

The Impact of Digital Competences on Academic Procrastination in Higher Education: A Structural Equation Modeling Approach

F. Sehkar FAYDA-KINIK*

Istanbul Technical University, Turkey

ABSTRACT

In the post-pandemic period, as a result of digitally-surrounded learning environments in higher education institutions (HEIs), some obstacles are observed in learning procedures such as academic procrastination because of poor digital competences. Because of the limited research focusing on specifically digital competences and academic procrastination of students in the post-pandemic period where HEIs have been digitally transformed at an unprecedented speed in the literature, this study aims to identify undergraduate students' levels of digital competences and academic procrastination and to explore the impact of digital competences on their attitudes towards academic procrastination in higher education. In a quantitative research design, 521 undergraduate students were surveyed taking online classes from different departments in different universities in Turkey. Descriptive analyses and structural equation modeling (SEM) were performed on the collected data by using SPSS v26.0 and IBM AMOS v24.0. According to the descriptive results, it was revealed that the overall average of the perceived digital competence is moderate, the perceived digital competences in everyday life online participation and learning are also moderate, and the highest digital competence is the students' perception of hedonic e-citizenship while the lowest perception refers to digital creation skills, and the students' attitude towards academic procrastination is low. The SEM results indicated that the self-perceived digital competences negatively affect academic procrastination; in other words, as the level of self-perceived digital competences increases, students' attitude towards academic procrastination decreases. The results of this study contribute to filling the research gap in the field of higher education by providing significant implications to policy-makers, educational administrators, and faculty in universities.

Keywords: Digital competences, academic procrastination, higher education, structural equation modeling

INTRODUCTION

With the rapid development of information and communication technologies (ICT) and the unprecedented impacts of Covid-19, the process of digitalization has accelerated in every part of human lives, which makes the topic of digital competences a center of research interest in the field of education. Therefore, higher education institutions (HEIs) have started to question the digital competences of the human capital to meet the requirements of the knowledge age. With the help of digitally competent faculty and students, technologically innovative processes are effectively used to facilitate teaching and learning practices providing a higher level of communication and interaction (Chen, 2020; Prestridge & Main, 2018). Taking the role of HEIs in development into account, digitally competent graduates in this digital era shape the social structure of communities and the future of countries.

The term "digital competence" is related to the ability to effectively use ICT in life, which involves "the confident, critical and responsible use of the technologies from the society of information for work, entertainment and education" comprised of "information and data literacy, communication and collaboration, media literacy, digital content creation (including programming), safety (including digital well-being and competences related to cybersecurity), intellectual

property related questions, problem-solving and critical thinking" (European Commission, 2018, p. 9). In other words, digital competence is a complex concept including a variety of digital skills necessary to effectively perform the student's everyday life and learning tasks.

In the knowledge age, the acceleration of digital infusion into students' school life in HEIs leads to some obstacles in learning procedures such as academic procrastination because of poor digital competences. As defined by Steel (2007),

Corresponding Author e-mail: kinik@itu.edu.tr

https://orcid.org/0000-0001-6563-4504

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procrastination is to “voluntarily delay an intended course of action despite expecting to be worse off for the delay” (p. 66), which is associated with a number of cognitive, emotional, and motivational factors (Pychyl & Flett, 2012). Academic procrastination is a learning-related term that describes students’ voluntary delay in completing learning assignments or tasks/activities required to be carried out to achieve the intended course (Kim & Seo, 2015; Steel & Klingsieck, 2016) because of the failure in self-regulation (Steel, 2007). Due to its negative consequences on students’ academic life such as low academic performance or failure in academic achievement (Goroshit & Hen, 2019; Kennedy & Tuckman, 2013; Kim et al., 2017; Kim & Seo, 2015; Kurtovic et al., 2019), academic procrastination is a research topic that needs to be reinvestigated considering digital factors under the current conditions of undergraduate students.

In the post-pandemic period, as a result of digitally-surrounded learning environments in HEIs, it is significant to reconsider the impact of digital competences on academic procrastination; however, the current research on these two variables investigated among students is quite scarce (Kaliba & Ambrožová, 2021; Rahardjo et al., 2013; Sage et al., 2021; Witt et al., 2021). Kaliba and Ambrožová (2021), in their study with 322 university students in the Czech Republic, reported that the student tendencies to procrastinate during online learning were stronger than the regular learning, and underlined the impact of digital competences of the teacher and the application of the digital tools on procrastination. Similarly, Rahardjo et al. (2013) stated, in a study carried out with 65 college students in Indonesia, that “when [the] computer is perceived as something that is unfamiliar and students feel anxious on their lack of ability in operating computer, there is a tendency that college students will delay the completion of course assignments” recommending to develop strategies to enhance students’ technological skills (p. 150). Another correlational study conducted by Sage et al. (2021) revealed that students’ technology use influences their level of procrastination individually during online courses suggesting technology training for both faculty and students. Moreover, Witt et al. (2021) detected procrastination as one of the risk areas for students in the management of digital education. In this context, due to the limited number of studies in the literature, it is obvious that there is a research gap focusing on specifically digital competences and academic procrastination of students in the post-pandemic period where HEIs have been digitally transformed at an unprecedented speed. Therefore, this study aims to identify undergraduate students’ levels of digital competences and academic procrastination and to explore the impact of digital competences on their attitudes towards academic procrastination in higher education.

