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Abstract

The goal of this research is to investigate self-efficacy degrees of prospective teachers from different disciplines in terms of five sub-dimension of Web Pedagogical Content Knowledge (W-PACK) and whether different factors (gender, grade, or department) significantly affect prospective teachers' perceived self-efficacy levels or not. The study employed the survey method, a quantitative non-experimental research technique. The students, who were in second, third, and fourth grades, successfully finished the two-period first-year information technology obligatory courses. The study's findings demonstrated that pre-service teachers were quite confident in their ability to use the web and understand its general, communication, content, pedagogical, and attitudinal elements. The findings also revealed that there were no statistically significant variations in the responses with respect to gender across all of the sub-scales. Moreover, the findings demonstrated that there were no appreciable variations in any of the sub-scales of the W-PACK regarding departments. With the exception of attitude toward web-based education, there were no statistically significant variations between participant grades in the five dimensions or the perceived self-efficacy degrees of prospective teachers across all the sub-dimensions. The results of this study, however, revealed that attitudes toward web-based instruction varied considerably across the junior and senior groups. In light of the findings, technology and web-based teaching methods should be coordinated with the existing teaching curricula to provide teacher candidates with the application of content-pedagogical-technology components in an integrated manner.

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<u>*Research Article*</u>

Perceived Self-Efficacy Levels of Prospective Teachers Regarding Some Factors in the Framework of Web Pedagogical Content Knowledge[*]

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Abstract

The goal of this research is to investigate self-efficacy degrees of prospective teachers from different disciplines in terms of five sub-dimension of Web Pedagogical Content Knowledge (W-PACK) and whether different factors (gender, grade, or department) significantly affect prospective teachers' perceived self-efficacy levels or not. The study employed the survey method, a quantitative non-experimental research technique. The students, who were in second, third, and fourth grades, successfully finished the two-period first-year information technology obligatory courses. The study's findings demonstrated that pre-service teachers were quite confident in their ability to use the web and understand its general, communication, content, pedagogical, and attitudinal elements. The findings also revealed that there were no statistically significant variations in the responses with respect to gender across all of the sub-scales. Moreover, the findings demonstrated that there were no appreciable variations in any of the sub-scales of the W-PACK regarding departments. With the exception of attitude toward web-based education, there were no statistically significant variations between participant grades in the five dimensions or the perceived self-efficacy degrees of prospective teachers across all the sub-dimensions. The results of this study, however, revealed that attitudes toward web-based instruction varied considerably across the junior and senior groups. In light of the findings, technology and web-based teaching methods should be coordinated with the existing teaching curricula to provide teacher candidates with the application of content-pedagogical-technology components in an integrated manner.

Keywords: Prospective teachers, web pedagogical content knowledge, self-efficacy levels

1. INTRODUCTION

The advent of contemporary computer technologies and digital gadgets into education has brought about a new paradigm that has fundamentally changed how teaching and learning take place (Chai, Koh, Ho & Tsai, 2012). Prensky (2001) coined the phrase "digital natives," which is now used to refer to younger generations who appear to be "native speakers of the digital language" of social media, video games, computers, and other websites (Prensky, 2001). Teachers must enhance their ICT (information and communication tools) skills to match this generation's expectations because they have a tremendous capacity to use various technologies in many facets of their lives (Prensky, 2001). According to Lee and Tsai (2010), teachers must successfully utilize their pedagogical, technological, and subject-matter skills in order to change classrooms from teacher-centered settings into collaborative and interactive places.

From "Pedagogical Content Knowledge" (PCK), the theoretical concept known as "Technological Pedagogical Content Knowledge" (TPACK) was constructed by Shulman (1986). Shulman (1986) defines it as "PCK represents the blending of content and pedagogy into an

understanding of how particular topics, problems, or issues are organized, represented, and adapted to the diverse interests and abilities of learners, and presented for instruction". Mishra and Koehler (2006) expanded the term to include academics who concentrate on utilizing ICT in the classroom. Mishra and Koehler (2006) claim that the TPACK framework places equal emphasis on knowledge of content (CK), or specifics about the subject or field, and knowledge of technology (TK), or particular applications, hardware, and software. It also emphasizes how to communicate with, guide, and instruct learners in addition to emphasizing pedagogy (PK) and subject-matter expertise (CK). Through the merger of each knowledge base, pedagogical content knowledge (PCK) and technical content knowledge (TCK), which is a comprehension of the subject matter as it is represented technologically, are generated. Understanding the connections between educational practices and technologies signifies technological pedagogical knowledge (TPK). TPACK, which includes PCK, TCK, and TPK, is the understanding of how to benefit technology to carry out teaching approaches for a variety of subject matter content (See Figure 1).

