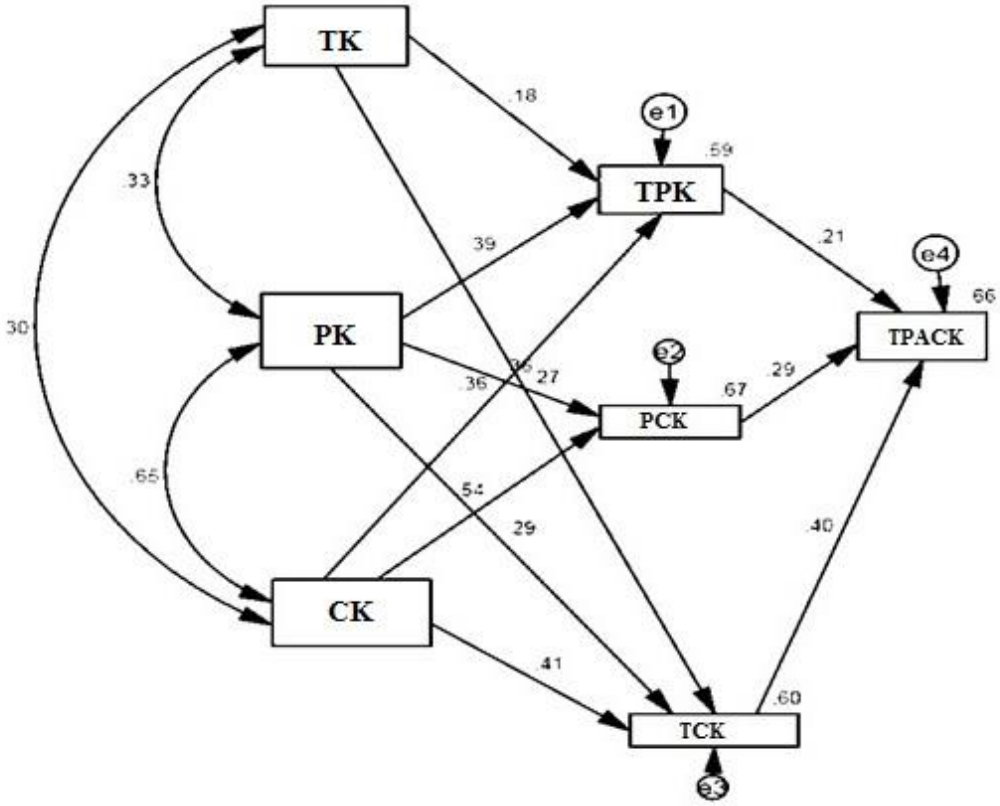

Figure 2. Findings showing the relation between the components of technological pedagogical content knowledge of pre-service teachers with structural equity model.

Fit Index Values: X2/df: 0.922, N: 919, RMSEA: 0.054, RMR: 0.84, GFI: 0.999, AGFI: 0.992, NFI: 1.00

The structural equation modelling outputs made with pre-service teachers related with TPACK are mentioned in figure 2. Accordingly it is detected that the adaptive values are in the acceptable level. Accordingly there is low level relation between TK and CK (r=0.30), there is higher relation between TK and PK (r=0.33) and there is a higher relation between PK and CK (r=0.65) No direct relation is seen between TK, PK, CK and TPACK. There is very low relation between TK and TPK (β=0.18), there is a higher relation between PK and TPK (β=0.39). The explanation percentage of TPK relation between these two factors is R^2=0.59. So 59 % of the TPK perception is explained by the TK and PK. There is a low level relation between PK and PCK is (β=0.27). A higher relation is detected between CK and PCK (β=0.54). The explanation percentage of PCK between these two factors is detected as R^2=0.67. So 67 % of the PCK perception is explained by the PCK. There is a medium relation between CK and TCK (β=0.41) and there is a lower relation between TK and TCK (β=0.36). The explanation percentage of TCK of these two factors are R^2=0.60. So 60 % of the TCK perception is explained by the TCK. There is a lower relation between TPK and TPACK (β=0.21), there is a higher relation between PCK and TPACK (β=0.29) and there is a medium level relation between TCK and TPACK (β=0.40). The explanation percentage of TPACK of these three factors are R^2=0.66. So 66 % of the TPACK perception is explained by these three factors.