It is obvious that the Covid-19 pandemic has accelerated the digitalization of educational life and caused some

unexpected situations that have not been encountered before in learning processes. When evaluated in this respect, investigating whether students’ digital competencies cause attitudes that negatively affect their learning processes will fill the gap in this area and will help determine a route for more efficient learning processes in HEIs. Undergraduate students’ digital competencies are complex in terms of measuring and determining their effects due to the diversity of courses taken at universities regarding their content and learning outcomes. Within this scope of view, this research contributes to the existing literature by examining the complex nature of digital competencies of undergraduate students in terms of everyday life online participation and learning including a variety of perspectives such as utilitarian e-citizenship, hedonic e-citizenship, ICT proficiency, ICT productivity, identification of information types, information literacy skills, digital creation skills, digital research skills, digital communication skills, digital innovation, digital learning and development, digital identity management, and digital wellbeing. Additionally, this study is significant by providing the findings about the impact of student digital competences on their attitudes towards academic procrastination in HEIs in the post-pandemic period. The results of the research, hereby, contribute to filling the research gap in the field of higher education by providing significant implications for the management and implementation of online learning processes in HEIs to policy-makers, educational administrators, and faculty in universities.

LITERATURE REVIEW

Digital Competences

Digital competence has been increasingly discussed in especially policy documents with different notions. In the Digital Competence Framework (DIGCOMP) published by the European Commission, five key areas of information, communication, content creation, safety, and problem solving were indicated with 21 related competences (Ferrari, 2013). Similarly, OECD (2016) outlined the promotion of “ICT-related skills and competences including basic ICT skills and ICT specialist skills” as one of the key areas for digital strategies of national economies (p. 37). As a concept, digital competence is adverted by utilizing different terms and approaches, which represents a set of skills integrating technical perspectives with a variety of multiple literacies (Durán Cuartero et al., 2016). The elements making up digital competences are frequently indicated in the literature as ICT competences (Albertos et al., 2016; Senkbeil & Ihme, 2017), information literacy (Hanbidge et al., 2015; Kolle, 2017), digital literacy (González-Conde et al., 2017; Hanbidge et al., 2016), computer literacy (Brown et al., 2015), ICT literacy (Goodfellow, 2011), and digital skills (Reedy et al., 2015; Sánchez et al., 2017).

After examining the definitions existing in the educational setting, Calvani et al. (2009) underlined the features of the concept of digital competence indicating that it is multidimensional, complex, interconnected, and sensitive to the socio-cultural context, and stated that “digital competence consists in being able to explore and face new technological situations in a flexible way, to analyze, select and critically evaluate data and information, to exploit technological potentials in order to represent and solve problems and build shared and collaborative knowledge, while fostering awareness of one’s responsibilities and the respect of reciprocal rights/obligations” (p.186). In other words, it is not only related to being familiar with the tools but also having the ability to use these tools to solve problems collaboratively with an awareness of personal and professional responsibilities. Because of its complex nature, it is quite difficult to identify one’s digital competence to be required to carry out certain tasks.

Within the context of higher education, students with a variety of socio-demographic backgrounds, which accelerates digital inequalities (Martzoukou et al., 2020), are registered in different fields with different digital requirements. Therefore, universities adopt digital strategies to develop and/or improve the digital competences of students, which is also highlighted as a center of interest for researchers. Prior research has proved that students lack the necessary digital competences to complete their academic tasks in faculties (Catalano, 2013; He & Li, 2019; López-Meneses et al., 2020; Sánchez et al., 2017; Vanslambrouck et al., 2018).

Academic procrastination

Academic procrastination or student procrastination, as an interchangeably used term, refers to connotations of delay for “the tasks and activities related to and/or relevant for learning and studying” (Steel & Klingsieck, 2016, p. 37). From the behavioral aspect of procrastination, it can be defined as a task-specific avoidance in student behaviors (Schouwenburg, 2004). Onwuegbuzie and Jiao (2000) reported that the tasks delayed to be carried out in an academic setting are studying for examinations, writing term papers, and weekly reading assignments. As a self-regulation failure (Pychyl & Flett, 2012; Steel, 2007), academic procrastination could be more common in autonomous learning environments such as online education (Delaval et al., 2017). In online education and/or blended learning environments, instructors are not physically available; therefore, students need to perform autonomously by completing certain tasks on their own, which increases their tendency to be procrastinators.