The interaction between these three knowledge parts-technology, content, and pedagogy-is described by a notion known as TPACK, which links technology to program content and pedagogical techniques. Technology, pedagogy, and content are all reliant on the teacher2s abilities and consideration for the students (Shin et al., 2009). In order to improve teachers' usage of ICT in the classroom, undergraduate training is crucial (Gao, Choy, Wong & Wu, 2009). Studies show that future educators who are more computer savvy are more inclined to use technology in their classrooms (Paraskeva, Bouta, & Papagianna, 2008). Teachers with high self-efficacy have been much more enthusiastic and receptive to introducing creative strategies that provide pupils with interesting learning possibilities (Tschannen-Moran & Woolfolk Hoy, 2001). Moreover, research demonstrates that teacher candidates who underwent ICT training have high levels of computer self-efficacy (Aydoğmuş & Ibrahim, 2022; Brown & Warschauer, 2006; Lee, Chai, Teo & Chen, 2008). Therefore, assessments of a teacher's technical self-efficacy can be used to gauge how well they can advance the technologies that are crucial teaching tools (Paraskeva et al., 2008). The majority of prospective teachers, however, lack the skills needed to properly utilize these resources in the classroom (Kay, 2006). Kay (2006) asserts that "there is no consolidated picture on how to effectively introduce technology to pre-service teachers."
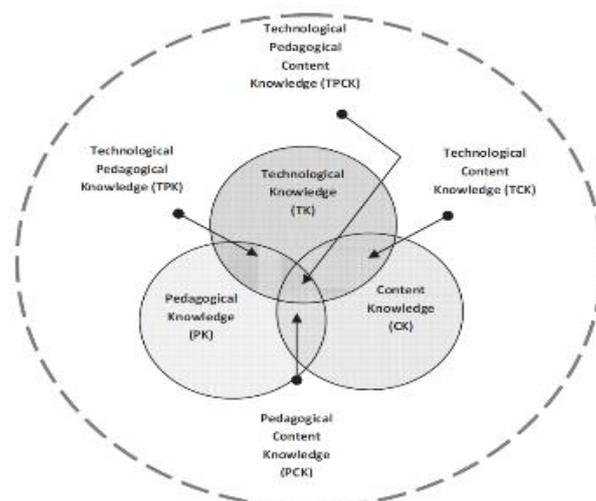
Figure 1. Technological pedagogical content framework (TPACK) (Koehler & Mishra, 2008)

It has become apparent that the technological content information of the Internet and the Web should be structured differently since the characteristics of the Web differ from other technologies and

the usage of the Web comprises some technologies (Horzum, 2011). Due to TPCK's inadequacy as a source of information in the educational setting, the web dimension has emerged as a crucial demand (Lee et al., 2008). In response to this need, Lee and Tsai (2010) and Lee et al. (2008) created the notion of Web Pedagogical Content Knowledge by incorporating the web into the idea of Technology Pedagogical Content Knowledge. These three key components-content, pedagogy, and web-interact to provide an understanding of web-based pedagogical content (WPCK). Basic web competencies include using web-related technology, communicating, and interacting online (Lee & Tsai, 2010). Mishra and Koehler (2006) state that numerous research has shown that teacher candidates' training programs' deficiencies limit the development of their technology skills from having a solid theoretical base. Mishra and Koehler (2006) enhanced TPACK by constructing on the idea of PCK (Shulman, 1986) and provided educators with a strong theoretical foundation to support their research into utilizing technology in the classroom. After the TPACK framework was introduced by Mishra and Koehler (2006), there have been many studies on the measurement of the TPACK levels of teacher candidates (Azgın & Şenler, 2018; Horzum, 2011; Kwangsawad, 2016) and in-service teachers (Delen, 2016) regarding different factors such as gender (Balçın & Ergün, 2018; Çiftçi & Dikmenli, 2018; Koh, Chai & Tsai, 2010); department (Çiftçi & Dikmenli, 2018; Yağcı, 2016) and year (Balçın & Ergün, 2018; Kavanoz, Yüksel & Özcan, 2015).

Lin, Tsai, Chai, and Lee (2013) carried out an investigation on science pre-service and in-service educators to explore their perceptions of TPACK with respect to demographic variables such as gender, age, and years of teaching. The results indicated female teachers had remarkably higher pedagogical knowledge but lower technological knowledge compared to males. Kavanoz et al. (2015) investigated EFL prospective teachers' self-efficacy and attitudes toward W-PACK. The findings indicated that teacher candidates displayed high levels of perceived self-efficacy and attitudes in the domains of "Web-general knowledge" and "Web-pedagogical knowledge" but lower scores in the domains of "Web-communicative" and "Web-Pedagogical Content knowledge". Moreover, the findings revealed no significant differences in terms of gender and year-level variables. Yağcı (2016) examined the TPACK competencies of teacher candidates who receive pedagogical formation education. According to the results of the research, the TPACK proficiency levels of pre-service teachers were found moderate level. Findings also revealed remarkable differences in terms of their department, age groups, and computer usage degrees but no significant differences regarding their gender.

