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Students' Perceptions About the Instructors' Competence in Technology-supported Courses at Dental Faculty: A Cross-sectional Study

Diş Hekimliği Fakültesinde Öğretim Elemanlarının Teknoloji Destekli Sınıflardaki Yeterliklerine İlişkin Öğrenci Algıları: Kesitsel Çalışma

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Abstract

Objective: The pandemic has highlighted the importance of technology-supported courses throughout the world. Evaluating the perceptions of students attending these courses is important to provide high-quality education

Materials and Methods: This study was carried out on 1st, 2nd, and 3rd-grade dentistry students. The "Student Perceptions Scale Regarding the Knowledge of Instructors in Technology - Supported Classrooms" was applied to 207 dentistry students. This scale consists of four sub-dimensions: subject matter knowledge (SMK), technological knowledge (TK), knowledge of students' understanding (KSU), and technological pedagogical content knowledge (TPCK).

Results: SMK, KSU, and TPCK sub-dimension scores did not significantly differ by gender ($p>0.05$). However, the mean TK score of females (3.55±0.47) was found to be significantly higher than that of males (3.28±0.59) ($p=0.001$). There was no statistically significant difference among the SMK, TK, KSU, and TPCK sub-dimension mean scores by age ($p>0.05$). There was a statistically significant difference in the mean scores of the SMK and KSU sub-dimensions by grade (p-values are $p<0.001$ and $p=0.015$ respectively). The mean TK and TPCK sub-dimension scores yielded no significant difference by grade (p-values are $p=0.368$ and $p=0.050$ respectively).

Conclusion: Measuring the quality of technology-assisted teaching and the instructor's TPCK from the student's perspective and determining student perceptions will provide accurate data on the long-term quality of education.

Keywords: Dental education, students, perception, technology-supported course

Öz

Amaç: Pandemi, dünya çapında teknoloji destekli derslerin önemini vurgulamıştır. Bu derslere katılan öğrencilerin oluşan algılarının değerlendirilmesi, bu süreçte kaliteli bir eğitim verilmesi açısından önemlidir.

Gereç ve Yöntemler: Çalışma diş hekimliği 1., 2. ve 3. sınıf öğrencileri ile gerçekleştirmiştir. İki yüz yedi diş hekimliği öğrencisine "Teknoloji Destekli Sınıflarda Öğretim Elemanlarının Bilgilerine İlişkin Öğrenci Algıları Ölçeği" uygulanmıştır. Ölçek, alan bilgisi (AB), teknolojik bilgi (TB), öğrenmeye ilişkin bilgi (ÖİB) ve teknolojik pedagojik alan bilgisi (TPAB) olmak üzere 4 alt boyuttan oluşmaktadır.

Bulgular: TPAB, ÖİB ve AB alt boyutları cinsiyete göre istatistiksel olarak anlamlı farklılık göstermemiştir ($p>0,05$). Ancak kadınların TB puan ortalaması (3,55±0,47) erkeklerinkinden (3,28±0,59) istatistiksel olarak anlamlı farklılık göstermiştir ($p=0,001$). Yaş grupları dikkate alındığında AB, TB, ÖİB ve TPAB puan ortalamaları arasında istatistiksel olarak anlamlı fark bulunmamıştır ($p>0,05$). AB ve

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ÖİB alt boyut puan ortalamaları arasında sınıflara göre istatistiksel olarak anlamlı farklılık görülmüştür (p-değerleri sırasıyla p<0,001 ve p=0,015). TB ve TPAB alt boyut puan ortalamaları sınıflara göre anlamlı bir farklılık göstermemiştir (p-değerleri sırasıyla p=0,368 ve p=0,050).

Sonuç: Teknoloji destekli öğretimin kalitesinin ve öğretim elemanının TPAB'nin öğrenci gözüyle ölçülmesi ve öğrenci algılarının belirlenmesi, eğitimin uzun vadeli kalitesi hakkında doğru veriler sağlayacaktır.

Anahtar Kelimeler: Diş hekimliği eğitimi, öğrenciler, algı, teknoloji destekli ders

Introduction

Technology-assisted teaching and learning resources and methods are widely used to provide qualified learning in higher education (1). The combination of technology, pedagogy, and field knowledge, which are considered to be necessary for the professional development of trainers (2). It is possible to measure the quality of teaching and adequacy of outcomes by making use of the opinions of students (3).