The nature of academic procrastination is complex due to its complicated structure including cognitive, behavioral, and affective components (Rakes & Dunn, 2010). Therefore, there are a variety of reasons why students

procrastinate, and a number of negative outcomes have been detected in the literature. Klingsieck (2013) categorized the antecedents of procrastination in psychological (e.g., personality traits), motivational (e.g., self-determination and self-efficacy), clinical psychology (e.g., anxiety and stress), and situational (e.g., task characteristics) perspectives. Previous studies on academic procrastination have detected negative consequences in students’ academic life such as failure in academic performance (Balkis, 2013; Moon & Illingworth, 2005), decrease in productivity and work ethic (Cahyani et al., 2022), and problems in health such as stress and sleeping (Grunschel et al., 2013).

In the context of higher education, students’ tendencies to procrastinate have increased under the impacts of digitalization in the post-pandemic period. Peixoto et al. (2021), in their study with 416 undergraduate and graduate students in Brazil, reported that procrastination behaviors in academic activities increased and “academic procrastination is negatively linked to harmonious passion, and positively linked to obsessive passion” (p. 877). Melgaard et al. (2022), in their mixed-method study with university students in Norway, found that “the procrastinators are encountering a higher degree of challenges related to motivation as opposed to non-procrastinators” (p. 117). Kathleen and Basaria (2021) detected “a significant negative relationship between self-oriented perfectionism and academic procrastination, and a significant positive relationship between socially prescribed perfectionism and academic procrastination” among 366 college students in Indonesia (p. 1197). Accordingly, the current increase in academic procrastination leads to the investigation of the topic with different research variables in higher education settings.

METHOD

Research Design

A quantitative research design was adopted to measure the levels of digital competences and academic procrastination and to investigate the impact of the self-perceived digital competences of undergraduate students on their attitude towards academic procrastination. In line with the research objectives, the following research questions were investigated in this study as presented in Figure 1:

- **RQ1:** What is the level of undergraduate students’ self-perceived digital competences?
- **RQ1a:** What is the level of undergraduate students’ self-perceived digital competences in everyday life online participation?
- **RQ1b:** What is the level of undergraduate students’ self-perceived digital competences in learning?
- **RQ2:** What is the level of undergraduate students’ attitudes towards academic procrastination?

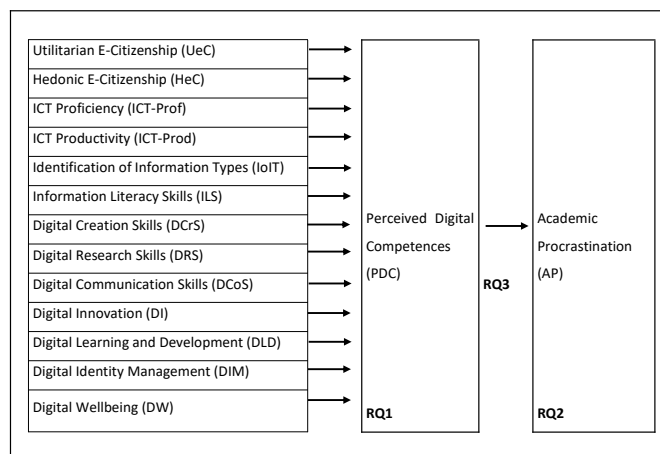


Fig. 1: The research model

- **RQ3:** What is the impact of self-perceived digital competences of undergraduate students on their attitudes towards academic procrastination?

As illustrated in Figure 1, for RQ1 and RQ2, descriptive statistics were calculated while correlational statistics were carried out to investigate RQ3. Therefore, the following hypothesis was formulated for RQ3 in the study to measure and explicitly identify the impact of digital competences on academic procrastination:

- **H₁:** Self-perceived digital competences of students in learning decrease their academic procrastination.

Participants

The sample of this study was determined as 521 undergraduate students taking online classes from different departments in different universities in Turkey. Convenience sampling techniques were used to select the participants as a non-probability sampling method. The demographic profile of the sample is presented in Table 1.

Accordingly, 192 male (36.9%) and 329 female (63.1%) students participated in the study. The majority of the participants had an age range of 18-24 ($n=467$; 89.6%) representing Generation Z whereas 54 students were 25 and more years old (10.4) corresponding to Generation Y. Regarding the faculty variable, 143 students were studying in the Faculty of Education (27.4%), 138 in the Faculty of Engineering (26.5%), and 80 in the Faculty of Health Sciences (15.4%). As for the year of study, 191 participants were studying in the first year (36.7%), 130 were in the second year (25.0%), 103 were in the third year (19.8%), 74 were in the fourth year (14.2%), and 23 were in the fifth and more years (4.4%).

