

Examination of information, media and technology skills of students in terms of certain variables

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Abstract: *The purpose of this study is to examine “the information, media and technology skills” of students in terms of certain variables. The study, which was designed with a survey method, included 612 high school senior students. In the research conducted with the screening model and participated by 612 high school senior students, effort was paid to determine whether the students' gender, the type of school they attend, whether they take information and communication technologies courses, and the digital devices they possess explain a significant difference in their levels of “information, media, and technology usage”. According to the results obtained from the research, it can be said that there is a significant difference in favor of males in terms of students' gender as regards "programming", "problem solving" and "security" skills. The results revealed that the level of use of information, media and technology skills increases with the variety of digital devices that students possess. Similarly, a significant difference was found in favor of students who took information and communication technologies course. As regards school types, it was found that especially students enrolled in private schools enjoy higher levels of use of “information, media and technology skills” compared to other students.*

Keywords: Digital devices, Digital technologies, High school level

1. Introduction

In the 21st century, as technology is changing rapidly and the lives of individuals are being reshaped, developments in information and communication technologies are triggering transformation in every field. On the other hand, positive or negative discrepancies and inequalities are emerging between societies and individuals due to digitalization (Devrani, 2021; İhtiyaroğlu & Ulucan, 2022). Technological developments have restructured social living spaces and have brought about significant change and transformation in the lives of societies, families and individuals (Gencer & Aktan, 2021). Technological changes

experienced in various fields have also affected education systems. As a result, it has emerged as a necessity to make learning experiences effective in order to meet these needs (Elvan & Mutlubaş, 2020). 21st century learning skills gain importance in the process of raising learners who are open to change and can adapt, can think critically, are creative, have high problem-solving and communication skills and can use technology effectively.

21st century skills are defined as a combination of content knowledge, skills, expertise, and literacy that include the knowledge, skills, and expertise that will enable students to accomplish in their work and life (P21 Framework Definitions, 2009). In order for students to have higher-order thinking, communication, collaboration, and production skills, they need to gain skills in the areas of information, media, and technology. In this context, the purpose of this study is to examine the levels of information, media, and technology skills usage of students in terms of certain variables. In order to achieve this goal, answers were sought to the following questions:

Do the following variables make a significant difference in students' information, media and technology skills?

1. Gender of students.
2. Whether the students took information and communication technologies course.
3. Type of school of students.
4. Digital devices students possess.

2. Method

This study was conducted with 612 high school senior students aged 17-18 in the northern part of Cyprus. The study examined “the information, media and technology skills” of students in terms of certain variables, and used the “information, media and technology skills proficiency scale” developed by Hazar in 2018 as a data collection tool. The scale, which consists of a 5-point Likert type, includes 6 sub-dimensions and 23 items. The values in the scale are scored from 5 (always) to 1 (never).

This study was conducted to determine whether there was a significant difference in “the information, media and technology skills” of the participating students according to the type of school they attended, whether they took a computer and communication technologies course, and the digital devices they possess. The researchers launched the data collection process by obtaining ethics committee permission from the institution they were affiliated with. Thereafter, the necessary permits for the implementation of the scale were given by the General Secondary Education Department to which the public schools were affiliated. The researchers interviewed the principals of the schools spread across 6 districts and determined the day and time for the implementation of the scale. The students were

informed about the purpose and importance of the study and they were explained that they had to answer the scale truthfully and sincerely.

The quantitative data obtained from the research were analyzed using the SPSS package program. The distribution of the students in terms of the type of school they study, whether they took information and communication technologies courses, and whether they possess digital devices were calculated with frequency (f) and percentage (%) values. In addition, mean, standard deviation, and lowest and highest values were used in the analysis of the data obtained in the research process. The independent sample t-test analysis tested if the gender of the students and whether they took information and communication technologies courses caused a significant difference in information, media and technology skills. Also, the One-way ANOVA analysis was used. The LSD analysis technique was employed to find out the source of the difference between the groups. The 0.05 level was taken as the baseline of the significance test.

3. Results

3.1 Determining the “level of information, media and technology skills usage” of students according to their gender

The findings obtained from the research are given in Table 1.