The effects of coronavirus disease-2019 (COVID-19) pandemic revealed the unpreparedness of both instructors and universities in using distance education techniques and educational materials, which are not used widely and extensively in dental education. As in all faculties in Turkey, dental schools' basic and clinical courses were switched to distance education and computer-aided teaching methods.

The present study investigated the students' perceptions about the quality of education provided by instructors through distance education technologies in technology-supported courses and their competence in using technological education tools, as well as students' feedback about the lessons taught during the pandemic.

Materials and Methods

Ethics Statement

Ethical approval was received from the Graduate Education Institute Ethics Committee of Çanakkale Onsekiz Mart University (approval no: 07/36, date: 18.12.2020)

Participants

In the Faculty of Dentistry of Çanakkale Onsekiz Mart University (COMU), all courses, except for the compulsory elective courses, were conducted face to face before the COVID-19 pandemic. After the beginning of the pandemic, all the courses started to be taught online on the Microsoft Teams platform (Microsoft Inc.®) as of the date of 03/23/2020. The present study was carried out with students, who were in the 1st, 2nd, and 3rd years in dental education at Çanakkale Onsekiz Mart University Faculty of Dentistry, during the pandemic period by making use of the Microsoft Teams. The scale was applied to 212 dentistry students of the dental faculty of COMU in Turkey in the academic year of 2020-2021 and the rate of response was 97.6% (n=207). Only the volunteers were involved in this study. The survey was created using Microsoft Forms (Google Inc.®) and the link of the survey was delivered to the students via Microsoft Teams®. Microsoft Forms® was used in collecting the responses. The personal information of the participants was recorded anonymously. Before the data collection, the participants were informed about the study. An e-mail containing a link to the online questionnaire page was sent to the participants, who read the preliminary information and volunteered to participate in the present study. The questionnaire forms were recorded digitally.

Data collection tool: The survey form consists of two parts. The first part consists of a personal information form that includes age, gender, and grade.

The second part of the survey questions the following;

1. "Student perceptions about the instructors degree of knowledge about the aims, information, and ideas of the subject area."

2. "Student perceptions about the instructors' level of knowledge about the digital technologies such as internet, video, interactive whiteboards, and application software."

3. "Student perceptions about the instructors' ability to know students' prior knowledge and to evaluate students' learning in the teaching process and at the end of the subject/unit."

4. "Student perceptions about the instructors' level of technological pedagogical content knowledge (TPCK)."

The "Student Perceptions Scale Regarding the Knowledge of Instructors in Technology - Supported Classrooms" used in the present study was developed by Shih and Chuang (4) and its adaptation to the Turkish language was performed by Şenel et al. (3). The questionnaire consists of a 50-items 5-point Likert-type scale. Scale items were scored as "Never" = 1, "Rarely" = 2, "Sometimes" = 3, "Generally" = 4, and "Always" = 5.

The scale consists of 4 sub-dimensions as subject matter knowledge (SMK) (Items 4-12), Technological Knowledge (TK) (Items 13-23), knowledge of students' understanding (KSU) (Items 24-29), and TPCK (items 30-53).

SMK sub-dimension investigates the students' perceptions about the instructors' aims, knowledge, and ideas in the subject area. TK sub-dimension investigates the students' perceptions about the instructors' knowledge of digital technologies such as the internet, video, interactive whiteboards, and application software. KSU sub-dimension examines the students' perceptions about the instructors' ability to know the students' prior knowledge and to evaluate students' learning in the teaching process and at the end of

the subject/unit. TPCK sub-dimension aims to investigate the students' perceptions about the instructors' TPCK.

Statistical Analysis

The data were analyzed with IBM SPSS V23.0 (SPSS Inc., Chicago, IL, USA). Conformity to normal distribution was examined by Kolmogorov-Smirnov and Shapiro-Wilk tests. The effect of gender, age, and grades on SMK, TK, KSU, TPCK was analyzed with MANOVA. Bonferroni test was used in multiple comparisons. Results are expressed as mean ± standard deviation and median (minimum-maximum) for quantitative data. The significance was set to be $p<0.050$.

Results

The study was conducted on 207 undergraduate dentistry students. 61.4% of the participants were female and 38.6% male respectively. 10.1% of the participants were 18 years old, 82.6% were in the 19-21 age group, and 7.2% were 22 years old. 38.6% of the participants were 1st grade, 34.8% were 2nd grade, and 26.6% were 3rd grade students. The frequency distribution of the demographic characteristics of the participants is presented in Table 1.