Data Collection Tools

The questionnaire used in this research consists of three parts: demographics as listed in Table 1, the “Survey of Self-Perceived

Table 1: The demographic profile of the participants

Demographics	<i>n</i>	%
<i>Gender</i>		
Male	192	36.9
Female	329	63.1
<i>Age</i>		
18-24 (Generation Z)	467	89.6
25+ (Generation Y)	54	10.4
<i>Faculty</i>		
Faculty of Administrative Sciences	26	5.0
Faculty of Education	143	27.4
Faculty of Engineering	138	26.5
Faculty of Fine Arts and Music	3	0.6
Faculty of Health Sciences	80	15.4
Faculty of Law	22	4.2
Faculty of Management	19	3.6
Faculty of Science and Letters	50	9.6
Faculty of Social Sciences	29	5.6
Faculty of Sports Sciences	11	2.1
<i>Year of Study</i>		
1st	191	36.7
2nd	130	25.0
3rd	103	19.8
4th	74	14.2
5+	23	4.4
Total	521	100.0

Digital Competences for Learning and Everyday Life Online Participation” (Martzoukou et al., 2020), and the “Academic Procrastination Scale” (Yockey, 2016). The indicators for the questionnaire are presented in Table 2.

As indicated in Table 2, the survey on self-perceived digital competences has two parts for everyday life online participation and learning with a five-level Likert-type scale (“Novice”, “Basic”, “Intermediate”, “Advanced”, “Expert”). Everyday life online participation in digital citizenship is comprised of utilitarian activities in 3 items and hedonic activities in 2 items. The second part of the survey has 60 items in total to measure students’ self-perceived digital competences for learning: ICT proficiency in completing different tasks in 7 items, ICT productivity in 3 items, information identification in different contexts in 3 items, information literacy skills in 7 items, digital creation skills tasks in 4 items, digital research skills tasks in 8 items, digital communication skills tasks in 6 items, digital innovation tasks in 2 items, digital learning and

Table 2: The Indicators for the Questionnaire

Aspects	Indicators	Number of Statements [Item Number]
<i>Digital competences in everyday life online participation</i>	Utilitarian E-Citizenship (UeC)	3 [Q1a1, Q1a2, Q1a3]
	Hedonic E-Citizenship (HeC)	2 [Q1b1, Q1b2]
<i>Digital competences in learning</i>	ICT Proficiency (ICT-Prof)	7 [Q2.1, Q2.2, Q2.3, Q2.4, Q2.5, Q2.6, Q2.7]
	ICT Productivity (ICT-Prod)	3 [Q3.1, Q3.2, Q3.3]
	Identification of Information Types (IoIT)	3 [Q4.1, Q4.2, Q4.3]
	Information Literacy Skills (ILS)	7 [Q5.1, Q5.2, Q5.3, Q5.4, Q5.5, Q5.6, Q5.7]
	Digital Creation Skills (DCrS)	4 [Q6.1, Q6.2, Q6.3, Q6.4]
	Digital Research Skills (DRS)	8 [Q7.1, Q7.2, Q7.3, Q7.4, Q7.5, Q7.6, Q7.7, Q7.8]
	Digital Communication Skills (DCoS)	6 [Q8.1, Q8.2, Q8.3, Q8.4, Q8.5, Q8.6]
	Digital Innovation (DI)	2 [Q9.1, Q9.2]
	Digital Learning and Development (DLD)	8 [Q10.1, Q10.2, Q10.3, Q10.4, Q10.5, Q10.6, Q10.7, Q10.8]
	Digital Identity Management (DIM)	6 [Q11.1, Q11.2, Q11.3, Q11.4, Q11.5, Q11.6]
	Digital Wellbeing (DW)	6 [Q12.1, Q12.2, Q12.3, Q12.4, Q12.5, Q12.6]
<i>Academic Procrastination</i>	Attitudes towards academic procrastination	5 [AP.1, AP.2, AP.3, AP.4, AP.5]

development tasks in 8 items, digital identity management tasks in 6 items, and digital wellbeing tasks in 6 items.

In the final part of the questionnaire, the Academic Procrastination Scale was conducted in its short version (Yockey, 2016). In the short version of the scale, 5 items were used to measure students' attitudes towards academic procrastination using a five-degree Likert-type scale ("Strongly disagree", "Disagree", "Neutral", "Agree", "Strongly agree").