İşler and Yıldırım (2018) investigated perceptions of Turkish prospective EFL teachers regarding their TPACK levels and the factors affecting pre-service EFL teachers' TPACK levels. The research included both quantitative and qualitative data analysis procedures. The findings revealed that pre-service EFL teachers who took part in the study showed a high level of TPACK. Another study conducted by Balçın and Ergün (2018) investigated science pre-service teachers' TPACK self-efficacy degrees regarding some variables such as gender, grade, high school graduation, etc. A cross-sectional survey model was used in this research. The results of the research showed that pre-service teachers had the highest self-efficacy levels in content knowledge sub-dimension among their TPACK dimensions. Moreover, the study revealed no remarkable difference in TPACK levels of pre-service teachers with respect to gender, grade, and internet access variables. Çiftçi and Dikmenli, (2018) investigated TPACK self-efficacy levels of prospective teachers from the Social Sciences and Geography departments with respect to some variables such as gender, high school graduation, and computer usage levels. Findings revealed no significant differences in terms of gender variables.

All in all, although the relevant literature shows that there has been a great amount of research on pre-service teachers' TPACK self-efficacy levels in terms of some variables in the Turkish context, studies generally focus on pre-service teachers' self-efficacy levels of TPACK taking a basis on individual departments such as Science, Mathematics, Social Sciences or English language teaching

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(Balçın & Ergün, 2018; İşler & Yıldırım, 2018; Kavanoz et al., 2015), there have been very limited comparative studies on prospective teachers' TPACK self-efficacy levels from different disciplines regarding some factors (Çiftçi & Dikmenli, 2018; Gömleksiz & Fidan, 2011). In addition, "the TPACK construct is a highly complex concept that is still open to further investigation" (Rahimi & Pourshahbaz, 2018), much more research has strongly been suggested to be conducted in order to clarify and elaborate TPACK knowledge in order to gain insights for professional development teacher candidates (Archambault & Crippen, 2009; Cox & Graham, 2009). Moreover, as different focus groups might create different findings, the relationship between demographic factors and TPACK perceptions needs further investigation. For this reason, the goal of the current research is to investigate self-efficacy degrees of teacher candidates from the fields of Special Education, ELT, and Primary School Education in terms of five sub-dimension of W-PACK and whether different factors (gender, grade, or department) significantly affect prospective teachers' perceived self-efficacy levels or not. The study was essentially guided by the research questions below:

1. What are prospective teachers' perceived self-efficacy levels regarding knowledge of web general, knowledge of web-communicative, knowledge of web-communicative, knowledge of web content, knowledge of web pedagogical content, and attitude towards web-based instruction?

2. Do gender, department, and grade of prospective teachers make any difference in their perceived self-efficacy levels regarding knowledge of web general, knowledge of web-communicative, knowledge of web-communicative, knowledge of web content, knowledge of web pedagogical content, and attitude towards web-based instruction?

2. METHOD

The study employed the survey method, which is a non-experimental quantitative research technique (Johnson, 2001; Johnson & Onwuegbuzie, 2004). The survey method is a research technique that compares the relationships between variables, tries to depict a past or present situation as it is, and is based on data collected over a predetermined time period (Karasar, 2000).

2.1. Participants

The participants, in the second, third, and fourth grades, had all successfully finished the two-period first-year information technology required courses. These courses' major goal is to teach students the fundamentals of information technology, web-based education, and online resources for learning. 160 undergraduate participants from the fields of English Language Teaching, Special Education, and Primary School Education at Tokat Gaziosmanpaşa University served as the study's responses throughout the 2022–2023 academic year. The group's average age ranged from 20 to 22. The following information about the respondents' demographics is taken from Table 1:

Table 1. Demography of the respondents

		f	%
Gender	Female	114	71.3
	Male	46	28.8
Department	ELT	56	35.0
	Primary School Education	31	19.4
	Special Education	73	45.6
Grade	Sophomore	68	42.5
	Junior	61	38.1
	Senior	31	19.4
Total		160	100%

According to Table 1, there were 114 (71.3%) female students and 46 (28.8%) male students. 56 (35%) of the participants at the Faculty of Education, Tokat Gaziosmanpaşa University came from the English Language Teaching department, 73 (45.6%) from the Special Education department, and 31 (19.4%) from the Primary Education department. Among the participants, there were 31 (19.4%) seniors, 61 (38.1%) juniors, and 68 (42.5%) sophomores.