When the points given by the participants to the questions to the sub-dimensions in the questionnaire are evaluated, the average SMK score was found to be 3.92, the average TK score to be 3.44, the KSU to be 3.29, and TPCK scores to be 3.42. Descriptive statistics of scale scores are given in Table 2.

Sub-dimensions were evaluated by considering the given points of the participants by different gender, ages, and grades. There was no statistically significant difference among SMK, KSU, TPCK scores by gender ($p>0.05$). The TK scores differ according to gender ($p=0.001$). However, the mean TK score of females (3.55±0.47) was found to be statistically significantly higher than that of males (3.28±0.59) ($p=0.001$). Since only the TK sub-dimension was significant in the evaluation according to gender, the partial eta square value (0.062) was also high only in this dimension (Tables 3, 4).

There was no statistically significant difference among the SMK, TK, KSU, and TPCK sub- dimension mean scores by age ($p>0.05$) (Tables 3, 4).

Considering the grades, there was a statistically significant difference between the mean scores in the SMK sub-dimension ($p<0.001$). The mean point given by the students in the 1st grade was lower than those of the students in the 2nd and 3rd grades ($p<0.05$). There was no statistically significant difference among the 2nd and 3rd grade students regarding the mean points given in SMK ($p>0.05$). While the mean point given by 1st grade students was found to be 3.77±0.38, those of 2nd grade and 3rd grade students were found to be 4.05±0.48 and 3.99±0.37, respectively. The mean TK sub-dimension scores yielded no significant difference by the grades ($p=0.368$) (Tables 3, 4).

Table 1. Frequency distribution of demographic characteristics

	Frequency (n)	Percent (%)
Gender		
Female	127	61.4
Male	80	38.6
Age		
18	21	10.1
19-21	171	82.6
22	15	7.2
Grade		
1st grade	80	38.6
2nd grade	72	34.8
3rd grade	55	26.6

Table 2. Descriptive statistics for scale scores

Sub-dimension	Mean	SD	Median	Minimum	Maximum
SMK	3.92	0.43	4.00	2.56	5.00
TK	3.44	0.54	3.45	1.64	5.00
KSU	3.29	0.74	3.33	1.33	5.00
TPCK	3.42	0.66	3.46	1.50	5.00

SD: Standard deviation, SMK: Subject matter knowledge, TK: Technological knowledge, KSU: Knowledge of students' understanding, TPCK: Technological pedagogical content knowledge

Table 3. Comparison of scale scores

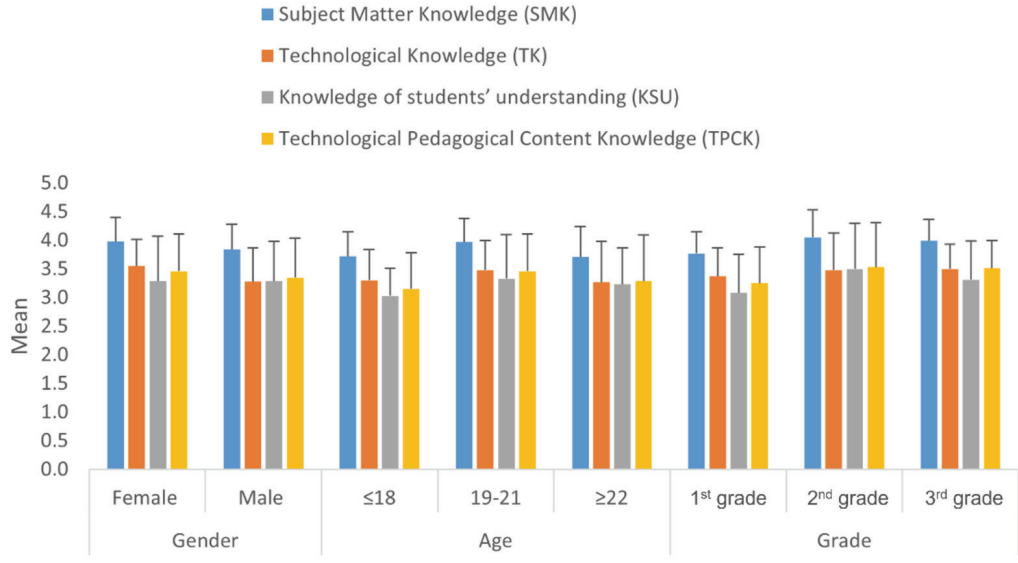
Source	Sub-dimension	F	p-value	Partial eta squared
	SMK	3.027	0.084	0.017
Gender	**TK**	11.864	0.001	0.062
	KSU	0.408	0.524	0.002
	TPCK	1.184	0.278	0.007
Age	**SMK**	2.876	0.059	0.031
	TK	1.311	0.272	0.014
	KSU	0.587	0.557	0.006
	TPCK	1.619	0.201	0.018
Grade	**SMK**	8.693	<0.001	0.088
	TK	1.005	0.368	0.011
	KSU	4.320	0.015	0.046
	TPCK	3.151	0.050	0.034