Table 1. Level of “Use of Information, Media and Technology Skills” by Gender

Sub-dimensions	Gender	n	M	Sd	t	df	p																																																																				
Communication and Collaboration	Female	379	3.91	0.747	-0.498	610	0.618																																																																				
	Male	233	3.94	0.781				Programming	Female	379	1.53	0.71	-3.424	610	0.001	Male	233	1.77	1.008	Problem Solving	Female	379	2.16	0.917	-8.775	610	0.000	Male	233	2.90	1.197	Digital Content Development	Female	379	3.45	1.242	-0.486	610	0.627	Male	233	3.5	1.198	Information and Data Literacy	Female	379	4.01	0.886	1.946	610	0.052	Male	233	3.86	0.96	Security	Female	379	3.00	1.193	-3.303	610	0.001	Male	233	3.34	1.268	Total	Female	379	3.03	0.61	-3.755	610	0.000
Programming	Female	379	1.53	0.71	-3.424	610	0.001																																																																				
	Male	233	1.77	1.008				Problem Solving	Female	379	2.16	0.917	-8.775	610	0.000	Male	233	2.90	1.197	Digital Content Development	Female	379	3.45	1.242	-0.486	610	0.627	Male	233	3.5	1.198	Information and Data Literacy	Female	379	4.01	0.886	1.946	610	0.052	Male	233	3.86	0.96	Security	Female	379	3.00	1.193	-3.303	610	0.001	Male	233	3.34	1.268	Total	Female	379	3.03	0.61	-3.755	610	0.000	Male	233	3.23	0.716								
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The findings obtained from the study revealed that there was no significant difference between the “communication and collaboration” ($t=-0.498$, $p>0.05$), “digital content development” ($t=-0.486$, $p>0.05$) and “information and data literacy” ($t=1.946$, $p>0.05$) skills of female and male students. On the other hand,

when the “programming” skills ($M=1.53$, $sd=0.71$) of female students and male students ($M=1.77$, $sd=1.008$) were compared, a significant difference was found in favor of the latter ($t=-3.424$, $p<0.05$). Similarly, a significant difference was found in favor of male students ($M=2.90$, $sd=1.197$) in the “problem solving” skills of students ($t=-8.775$, $p<0.05$). Another finding from the study is that there is a significant difference between the “security” skills of female students ($M=3.00$, $sd=1.193$) and male students ($M=3.34$, $sd=1.268$) ($t=-3.303$, $p<0.05$). The findings reveal that male students have higher levels of information, media and technology skills usage compared to female students.

3.2 Student levels for use of information, media and technology skills according to whether or not they took information and communication technologies courses

The findings obtained from the research are given in Table 2.

Table 2. Student Levels for Use of Information, Media and Technology Skills According to Whether or Not They Took Courses

Information, Media, Technology Skills	Did they take the course?	n	M	Sd	t	df	p																																																																				
Communication and Collaboration	Yes	367	3.96	0.697	1.381	610	0.168																																																																				
	No	245	3.87	0.843				Programming	Yes	367	1.69	0.897	2.562	610	0.011	No	245	1.52	0.745	Problem Solving	Yes	367	2.53	1.090	2.363	610	0.018	No	245	2.32	1.091	Digital Content Development	Yes	367	3.54	1.174	1.788	610	0.074	No	245	3.36	1.291	Information and Data Literacy	Yes	367	4.03	0.884	2.488	610	0.013	No	245	3.84	0.956	Security	Yes	367	3.20	1.199	1.593	610	0.112	No	245	3.04	1.276	Total	Yes	367	3.17	0.642	3.031	610	0.003
Programming	Yes	367	1.69	0.897	2.562	610	0.011																																																																				
	No	245	1.52	0.745				Problem Solving	Yes	367	2.53	1.090	2.363	610	0.018	No	245	2.32	1.091	Digital Content Development	Yes	367	3.54	1.174	1.788	610	0.074	No	245	3.36	1.291	Information and Data Literacy	Yes	367	4.03	0.884	2.488	610	0.013	No	245	3.84	0.956	Security	Yes	367	3.20	1.199	1.593	610	0.112	No	245	3.04	1.276	Total	Yes	367	3.17	0.642	3.031	610	0.003	No	245	3.01	0.675								
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The study found that the students who took the information and communication technologies course showed higher levels of using information, media and technology skills than other students ($t=3.031, p<0.05$). This result reveals that the information and communication technologies course is effective in helping students acquire 21st century learning skills. Likewise, it was determined that the programming skills of the students who took the course were higher than those of those who did not ($t=2.562, p<0.05$). In addition, a significant difference was determined between the problem solving skills of the students who took the course and other students in favor of the former ($t=2.363, p<0.05$). While the information and communication technologies course did not create a significant difference in the security skills of the students ($t=1.593, p>0.05$), an important difference emerged in favor of the students who took the course in terms of information and data literacy skills ($t=2.488, p<0.05$). These findings show that the information and communication technologies course plays an effective role in developing “the information, media and technology skills” of the students.