2.2. Data Collection Instruments

The study gathers information on pre-service teachers' attitudes and self-efficacy towards TPACK using a 5-point Likert-type scale with a range of 1 to 5. A Turkish translation of Lee and Tsai's (2010) "Technological Pedagogical Content Knowledge (TPACK)" scale by Horzum (2011) served as the research instrument. The scale is composed of a total of 30 components, which are distributed among 5 distinct sub-dimensions. The following qualities are listed respectively: "attitude toward online-based instruction," "web general," "web communicative," "web content knowledge," and "web pedagogical content knowledge." The Statistical Package 26.0 was used to analyze the data using inferential and descriptive statistics. The examination of the questionnaire yielded a Cronbach Alpha of .87. Data on participant demographics, including gender, program type, and grade, was also gathered in this study using "Personal Knowledge Form" created by the researchers.

2.3. Data Analysis

Inferential statistics were performed using SPSS 26.0, along with descriptive statistics that included mean scores and standard deviations. Using an independent samples t-test and an ANOVA, it was determined if three covariates (gender, year, and department) had any impact on the five dependent variables (attitude toward web-based teaching, web general, web content knowledge, web communicative, and web pedagogical content knowledge). When evaluating arithmetic means, the following average values between 1.00 and 5.00 are established: Overall agreement ranges from 4.21 to 5.00, the agreement is 3.4 to 4.20, neutrality is 2.6-3.40, disagreement is 1.8 to 2.60, and the whole disagreement is 1.00 to 1.80.

The values of Skewness and Kurtosis were analyzed in order to check whether the data's normality assumption is met. Tables 2 presents the results:

Table 2. Skewness and Kurtosis values

	Statistics	Std. Error
Skewness	-.889	.192
Kurtosis	.273	.381

The values of Skewness and Kurtosis varied between -.889 and .192 for Skewness and .273 and .381 for Kurtosis. When the values of the kurtosis and skewness are between -1.5 and +1.5, the dispersion is regarded as standard (Tabachnick & Fidell, 2013). The impact of gender on pre-service teachers' perceived self-efficacy levels regarding their TPACK knowledge was investigated using an independent groups t-test, and the impacts of department and grade were investigated using a one-way ANOVA.

3. FINDINGS

This section reveals the statistical analysis of the quantitative data and the findings obtained from this data analysis were given in detail. Table 1 presents the details of the first research question below:

Table 1. Self-efficacy levels for web-general knowledge

"Web general knowledge"	X̄	SD
1. "Be able to click the hyperlink to connect to another Website."	4.01	1.17
2. "Be able to key in the Website address to connect to a particular Website."	4.61	.69
3. "Be able to print out the content of a Website."	4.33	.92
4. "Be able to search for information on the Web using keywords."	4.50	.76
5. "Be able to download pictures from the Web."	4.71	.63
6. "Be able to use the Web search engines."	4.79	.51
7. "Be able to copy the text on the Web into the Word"	4.66	.76
Total	4.51	.26

Table 1 shows that item 6—where participants completely agreed that they were able to use Web search engines—had the highest mean score (X̄: 4.79; SD:.51) among the other items (X̄: 4.61; SD:.69; X̄: 4.33; SD:.92; X̄: 4.50; SD:.76; X̄: 4.71; SD:.63; and X̄: 4.66; SD:.76). The participants' overall mean score for web general knowledge is at the "I totally agree" level (X̄: 4.51; SD: .26). The findings demonstrate that pre-service teachers consider themselves sufficient in the general web sub-dimension.

Table 2. Self-efficacy levels for web-communicative knowledge

"Web communicative knowledge"	X̄	SD
8. "Be able to read others' messages in a chat room."	4.14	1.16
9. "Be able to set a nickname by yourself in an online chat room."	4.20	1.16
10. "Be able to talk to others one on one in an online chat room."	4.35	.97
11. "Be able to provide information or respond to someone else on a BBS (Bulletin Board System)."	3.92	1.11
Total	4.15	.91

Table 2 demonstrates that participants who agreed that they were able to converse privately with individuals in an online chat group received the highest mean score (X̄: 4.35; SD: .97) for item 10. The participants' overall mean score for online communicative knowledge is at the "I agree" level (X̄: 4.15, SD: .91). The results show that prospective teachers believe they are adequate in the sub-dimension of web communicative knowledge.