F: MANOVA test statistic, SMK: Subject matter knowledge, TK: Technological knowledge, KSU: Knowledge of students' understanding, TPCK: Technological pedagogical content knowledge

The mean points given by the students in KSU sub-dimension differed by the grades (p=0.015). The mean point given by the 1st grade students' was found to be lower than that of the 2nd and 3rd grades. And the the mean point given by the 3rd grade students was found to be lower than that of the 2nd grade. While the mean score was found to be 3.08±0.67 in the 1st grade students, the mean score was calculated to be 3.50±0.80 and 3.31±0.68 in the 2nd and 3rd grades, respectively. TPCK sub-dimension mean scores did not differ by grades (p=0.050).

SMK and KSU sub-dimension scores differed by the grades, and examining the partial eta- squared values, it was determined that the effect of grades on SMK was at a higher level. The comparison of scale scores is given in Table 3, whereas the descriptive statistics by gender, age, and grades are given in Table 4, and the descriptive statistics graphs in Graphic 1.

The present study revealed that the gender may affect the perception of technology knowledge sub-dimension in the dental education in favor of males. However, the age groups did not have a similar effect. Moreover, the first-year students have the disadvantages of not knowing their instructors and facing a new educational style.



Graphic 1. Descriptive statistics graphs by gender, age, and grade

Table 4. Descriptive statistics by gender, age, and grade

	Subject matter knowledge	Technological knowledge	Knowledge of students' understanding	Technological pedagogical content knowledge
Gender				
Female	3.98±0.42	3.55±0.47	3.29±0.78	3.46±0.65
Male	3.84±0.44	3.28±0.59	3.29±0.69	3.35±0.68
Age				
≤18	3.72±0.43	3.30±0.54	3.03±0.48	3.15±0.63
19-21	3.97±0.41	3.48±0.52	3.33±0.77	3.46±0.65
≥22	3.71±0.53	3.27±0.71	3.23±0.64	3.29±0.80
Grade				
1st grade	3.77±0.38[a]	3.37±0.50	3.08±0.67[a]	3.25±0.63
2nd grade	4.05±0.48[b]	3.48±0.65	3.50±0.80[b]	3.53±0.78
3rd grade	3.99±0.37[b]	3.50±0.43	3.31±0.68[ab]	3.51±0.49

[a,b]No difference between groups with the same letter

Discussion

In the COVID-19 pandemic, which caused the sudden and mandatory use of tech - supported learning instruments, it was also determined that students and instructors faced several pedagogical, technological, and psychological difficulties (5). Despite these difficulties, it was observed that, after overcoming the problems such as internet connection speed or interruptions, students adapted to the process much faster than instructors. Previous studies revealed that instructors having effective communication skills, teaching style, effective use of technology, flexibility towards teaching, and friendly and supportive attitude successfully managed this process (6).

It was reported in the literature that, in comparison to the face-to-face teaching, teaching in the online media requires different skills in terms of technology and integration (7). It was stated that certain face-to-face approaches may be insufficient for the academicians to use digital instruments and new approaches to teaching and learning should be developed (8).

Measuring the quality of teaching based on the student's feedback and adequacy of the education outcomes has become an important evaluation criterion in education techniques. At this point, tools that measure the quality of technology-supported teaching and the instructors' technological pedagogical field knowledge from the students' perspective will determine these perceptions provide accurate data about the long-term quality of education (3,9).

The scale used in this study was developed by Shih and Chuang (4) and adapted to Turkish by Şenel et al. (5). PCK was defined by Shulman (10) as making a topic understandable to others by using analogies, drawings, examples, explanations, and demonstrations representing it most effectively. PCK enables instructors to know how to help students learn a subject and how to organize and use it in a meaningful way for students having different interests and skills (11). The fact that TPCK mean values did not differ by grades made us think that students had similar expectations in this sub-dimension.