Discussion and Conclusion

Results related with pre-service teachers

In the structural equity model analysis of the pre-service teachers, the relation level of technology with other components of TPACK is low with pedagogy and content knowledge. However, it is so challenging that the pre-service teachers, who will start working in Ministry of National Education, should have these types of skills during their bachelor education but they do not have these skills. Similar result to this situation shows parallelism to a study made by Celik et al. (2014). The technology which the teachers need for integrating the technology in parallel with the development of technology from past to present has been built on the knowledge (Hofer & Swan, 2008; Koehler, Mishra & Yahya, 2007; Landry, 2010). Likewise, it has been mentioned that the

technological knowledge of the teachers shall be strengthened for providing the efficiency and persistency of the learning environment with technology (Sahin, 2011; Selim, Tatar & Oz, 2009; Schmidt et al., 2009; Kabakci Yurdakul et al., 2012). The relation level between the TK and PK of the pre-service teachers in structural equity modelling is low (r=0.33) while the relation level between CK and PK is higher (r=0.65). When we consider the results, we can see that the relation level between the TK and PK is low. Accordingly the technology must be supported together with the pedagogical perceptions in education (Hughes, 2005; Koehler, Mishra & Yahya, 2007; Erdogan & Sahin, 2010; Lux, Bangert, & Whittier, 2011). There is low relation between the CK and TK (r=0.30) and the relation level between CK and PK is higher (r=0.65). There is no direct relation with the CK and TPACK but there is a relation between PCK, TPK and PCK. It is mentioned in the results of various studies that the CK of the pre-service teachers shall be supported with the educations they take and the following skills they gain (Koehler & Mishra, 2005; Koehler & Mishra, 2008; Koehler & Mishra, 2009; Mishra & Koehler, 2006; Mishra & Koehler, 2008; Schmidt et al., 2009). The relation level between PCK and TPACK is lower (β=0.27). The situation includes contrast in the research made by Celik et al. (2014). Accordingly the relation level between PCK and PK is higher and the relation level between PCK and CK is lower. There is a direct relation between the PK and CK on PCK. When the researches made on the teacher education is examined, the PK is ignored although the PCK which the teachers and pre-service teachers should have must be within an in dissociable structure (Shulman, 1986). However many studies in the last years are built on the PCK (Shulman, 1986). It has been discussed that the PK and CK shall be integrated with each other (Mishra and Koehler, 2006), and the learning strategies shall be learned for being a better teacher (Shulman, 1986). The level of the relation between TPK and TK is lower (β=0.18). The level of relation between TPK and PK has medium level (β=0.39). The relation level between TPK and TPACK is (β=0.21). The results of the study made by Celik et al. (2014) show parallelism. However there is no direct relation between TPK and TPACK in this study. In the different studies, there is also no direct relation between TPK and TPACK (Lux, 2010).

There is medium level between TCK and TK (β=0.36), there is a medium relation between TCK and CK (β=0.41), there is a medium relation between TCK and TPACK (β=0.49). There is a low relation between TCK and TK, the relation between TCK and CK is very low in the study made by Celik et al. (2014). The relation between TCK and TPACK shows parallelism with our study. The usage of content and technology together, is more important than using the technology by itself (Kuşkaya-Mumcu, Haslaman, & Usluel, 2008; Mishra & Koehler, 2008; Sahin, 2011).There is no direct relation between TPACK and TK, PK and CK. There is a low level relation with TPK (β=0.21), low relation with PCK (β=0.29), medium relation level with TCK. In the study developed by Schmidt et al. (2009), the measurement of TPACK is aimed and similar results have been achieved. In another study made by Kim et al. (2009) on pre-service teachers, it is observed that TK, PK and CK which are the components of TPACK are not efficient adequately.