Table 3. Self-efficacy levels for web-content knowledge

"Web- content knowledge"	X̄	SD
12. "Know that Web technology can provide various materials to enrich course content."	4.36	.85
13. "Know how to search online resources for course content."	4.62	.69
14. "Know how to select proper content from Web resources."	4.57	.65
15. "Be able to search related online materials for course content."	4.41	.80
16. "Be able to search for various materials on the Web to be integrated into course content"	4.41	.75
Total	4.48	.63

According to Table 3, participants entirely agreed that they know "how to search online resources for course content" in response to question 13, which got the highest mean score (X̄: 4.62; SD:.69). The majority of the participants received "I totally agree" as their overall mean score for their awareness of the online content (X̄: 4.48, SD: .63). The findings demonstrate the teacher candidates displayed high self-efficacy levels in the understanding of web content sub-dimension.

Table 4. Self-efficacy levels for web-pedagogical knowledge

Web- pedagogical knowledge	⁻	X̄	SD
17. "Know how to apply teaching modules on the Web into courses."		4.18	.78
18. "Be able to use Web technology to enhance teaching."		4.40	.72
19. "Be able to use the Web to enhance students' learning motivation"		4.75	.73
20. "Be able to select proper existing Web-based courses to assist teaching."		4.36	.78
21. "Be able to apply Web technology to use multiple teaching strategies on a particular course unit."		4.36	.72
22. "Be able to guide students to use Web resources to study a certain course unit."		4.34	.79
23. "Be able to use Web resources to guide students' learning activities for a certain course unit."		4.38	.76
24. "Be able to use Web technology to support teaching for the content of a particular course unit."		4.41	.80
Total		4.39	.61

As seen in Table 4, the findings showed that the top-rank mean score (X̄: 4.75; SD: .73) was from the item 19 in which participants totally agreed that "they were able to use the Web to enhance students' learning motivation." The total mean score of the participants' perspectives on the web pedagogical knowledge is at the level of "I totally agree" (X̄: 4.39, SD: .61). The findings demonstrate that prospective teachers had high self-efficacy levels in the web pedagogical knowledge sub-dimension.

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Table 5. Self-efficacy levels for attitude toward web-based instruction

"Attitude toward web-based instruction"	X̄	SD
25. "Web technology can be actually used in the practice of teaching."	4.41	.747
26. "The characteristics of the Web can help instruction."	4.57	.649
27. "Web technology can enhance teaching skills."	4.53	.717
28. "Web-related resources can enrich course content."	4.56	.660
29. "Web-based teaching can enhance students' learning motivation."	4.56	.688
30. "Web-based teaching is a future trend in education."	4.57	.678
Total	4.53	.55

The items with the highest mean scores (X̄: 4.57; SD: .649) were the item 26 (where participants entirely agreed that the properties of the Web can enhance instruction) and the item 30 (participants entirely agreed that "web-based teaching is a future trend in education"). The total mean score of the participants' perspectives on the attitude towards web-based instruction is at the level of "I totally agree" (X̄: 4.53, SD: .55). In the attitude sub-dimension of web-based education, the findings indicate that pre-service teachers exhibited high levels of self-efficacy.

The second research question concerns whether gender makes a difference in students' self-efficacy levels across sub-scales or not. In response to the second research question, independent samples t-test was performed to reveal gender differences.

Table 6. The findings of the independent samples t-test for gender differences

Overall Results	Gender	N	X̄	SD	t	p
Web-general knowledge	Female	114	4.53	.49	.649	.517
	Male	46	4.47	.67		
Web-communicative knowledge	Female	114	4.10	.92	-1.11	.269
	Male	46	4.28	.88		
Web-content knowledge	Female	114	4.49	.60	.461	.646
	Male	46	4.44	.71		
Web-pedagogical knowledge	Female	114	4.42	.60	1.074	.284
	Male	46	4.31	.65		
Attitude	Female	114	4.58	.52	1.735	.085
	Male	46	4.41	.62		

The findings demonstrate non-significant results, as shown in Table 6. It means that there is no statistically significant difference between males and females in terms of perceived self-efficacy degrees for pre-service teachers with regard to general web knowledge (t (158)=.649, p>.05); with regard to web communicative knowledge (t (158) = -1.11, p>.05); with regard to web-content knowledge (t (158) =.461, p>.05); with regard to web-pedagogical knowledge (t (158) = 1.074, p>.05) and with regard to attitude toward online education (t (158)= 1.735, p>.05). This indicates that there were no statistically remarkable disparities between the sexes in pre-service teachers' perceived self-efficacy degrees across all sub-scales. To reveal if the department has a significant effect on pre-service teachers' perceived self-efficacy levels in relation to the dimensions of web-general knowledge, web-communicative knowledge, web-content knowledge, web-pedagogical knowledge, and attitude toward web-based instruction, a one-way analysis of variance was conducted. The conclusions are presented in Tables 7 and 8 as follows:

Table 7. The descriptive statistics of students' departments

Overall Results	Department	N	X̄	SD
Web-general knowledge	English Language Teaching	56	4.44	.54
	Special Education	73	4.49	.59
	Primary School Education	31	4.71	.41
Web-communicative knowledge	English Language Teaching	56	4.24	.84
	Special Education	73	4.10	.89
	Primary School Education	31	4.11	1.10
Web-content knowledge	English Language Teaching	56	4.49	.71
	Special Education	73	4.45	.57
	Primary School Education	31	4.52	.63
Web-pedagogical knowledge	English Language Teaching	56	4.42	.68
	Special Education	73	4.34	.54
	Primary School Education	31	4.46	.66
Attitude	English Language Teaching	56	4.50	.62

Special Education	73	4.48	.52
Primary School Education	31	4.72	.46

According to Table 7, 56 participants came from the English Language Teaching department, 73 from Special Education, and 31 from the Primary School Education program. Table 7 displays the findings of the one-way analysis of variance which was carried out to reveal whether there was a statistically significant difference in the mean scores in terms of department factor. As for web-general knowledge, the means for the departments of English Language Teaching (X̄: 4.44, SD: .54), Special Education (X̄: 4.49, SD: .59), and Primary School Education (X̄: 4.71 SD: .41) had comparable results.

As for web-communicative knowledge, Table 7 shows that the means for the departments of English Language Teaching (X̄: 4.24, SD: .84), Special Education (X̄: 4.10, SD: .89), and Primary School Education (X̄: 4.11 SD: 1.10) had similar results. As for web-content knowledge, the findings of the study showed that there was a good agreement between the means for the departments of Primary School Education (X̄: 4.52, SD:.63), Special Education (X̄: 4.45, SD:.57), and English Language Teaching (X̄: 4.49, SD:.71). For the dimension of web-pedagogical knowledge, the findings of the study show that the means of the English Language Teaching (X̄: 4.42, SD:.68), Special Education (X̄:4.34; SD:.54), and Primary School Education (X̄:4.46; SD:.66) departments had comparable scores. For the last dimension of attitude, the study's findings demonstrate that the departments of English Language Teaching (X̄: 4.50, SD:.62), Special Education (X̄:4.48; SD:.52), and Primary School Education (X̄:4.72 SD:.46) all had similar scores.

Table 8. One way-ANOVA outcomes for department differences

		Sum of Squares	df	Mean Square	F	p
Web-general knowledge	Between Groups	1.61	2	.809	2.73	0.68
	Within Groups	46.8	157	.296		
Web-communicative knowledge	Between Groups	.620	2	.310	.367	.693
	Within Groups	132.599	157	.845		
Web-content knowledge	Between Groups	.122	2	.061	.150	.861
	Within Groups	64.054	157	.408		
Web-pedagogical knowledge	Between Groups	.424	2	.212	.549	.579
	Within Groups	60.66	157	.386		
Attitude	Between Groups	1.307	2	.654	2.128	.123
	Within Groups	48.230	157	.397		

According to Table 8, there were no statistically significant departmental differences on the dimension of web-general knowledge (F (157) = 2.73, p>.05); web-communicative knowledge (F (157) =.367, p>.05); web-content knowledge (F (157) =.150, p>.05); web-pedagogical knowledge (F (157) = .549, p>.05) and attitude towards web-based instruction (F (157) = 2.128, p>.05). The findings indicated that the department factor had no appreciable effect on participants' assessed levels of self-efficacy across all dimensions.

To ascertain if the grade has a remarkable impact on perceived self-efficacy levels in terms of all dimensions, a one-way analysis of variance was conducted. Tables 9 and 10 provide evidence for the conclusions listed below:

Table 9. The mean scores and standard deviations of students' grade

Overall Results	Grade	N	X̄	SD
Web-general knowledge	sophomore	68	4.44	.57
	Junior	61	4.50	.55
	senior	31	4.71	.41
Web-communicative knowledge	sophomore	68	4.11	.93
	Junior	61	4.21	.78
	senior	31	4.13	1.11
Web-content knowledge	sophomore	68	4.46	.67
	Junior	61	4.46	.59
	senior	31	4.55	.63
Web-pedagogical knowledge	sophomore	68	4.39	.62
	Junior	61	4.34	.59
	senior	31	4.49	.66
Attitude	sophomore	68	4.53	.56
	Junior	61	4.43	.57
	senior	31	4.74	.45

Table 9 shows that there were 68 sophomores, 61 juniors, and 31 seniors among the participants. As seen in Table 9, in the dimension of web-general knowledge, the mean scores and standard deviations of sophomores (X̄:4.44, SD: .57), juniors (X̄:4.50, SD: .55), and seniors (X̄:4.71, SD: .41) were comparable. As for the web-communicative knowledge dimension which includes the mean scores and standard deviations of sophomores (X̄:4.11, SD: .93), juniors (X̄:4.21, SD: .78), and seniors (X̄:4.13, SD: 1.11), it has been seen that there were no significant differences across year levels.