The data obtained in the present study suggest a statistically significant difference in the SMK sub-dimension by the grades. The mean points given by the students in the 1st grade were lower than the other grades. The current students are in the first year of their university education, they only received face-to-face training for five months, unlike other grades, because of the pandemic. Since the first year of dental education is mostly based on acquiring motor manipulation skills and less theoretical education, the translation of this training to online distance education may not have been as successful as in the following grades. Moreover, in the first year of dental education, students may gain insufficient assessment skills because they faced a different education method and the students, who knew their instructors only through online education, had limited opportunity to evaluate them in some courses. However, there was no statistically significant difference between the 2nd and 3rd-grade students in terms of the mean points given in SMK.

In the literature, the word "feedback" is defined as any information that helps students reduce the gap between what they know and what they need to know to complete a task competently (12). Online distance education does not provide face-to-face feedback and peer assessment to the students and it affects the KSU perception of student and causes hesitation in self-evaluation (3,13).

The present study showed that the perception of KSU among the 1st-grade students was lower than the other grades. Students have never met face-to-face with their instructors or classmates during their first year in dental education. In face-to-face education, communicating with the instructor and their peers, they find the opportunity to evaluate themselves unawarely. Both the instructor and the students need direct communication, feedback, and guidance, especially in preclinical courses. The student perception about the instructor's ability to know the students' prior knowledge and evaluate students' learning at the end of the subject/unit is critical (13). The higher KSU perception of 2nd and 3rd grade students supported that the face-to-face interaction with instructors positively influenced the students' KSU perception and, given the data achieved in the present study, this finding corroborates our thoughts specified above.

The perception of TK showed no difference by the grades and corroborated the result that there was no difference between the age groups in terms of TK, KSU, and TPCK scores. Both results did not differ significantly between the groups, and this finding indicates that students' perceptions aged between 18 and 21 years were at the same intensity.

TK scores of males were lower than females and this finding can be interpreted as that the male students expect better technological performance than females do.

Students' perceptions in SMK, TK, KSU, and TPCK did not differ by the age groups. These results suggest that the perceptions of students in the same age group on these issues were similar. Prensky (14) defined the new generation of students as the new native speakers of the digital language used in computers, video games, and the internet and he also named these students "Digital Natives". These students were born into a digital world. As faculty members, we are defined as "digital immigrants" by Prensky (14) since we have involved in this world later in our academic lives. At this point, digital immigrant instructors' outdated language may cause problems in education. Prensky (14) claims that it is challenging to meet students' expectations in technology-supported classrooms because faculty members met technology late but can succeed if they can adapt to change.

Digitalization offers a revolutionary potential for the whole of dental education. It is needed to set generally accepted

standards for digital education among dental faculties and make more use of up-to-date technologies by instructors. It is anticipated that online lectures or demonstrations will become an inseparable part of dental education in the future (15). At this point, it will become a necessity for both instructors and students in dental education to gain sufficient TK in order to use the special materials in education. The impact of the COVID-19 pandemic has caught both instructors and universities unprepared in terms of distance learning techniques and educational materials that have never been used in dental education. Consequently, instructors must be flexible and willing to adapt to the changes. The evolving technological environment and the audience's familiarity will help instructors to integrate into this process.

Conclusion

In the future, the dental education model should be more technology-supported and kept up- to-date. Universities should encourage instructors at this point. Possible problems, which might be encountered in the process of the integration of educators' knowledge, skills, and attitudes into the education in technology-supported classrooms, should be minimized. Moreover, the changes, which affect the adoption and use of technology, should also be determined so that they can use technology effectively in education.

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Ethics

Ethics Committee Approval: Ethical approval was received from the Graduate Education Institute Ethics Committee of Çanakkale Onsekiz Mart University (approval no: 07/36, date: 18.12.2020)

Informed Consent: Informed consent was obtained.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: Ç.Ç.G., Design: Ç.Ç.G., Y.D., Data Collection or Processing: Ç.Ç.G., C.G., Analysis or Interpretation: Ç.Ç.G., Y.D., C.G., A.D., Literature Search: Ç.Ç.G., Y.D., Writing: Ç.Ç.G., Y.D., C.G., A.D., İ.T.

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