Data Collection

Primary data collection procedures were adopted in the study; therefore, ethical approval by the Board of Ethics affiliated with the institution of the researcher was confirmed before collecting data. The questionnaire was configured on an online platform, and the link was shared with the students eligible for the targeted sample profile of the research. Of more than 700 deliveries during the 2021-2022 academic year, 521 valid responses from different universities in Turkey were included in the study.

Data Analysis

After the data was collected from the sample, all the components of the questionnaire from each respondent were examined and checked for the data clearance procedures such as eliminating invalid/missing responses and coding for the organization on EXCEL. Data analyses were performed with SPSS v26.0 and IBM AMOS v24.0. First, demographic data were analyzed to determine the sample profile using descriptive statistics on SPSS v26.0. Afterward, confirmatory factor analysis (CFA) was used to confirm the factor structure

of the "Survey of Self-Perceived Digital Competences for Learning and Everyday Life Online Participation". Then, Cronbach's Alpha values were taken as $CA > 0.700$ acceptable by Nunnally (1978) and descriptive statistics for the scales of digital competences and academic procrastination constituting the second and third parts of the questionnaire were analyzed after the factor structure was verified. In the analysis of the results of the descriptive statistics, the 5-point Likert type responses depending on the weighted mean scores were interpreted as very low ($\bar{x} = 1.00-1.80$), low ($\bar{x} = 1.81-2.60$), moderate ($\bar{x} = 2.61-3.40$), high ($\bar{x} = 3.41-4.20$), and very high ($\bar{x} = 4.21-5.00$).

Finally, the model created within the framework of the theory was tested with structural equation modeling (SEM) on IBM AMOS v24.0. SEM is used to test whether a specified model fits the data (Yuan, 2005). The Chi-Squared test, RMSEA, NFI, and CFI are calculated to measure model fit indices (Hooper et al., 2008). The acceptable threshold levels of fit indices are used as $0 < X^2/df < 5$ (Klein, 2005; Marsh & Hocevar, 1988; Tabachnick & Fidell, 2007); $0.00 \leq RMSEA \leq 0.10$ (McQuitty, 2004); $0.90 \leq NFI \leq 1.0$ (Hu & Bentler, 1999); and $0.90 \leq CFI \leq 1.0$ (Hair et al., 2010).

FINDINGS

The results of the study are reported addressing the research questions in sequence: Accordingly, the findings are presented below as the level of undergraduate students' self-perceived digital competences (RQ1), the level of undergraduate students' attitude towards academic procrastination (RQ2), and the impact of the self-perceived digital competences of

undergraduate students on their attitude towards academic procrastination (RQ3).

Students' self-perceived digital competences

The descriptive findings on the students' self-perceived digital competence levels are presented with the Cronbach's Alpha (CA) values in Table 3.

Table 3 lists the Cronbach's Alpha values of the scale and its sub-dimensions. The Cronbach's Alpha value can be positive or negative taking a value between 0 and 1. In order for a scale to obtain reliable results, the relevant value must be greater than 0.700 as Nunnally (1978) recommended. Accordingly, since the Cronbach's Alpha values of the whole scale and its sub-dimensions are higher than the limit value ($CA > 0.700$), it is possible to claim that the results obtained with the data collected by the scale are quite reliable ($0.980 > 0.700$).

According to the results of descriptive statistics, the overall average of the perceived digital competence is moderate (2.928 ± 0.663): the perceived digital competences in everyday life online participation (3.114 ± 0.761) and the perceived digital competences in learning (2.925 ± 0.750) are also moderate. Regarding the sub-dimensions, the students' perception of hedonic e-citizenship (HeC), which is the digital competence

they have the highest mean, is at a moderate level (3.362 ± 0.969). The digital competence they have the lowest perception is digital creation skills (DCrS) (2.438 ± 1.046).

Students' attitudes towards academic procrastination

The results of descriptive analyses of students' attitudes towards academic procrastination are presented in Table 4 with Cronbach's Alpha value.

As presented in Table 4, the Cronbach's Alpha value of the scale is higher than the limit value ($CA > 0.700$) with a score of 0.875, which proves that the results obtained with the data collected by the scale are quite reliable. According to the results of mean scores, it was detected that the students' attitude towards academic procrastination is low (2.594 ± 1.004).

Impact of digital competences on academic procrastination

The results of the structural model for confirmatory factor analysis (CFA) of the perceived digital competence (PDC) scale are illustrated in Figure 2, and the model fit indices are listed in Table 5 with the scores of the Chi-Squared test, RMSEA, NFI, and CFI.