Moreover, there were no discernible differences between the mean scores and standard deviations of sophomores (X̄: 4.46, SD: .67), juniors (X̄: 4.46, SD:.59), and seniors (X̄:4.55, SD:.63) in the dimension of web-content knowledge. As indicated in Table 9, as for the web-pedagogical knowledge dimension, there were no discernible differences across the year levels for the mean scores and standard deviations of sophomores (X̄:4.39, SD:.62), juniors (X̄:4.34, SD:.59), and seniors (X̄:4.49, SD:.66). However, in the dimension of attitude toward web-based instruction, There were substantial variations between year levels, as displayed in Table 9 for the mean scores and standard deviations of sophomores (X̄:4.53, SD:.56), juniors (X̄:4.43, SD:.57), and seniors (X̄:4.74, SD:.45).

One-way analysis of variance (ANOVA) was performed to see if there was a statistically significant difference in the mean scores for the grade variable are shown in Table 10.

Table 10. One way-ANOVA outcomes for grade differences

		Sum of Squares	df	Mean Square	F	p
Web-general knowledge	Between Groups	1.66	2	.831	2.808	.063
	Within Groups	46.44	157	.296		
Web-communicative knowledge	Between Groups	.382	2	.191	.226	.798
	Within Groups	132.837	157	.846		
Web-content knowledge	Between Groups	.215	2	.108	.264	.768
	Within Groups	63.961	157	.407		
Web-pedagogical knowledge	Between Groups	.500	2	.250	.648	.524
	Within Groups	60.590	157	.386		
Attitude	Between Groups	1.912	2	.956	3.151	.046
	Within Groups	47.626	157	.303		

Table 10 shows that there is no statistically significant variation in pre-service teachers' assessments of their own self-efficacy across grade levels with regard to web-general knowledge (F (157) = 2.808, p>.05); in terms of web-communicative knowledge (F (157) =.226, p>.05); in terms of web-content knowledge (F (157) =.264, p>.05); in terms of web-pedagogical knowledge (F (157) =.648, p>.05). A one-way analysis of variance showed no major difference between the sophomore, junior, and senior groups. However, the findings show substantial results, showing that the prospective teachers' perceived levels of self-efficacy in the area of attitude toward web-based instruction knowledge are significantly influenced by their year level (F (157) = 3.151, p< .05). According to a one-way analysis of variance, there were statistically significant differences between the sophomore, junior, and senior groups.

As a result, post-hoc analyses utilizing the Bonferonni post-hoc test were performed to reveal where the remarkable variations among the groups occur.

Table 11. Bonferonni results for grade differences

(I) Grade	(J) Grade	Mean Difference (I-J)	Sig.	95% Confidence Interval	
				Lower Bound	Upper Bound
2.00	3.00	.09470	.993	-.1403	.3297
	4.00	-.21007	.241	-.4989	.0788
3.00	2.00	-.09470	.993	-.3297	.1403
	4.00	-.30478[*]	.039	-.5988	-.0108
4.00	2.00	.21007	.241	-.0788	.4989
	3.00	.30478[*]	.039	.0108	.5988

According to Table 31, Bonferonni post-hoc test results showed that attitude towards web-based instruction knowledge was significantly different between junior and senior groups (p=.039, CI= [.108, .5988]). There was no statistically significant difference between sophomore groups and junior groups (p=.993) and sophomore groups and senior groups (p=.241).

4. DISCUSSION AND CONCLUSION

The goal of the current research is to investigate self-efficacy degrees of pre-service teachers from three departments in the Faculty of Education in terms of five sub-dimension of Web Pedagogical Content Knowledge (W-PACK) and whether different factors (gender, grade or department) significantly affect prospective teachers' perceived self-efficacy levels or not. According to the study's findings, pre-service teachers were quite confident in their knowledge of the web's general, communicative, content, pedagogical, and attitudinal characteristics. This finding aligns with prior research (Gömleksiz & Fidan, 2011; İşler & Yıldırım, 2018; Kavanoz et al., 2015), which report a high level of self-efficacy perceptions of TPACK. Kavanoz et al., (2015) examined EFL prospective teachers' views of self-efficacy in terms of Web pedagogical content knowledge and their attitudes towards web-based instruction. The results demonstrated that EFL pre-service teachers had a high level of self-efficacy and positive perceptions toward web-based instruction. In another study, Kwangsawad (2016) demonstrated that Taiwanese prospective EFL teachers had high scores in all domains of TPACK knowledge. One reason for this positive conclusion might be that these youth, who are regarded as digital natives (Prensky, 2001) and who have grown up surrounded by technology and mobile devices, believe themselves to be adept internet users. These students have also participated in freshman-year computer-based courses as sophomores, juniors, and seniors. They could have gained more knowledge about integrating technology into teaching.