Results related with teachers

According to the structural equity model, the relation between TK and PK is in medium level (r=0.48), the relation with CK is in medium level (r=0.50), the relation with TCK is in medium level (β= 0.44) and the relation with TPK is in low level (β=0.19). In the study made by Archambault and Crippen (2009) for measuring the competence of the teachers in terms of TPACK, it is seen that the TK of the teachers is in medium level however their TCK is in low level. In the study of Schmidt et al. (2009), aimed at the course experiences of the teachers, it is observed that their TPACK increases when the courses are organized with technologies approaches for teachers. There is a medium level between PK and TK of the teachers (r=0.48) and there is a high relation between PK and CK (r=0.73). There is low relation between PK and TPK (β=0.38) and there is a medium level relation between PCK (β=0.44). There is no direct relation between TPACK. In the study made by Archambault and Crippen (2009), there is weak relation between TK and PK forming TPACK however the relation between PK and CK is high.

This study shows parallelism with our study. According to the results of the structural equity modelling; there is a medium relation between CK and TK (r=0.50), a high level between PK (r=0.73). There is a low level relation between CK and TPK (β=0.28), a medium level relation between PCK (β=0.44), low level relation between TCK (β=0.30), there is a direct relation between TPACK (β=0.12). When other researchers are examined, it is observed that in case the CK is low, the other content types shall be affected negatively and therefore the teachers shall have a healthy CK level (Cavanagh & Koehler, 2013; Kuşkaya-Mumcu, Haşlaman, & Usluel, 2008; Demir & Bozkurt, 2011). It is seen that TPACK has a direct relation with CK, PCK, TPK and TCK, TK and PK has no direct relation. In the researches made in the different education field, same results have been achieved (Bilgin, Tatar, & Ay, 2012). Schmidt et al. (2009) have concluded that the in service courses provided to the teachers increase TPACK skills of the teachers.

Suggestions

The developments in science and technology have changed the education technologies as well as the communal life. Therefore the pre-service teachers, who shall be appointed to this sacred profession in the future, shall adopt and comprehend this change. They shall not limit themselves only with the bachelor courses in the faculty in terms of professional development but also; they shall follow the academic and scientific activities for improving themselves.
The teachers shall keep their pedagogical and technological knowledge updated during learning and teaching process. They shall guide the students in accessing the right information in digital sources (internet, CD, etc) they shall develop themselves in technology integration by using their expertise's in social sciences.

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Appendix 1: The Scale of TPACK

Dear Social Studies Teacher and Pre-Service Teacher

This survey is issued for examining the relation between technology, pedagogy and content knowledge of the social studies teacher and pre-service teachers. Your answers in the Survey shall be used for research and your identification and answers shall be definitely kept secret. For this reason, do not hesitate to answer intimately. The numbers at the right side of the page express these: (1) I do not know, (2) I know in low level, (3) I know in middle level, (4) I know in good level, (5) I know in very good level