Table 3.: Cronbach's Alpha values and descriptive statistics of students' self-perceived digital competences

		$X \pm SD$	Skewness	Kurtosis	CA*
Question No	Perceived Digital Competences	2.928 ± 0.663	0.076	0.052	0.980
	Digital competences in everyday life online participation	3.114 ± 0.761	-0.151	-0.123	0.753
Q1a	Utilitarian E-Citizenship (UeC)	2.867 ± 0.845	0.047	-0.280	0.736
Q1b	Hedonic E-Citizenship (HeC)	3.362 ± 0.969	-0.213	-0.672	0.745
	Digital competences in learning	2.925 ± 0.750	0.114	-0.117	0.980
Q2	ICT Proficiency (ICT-Prof)	3.117 ± 0.824	0.032	-0.208	0.892
Q3	ICT Productivity (ICT-Prod)	3.080 ± 0.946	0.123	-0.492	0.811
Q4	Identification of Information Types (IoIT)	2.910 ± 0.868	0.007	-0.376	0.806
Q5	Information Literacy Skills (ILS)	3.076 ± 0.847	-0.106	-0.184	0.895
Q6	Digital Creation Skills (DCrS)	2.438 ± 1.046	0.372	-0.695	0.890
Q7	Digital Research Skills (DRS)	2.910 ± 0.924	0.055	-0.433	0.935
Q8	Digital Communication Skills (DCoS)	2.969 ± 0.870	0.028	-0.330	0.869
Q9	Digital Innovation (DI)	2.632 ± 1.056	0.338	-0.491	0.843
Q10	Digital Learning and Development (DLD)	2.993 ± 0.870	0.124	-0.268	0.923
Q11	Digital Identity Management (DIM)	2.934 ± 0.887	0.072	-0.364	0.895
Q12	Digital Wellbeing (DW)	3.116 ± 0.869	-0.056	-0.046	0.857

*CA: Cronbach's Alpha

Table 4: Cronbach's Alpha and descriptive statistics of students' attitudes towards academic procrastination

	$\bar{X} \pm SD$	Skewness	Kurtosis	CA*
Academic Procrastination (AP)	2.594 ± 1.004	0.380	-0.543	0.875

*CA: Cronbach's Alpha

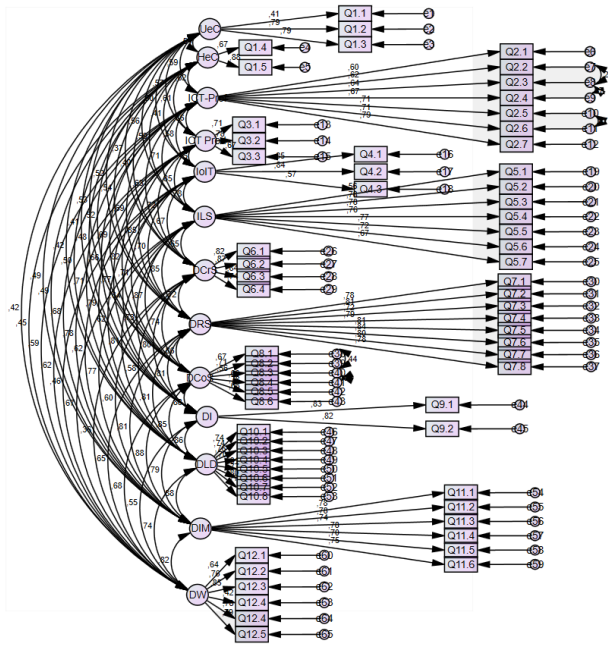


Fig. 2: CFA model of the PDC scale

Table 5: CFA model fit indices of the PDC scale

Model Fit Indices	Calculated	Acceptable	Good/Very Good
X ² /sd	2.269	0<X ² /sd<5	0<X ² /sd<3
RMSEA	0.049	0.00≤RMSEA≤0.10	0.00≤RMSEA≤0.05
NFI	0.837	0.90≤NFI≤1.0	0.95≤NFI≤1.0
CFI	0.901	0.90≤CFI≤1.0	0.95≤CFI≤1.0

Accordingly, the model fit indices for CFA were calculated as $X^2/sd=2.269$; $RMSEA=0.049$; $NFI=0.837$; and $CFI=0.901$. Of these four fit indices examined, it was observed that the Chi-square/degree of freedom value is less than 3, so it fits very well. RMSEA value is less than 0.05; therefore, it fits very well. CFI value is between 0.90 and 1.0 which is within acceptable limits. NFI value is low than acceptable limits. Since it was concluded that the factor structure of the scale showed acceptable/good fit in three of the four index values examined, the factor structure of the scale was confirmed through CFA.

After the confirmation of the CFA model structure of PDC, the hypothesis was tested to identify the effect of perceived digital competences (PDC) on academic procrastination (AP) with SEM as presented in Figure 3. The calculated fit indices for the model are also given in Table 6.