The results also revealed no statistically significant differences between males and females with respect to any of the sub-research questions across all of the sub-scales. Females did, however, show slightly higher levels of self-efficacy in all sub-dimensions, with the exception of the web-communicative knowledge dimension, when the mean scores of males and females were compared. This result is in line with previous research (Kavanoz et al., 2015; Schumacher & Morahan-Martin, 2001; Yang 2012), which found no obvious differences between males and females. Yang (2012) looked into how students' perceptions of gender and their sense of self-efficacy related to one another. The study's findings showed that there were no significant variations in male and female students' levels of self-efficacy or attitudes. The present study found that male students only slightly outperformed female students in one subscale of the web communicative knowledge dimension. This result may be in agreement with some studies (Gömleksiz & Fidan, 2011; Kavanoz et al., 2015), which found that male students had significantly higher mean scores in the web-communicative knowledge sub-scale compared to female students. One explanation might be that male students are more inclined than female pupils to compose lengthy messages (Androutsopoulos, 2006).

The results also revealed no statistically remarkable variations in the sub-scales of W-PACK between participant departments in any of the aspects. When comparing students from the Primary School Education department to those from other departments' mean scores, it was found that, with the exception of the web-communicative knowledge base, they had slightly higher levels of self-efficacy. This finding aligns with other previous studies (Çiftçi & Dikmenli, 2018; Karademir, 2015). Çiftçi and Dikmenli (2018) conducted an investigation on the relationship between pre-service teachers' TPACK self-efficacy levels and their departments. The study revealed no statistically significant differences in the scores of all domains of TPACK in terms of the department variable. Another study conducted by Karademir (2015) also revealed that the majors of prospective teachers had no significant difference in their TPACK self-efficacy degrees. However, the finding of this research contradicts with the results of some previous research (Bal & Karademir, 2013; Gömleksiz & Fidan, 2011). In their research, Gömleksiz and Fidan (2011) revealed that teacher candidates from the geography department considered themselves more competent in the sub-dimension of the general web than other department graduates. The study also revealed that teacher candidates from the biology department had the lowest TPACK self-efficacy levels compared to other departments.

Except for attitude toward the understanding of web-based education, there were no statistically significant variations between participants' grades in the five W-PACK dimensions or the perceived self-efficacy levels of pre-service teachers across all the sub-dimensions. The results of the current study, however, revealed that there were substantial differences in attitudes between the junior and senior groups about web-based training. Compared to junior groups, senior groups were more likely to have a more favorable attitude toward web-based training. The results were consistent with the literature (Kavanoz et al., 2015), which indicated no variations between year levels that were statistically significant. This discovery might be the outcome of computer-based courses that have a favorable impact on their attitudes and levels of self-efficacy (Torkzadeh, Chang & Demirhan 2006). Senior groups, however, were found to have much more favorable opinions regarding web-based learning in the current study. The reason for senior groups' more favorable attitudes toward web-based instruction might be that they entered their final year of the teacher training program and implemented micro lessons in their practicum settings.

For teacher preparation programs, the current study has some pedagogical implications. Pre-service teacher education programs are suggested to teach prospective teachers how to use pedagogy, content, and technology to deliver successful instruction in their subject areas. In addition to enabling teacher candidates to develop technology-based materials for technology integration and deliver technology-based education utilizing these materials in their practicum settings, teacher training programs ought to offer well-qualified courses in the field. Technology and web-based teaching

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methods should be coordinated with the existing teaching curricula to provide teacher candidates with the application of content-pedagogical-technology components in an integrated manner.

The present investigation has several restrictions. One problem with the current study was the small sample size. In order to produce more trustworthy and broadly applicable results, future research could recruit additional volunteers from diverse departments and from other disciplines. Another issue was the fact that only quantitative data was used as a source of knowledge. In order to ensure that the results are consistent, future research may include qualitative data in addition to quantitative data.

Based on the findings of this research, the following recommendations can be summarized:

- To better understand the implications of these results, future studies could address the deeper analysis of qualitative data such as an interview, observation or open-ended questions for more reliable and valid findings.
- There could be other factors such as teaching experience, age, and the influence of TPACK constructs that could be investigated for further research.
- Research can be conducted with different groups of participants from different majors with different data collection tools as they might create different results.

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