ITEMS OF TPACK SURVEY

1	Using Office programs (Like *Word, Excel*, and *Powerpoint*) …	1	2	3	4	5
2	Communicating through Internet (*E-mail, Skype*) …	1	2	3	4	5
3	Using data (*saving to Flash Memory, CD, DVD*) …	1	2	3	4	5
4	*Using printer, digital camera and Scanner* …	1	2	3	4	5
5	Using the programs of concept maps, drawing graphics (*Inspration, Excel* etc.) …	1	2	3	4	5
6	Developing daily, annual and unit plan…	1	2	3	4	5
7	Developing classic (multiple choice test, True-False Test, open ended Question etc) and complementary (Control List, Valuation Scale, Gradational Grading Key, Self-Efficacy Form, Peer Assessment Form etc) measurement tools …	1	2	3	4	5
8	*Evaluating the performance of the teacher with classic and alternative (complementary) measuring tools.* …	1	2	3	4	5
9	Implementing the different teaching strategies (Presentation Strategy, *Invention Strategy, Research-Analysing Strategy etc*.) …	1	2	3	4	5
10	*Implementing different methods (Plain Expression, Case Study, Problem Based Learning, Project based Learning etc*.) …	1	2	3	4	5
11	*Implementing different teaching techniques* (*Brain Storming, Six Thinking Hats, Demonstration, Metaphor etc*.) …	1	2	3	4	5
12	Learning theory and hypothesis (Structuralist *Learning, Multiple Intelligence Theory, Project Based Education etc.*)…	1	2	3	4	5
13	*How the class management shall be organized and continued in Social Sciences course* …	1	2	3	4	5
14	*Content Knowledge related with Individual and Society learning domain*	1	2	3	4	5
15	*Content Knowledge related with Culture and Heritage learning domain* …	1	2	3	4	5
16	*Content Knowledge related with Humans, Places and Environment learning domain*	1	2	3	4	5
17	*Content Knowledge related with Production, Distribution, Consumption learning domain*	1	2	3	4	5
18	*Content Knowledge related with Time, Consistency and Alteration learning domain*	1	2	3	4	5
19	*Content Knowledge related with Science, Technology and Society learning domain*	1	2	3	4	5
20	*Content Knowledge related with Groups, Institutions and Social Organizations learning domain*	1	2	3	4	5
21	*Content Knowledge related with Power, Management and Society learning domain*	1	2	3	4	5
22	*Content Knowledge related with Global Connections learning domain*	1	2	3	4	5
23	Current releases in Social Sciences field (Releases and books)…	1	2	3	4	5
24	*Selecting teaching strategies which are convenient to achievements related with Social Studies* …	1	2	3	4	5
25	*Selecting education models which are convenient to achievements related with Social Studies* …	1	2	3	4	5
26	*Selecting education techniques* which are convenient for teaching achievements related with Social Studies …	1	2	3	4	5
27	*Selecting education methods which are* convenient for teaching achievements related with Social Studies ……	1	2	3	4	5
28	*Selecting alternative /complementary and evaluation tools for evaluating achievements related with Social Studies.* …	1	2	3	4	5
29	*Preparing* daily, annual and unit plan *which is convenient to achievements*	1	2	3	4	5

	related with Social Studies courses …					
30	*Preparing a course plan including the class/ intramural activities for Social Studies courses …*	1	2	3	4	5
31	Technologies which are convenient to teaching approaches/ strategies …	1	2	3	4	5
32	Providing class management while using different education technologies. …	1	2	3	4	5
33	Using technologies which are convenient to different education model and theories …	1	2	3	4	5
34	Using technologies which are convenient to different education strategies….	1	2	3	4	5
35	Using technologies convenient to different education methods …	1	2	3	4	5
36	Using technologies convenient to different education techniques …	1	2	3	4	5
37	Using technologies which shall affect the education in positive manner …	1	2	3	4	5
38	Using technologies which are convenient to classic-alternative measurement and evaluation approaches …	1	2	3	4	5
39	Benefiting from technology by considering the individual differences of the students …	1	2	3	4	5
40	Preparing daily, annual and unit annual plans in computer …	1	2	3	4	5
41	Evaluating the conformance of a new technology to the education …	1	2	3	4	5
42	*Education technologies which are convenient to different learning content of the social studies courses …*	1	2	3	4	5
43	*Selecting technologies which are convenient for enriching the content of social studies course …*	1	2	3	4	5
44	*Using technologies which are developed by Course Tools Construction Centre while teaching achievements of Social Studies course …*	1	2	3	4	5
45	*Technologies which shall provide easier access to the targets/ achievements mentioned in the social studies course teaching plan …*	1	2	3	4	5
46	*Using computer aided technologies which are convenient to different learning content of social studies course …*	1	2	3	4	5
47	*Using tablet computer and smart board while teaching the different learning content of social studies courses*	1	2	3	4	5
48	*Developing projects and class activities including the education technologies in social studies course …*	1	2	3	4	5
49	*Integrating the social studies course content with appropriate technology and formation information …*	1	2	3	4	5
50	*Selecting appropriate education approaches and contemporary education technologies which shall provide better teaching of social studies course content …*	1	2	3	4	5
51	*Teaching courses by integrating the social studies learning content with my formation and technological knowledge …*	1	2	3	4	5
52	To take the leading to my colleagues about integrating the social studies contend and formation and technological knowledge …	1	2	3	4	5
53	Teaching a social studies subject by using appropriate technologies according to different education theories …	1	2	3	4	5
54	*To increase the value of the learning of my students through my formation and technological knowledge while teaching social studies subjects …*	1	2	3	4	5
55	*To integrate my content, technology and formation knowledge related with social studies course …*	1	2	3	4	5