Based on the SEM results, the fit index values of the structural model created within the framework of the theory were calculated as $X^2/sd=2.345$; $RMSEA=0.067$; $NFI=0.921$; and $CFI=0.953$. Accordingly, it was deduced that RMSEA and NFI were within acceptable limits, while the chi-square/degree of freedom and CFI value showed a good fit.

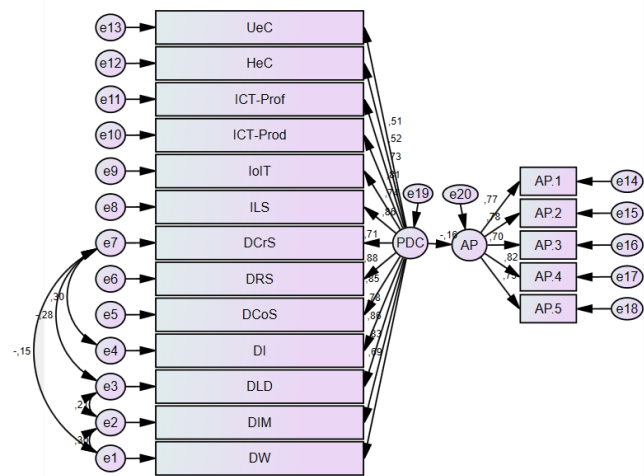


Fig. 3: Standardized model

Table 6: Model fit indices

Model Fit Indices	Calculated	Acceptable	Good / Very Good
X ² /sd	2.345	0<X ² /sd<5	0<X ² /sd<3
RMSEA	0.067	0.00≤RMSEA≤0.10	0.00≤RMSEA≤0.05
NFI	0.921	0.90≤NFI≤1.0	0.95≤NFI≤1.0
CFI	0.953	0.90≤CFI≤1.0	0.95≤CFI≤1.0

Finally, standardized estimates of the structural model were analyzed to explore the impact of perceived digital competences (PDC) on academic procrastination (AP) as listed in Table 7.

As evident in Table 7, the PDC estimate coefficient is statistically significant ($p<0.05$), and the value is negative ($\beta=-0.162$), which means perceived digital competences negatively affect academic procrastination. Only one standard deviation increase in PDC causes a 0.162-point standard deviation decrease in AP. Therefore, it can be deduced that as the perceived digital competences increase, students' attitudes towards academic procrastination decrease, which proves that H1 is accepted.

DISCUSSION

In the present research, it was aimed to identify undergraduate students' levels of digital competences (RQ1) and academic procrastination (RQ2), and to explore the impact of digital competences on their attitudes towards academic procrastination in higher education (RQ3). According to the results of the analyses for RQ1, the overall average of the perceived digital competences is found moderate in both everyday life online participation and learning. Consistently, Zhao et al. (2021), in their study with 5164 university students in China, found that the majority of the students perceived

Table 7: Standardized estimates of the model

			<i>Estimate</i>	<i>p</i>
Academic Procrastination (AP)	<---	PDC	-0.162	0.011
Q12_Digital Wellbeing (DW)	<---	PDC	0.690	
Q11_Digital Identity Management (DIM)	<---	PDC	0.825	***
Q10_Digital Learning and Development (DLD)	<---	PDC	0.859	***
Q9_Digital Innovation (DI)	<---	PDC	0.782	***
Q8_Digital Communication Skills (DCoS)	<---	PDC	0.850	***
Q7_Digital Research Skills (DRS)	<---	PDC	0.884	***
Q6_Digital Creation Skills (DCrS)	<---	PDC	0.712	***
Q5_Information Literacy Skills (ILS)	<---	PDC	0.863	***
Q4_Identification of Information Types (IoIT)	<---	PDC	0.740	***
Q3_ICT Productivity (ICT-Prod)	<---	PDC	0.810	***
Q2_ICT Proficiency (ICT-Prof)	<---	PDC	0.730	***
Q1b_Hedonic E-Citizenship (HeC)	<---	PDC	0.518	***
Q1a_Utilitarian E-Citizenship (UeC)	<---	PDC	0.506	***
AP.1	<---	AP	0.769	
AP.2	<---	AP	0.777	***
AP.3	<---	AP	0.700	***
AP.4	<---	AP	0.815	***
AP.5	<---	AP	0.749	***

their level of digital competence as “good”. Similarly, in a study with 686 university students from Spain and Italy, Llorent-Vaquero et al. (2020) detected that the level of university students’ digital competence is also “good”. Thereby, the overall self-evaluation of digital competence may not help one understand its reflections on other areas, and it is necessary to examine the descriptive findings in detail.

Another finding of the descriptive analyses revealed that the mean score of the perceived digital competences for everyday life online participation is higher than those of learning, which can imply that students are more familiar with the e-citizenship applications rather than digital tools used for learning. Consistently, Martzoukou et al. (2020) reported that as the level of the self-perceived digital competence of students based on carrying out everyday digital tasks increases, the level of the self-perceived digital competence in learning likely increases in a relatively positive way. It is obvious that different kinds of digital competences in different areas of life support one another in terms of competence development.

The other interesting finding at this phase is that the lowest mean score in digital competences belongs to digital creation skills, which could be because of the lack of knowledge of different kinds of digital tools used in learning activities. Similarly, Zhao et al. (2021) underlined

that digital creation skills necessary for digital content should be promoted “helping students to gain knowledge when dealing with everyday technological issues” (p. 1). Elaborately, the difficulty of tasks asked from students should be evaluated extensively. Cabezas González et al. (2017), in their study with 70 undergraduate and graduate students in Portugal, reported that students’ attitude towards ICT is very positive and they generally use the internet to share photos highlighting that they do not have a blog or website. Critically, task difficulty in learning should be questioned with instructor competences in digital teaching and pedagogies.

Regarding the results of the analyses for RQ2, it was detected that the students’ attitude towards academic procrastination is low. This could be because of the moderate level of their digital competences during online learning. Inconsistently, Peixoto et al. (2021) detected that procrastination behaviors of 416 undergraduate and graduate students in Brazil increased in academic activities which was negatively linked to harmonious passion. However, this finding consistently supports the prior research in that the level of the perceived digital competences of the students is not low. In other words, when students are digitally competent, their level of procrastination decreases. Vanslambrouck et al. (2018) underlined the significance of computer skills and ICT infrastructure to eliminate

procrastination by increasing participation in the online learning environment.

Finally, the impact of digital competences on academic procrastination was investigated for RQ3. Accordingly, it was revealed that students' attitudes towards academic procrastination decrease when the level of perceived digital competences increases. Consistently, prior research supports this result in the context of higher education (Kaliba & Ambrožová, 2021; Rahardjo et al., 2013; Sage et al., 2021; Witt et al., 2021). Apparently, this finding proves that digital competences have a significant effect on academic procrastination in the post-pandemic period. In this respect, the complexity of digital skills should be evaluated elaborately. The structural model fit the dimensions of digital competence as a whole, which can imply that because of its multidimensional, complex, and interconnected structure (Calvani et al., 2009), the issue of digital competence should be tackled extensively from daily life tasks including utilitarian and hedonic activities to learning tasks involving ICT proficiency, ICT productivity, information identification, information literacy skills, digital creation skills, digital research skills, digital communication skills, digital innovation, digital learning and development, digital identity management, and digital wellbeing. Therefore, it is evident that the more "thoroughly" digitally competent university students become, the less they procrastinate their academic tasks.

CONCLUSION

Academic procrastination is a significant outcome hindering student improvement in learning environments. Of a variety of factors in student learning, digital competences are regarded as a significant variable influencing student attitudes towards academic procrastination. Therefore, it was aimed, in this study, to identify undergraduate students' levels of digital competences and academic procrastination in addition to exploring the impact of digital competences on their attitudes towards academic procrastination in higher education. The results of the study proved that there is a negative link between digital competences and academic procrastination. Therefore, practitioners and educational administrators in higher education should take students' current level of digital skills into consideration in planning and developing the curricula and the digital tools necessary to be used in the intended courses in the departments. Because of the complex, multidimensional and interconnected structure of digital skills, attempts to implement programs should be taken for the students with poor digital competences in order to develop and/or improve their current digital competences to autonomously manage their own learning requirements.

At this point, it is necessary to outline the complexity of digital skills in a learning context, which requires a digital transformation of each component making up student learning

such as instructor training for digital teaching, the upgraded versions of the software, and the digital tools pedagogically and instructionally appropriate for the content and implementation of the courses. Hence, online learning environments offered by HEIs should be configured so that learning can digitally be facilitated with all of these components. Thereby, academic procrastination resulting from digital incompetence can be controlled, and improvement in student learning; consequently, academic performance can significantly be provided through the adoption of proper digital policies and strategies.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

This study is limited to the data collected from the undergraduate students studying in different departments of different universities in Turkey, and academic procrastination was investigated from the perspective of the perceived digital competences. However, as stated in the literature, there are a variety of reasons for student procrastination. In future studies, some other factors such as socio-economic, motivational, psychological, and situational components can be explored in not only quantitatively-designed research but also qualitatively-adopted studies. Moreover, it is also significant to measure the digital skills of faculty and the digital requirements of certain courses in the field, which will provide more understanding of academic procrastination in the educational setting.

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