3.3 Student levels for use of information, media and technology skills according to the type of school

The One Way ANOVA analysis technique was used with the purpose of determining whether there was a significant difference in the level of information, media and technology skills use of students studying in different types of schools.

Table 3. School Types

School Type	n	M	Sd	Std. Error
Private High School	121	3.26	0.615	0.0559
Anatolian High School	37	3.14	0.671	0.1103
General High School	382	3.10	0.663	0.0339
Fine Arts High School	13	3.00	0.329	0.0913
Science High School	13	2.96	0.796	0.2208
Theology High School	46	2.80	0.664	0.0979
Total	612	3.11	0.660	0.0267

The information, media and technology skills usage levels of the students participating in the study were examined according to the types of schools they attended, and it was seen that the school type with the highest average scores was private schools ($M=3.26, sd=0.615$). It was determined that the students who had the lowest level of information, media and technology skills usage were theology students ($M=2.80, sd=0.664$).

Table 4. ANOVA Results for “Information, Media and Technology Skills” Usage Levels by School Types

School types		Sum of Squares	df	Mean Square	<i>f</i>	Sig.
Information, Media and Technology Skills * School	Inter-Groups	7.766	5	1.553	3.648	0.003
	Intra-Groups	258.031	606	0.426		
	Total	265.797	611			

According to the findings, school types lead to a significant difference in the information, media and technology skills of students ($F_{(5;606)} = 3.648$, $p < 0.05$). Table 5 shows the LSD test findings performed to determine the difference between groups.

Table 5. LSD Test Findings

School types	School type comparison	Mean Difference	Std. Error	Sig.
General High School	Theology High School	0,306*	0,1018	0,003
Anatolian High School	Theology High School	0,348*	0,1441	0,016
Private School	General High School	0,157*	0,0681	0,021
Private School	Theology High School	0,464*	0,1130	0,000

The LSD test results investigating the levels of “information, media and technology skills” usage according to school types show that there is a significant difference between the information, media and technology skills usage levels of general high school students and theology students in favor of the former ($md=0.306$, $p < 0.05$). Again, a significant difference was found between the information, media and technology skills usage levels of Anatolian high school students and theology students in favor of the former ($md=0.348$, $p < 0.05$). A significant difference was found between the information, media and technology skills usage levels of general high school and private high school students in favor of the latter ($md=0.157$, $p < 0.05$). In addition, it was understood that there was a significant difference between the information, media and technology skills usage levels of private high school and theology students in favor of the former ($md=0.464$, $p < 0.05$).

3.4 Possessed digital devices

The levels of use of information, media and technology skills by students according to their digital devices are given in Table 6.

Table 6. Digital Devices

Possessed devices	n	M	sd
Computer	5	2.66	0.799
Smartphone	136	2.85	0.665
Tablet, Smartphone	20	3.03	0.386
Computer, Smartphone	277	3.13	0.630
Computer, Tablet, Smartphone	174	3.30	0.655
Total	612	3.11	0.660

Table 6 shows that “the levels of information, media and technology skills” usage of the students participating in the study are as follows: (M=2.66, sd=0.799) for students who only have a computer, (M=2.85, sd=0.665) for students who only have a smartphone, (M=3.03, sd=0.386) for students who have a tablet and a smartphone, and (M=3.13, sd=0.630) for students who have a computer and a smartphone. It is seen that the level of “information, media and technology skills” usage of students who have a computer, a tablet and a smartphone at the same time is (M=3.30, sd=0.665). The findings revealed that students who have a computer, a tablet and a smartphone at the same time enjoy higher levels of information, media and technology skills usage compared to other students.

Table 7. One Way ANOVA Results

Digital Devices Possessed		Sum of Squares	df	Mean Square	F	Sig.
Information, Media and Technology Skills * Devices Possessed	Inter-groups	16,827	4	4.207	10.256	0.000
	Intra-groups	248.970	607	0.410		
	Total	265.797	611			

As seen in Table 7, various digital devices possessed by students can explain significant differences between their levels of information, media and technology skills usage ($F_{(4;607)} = 10.256, p < 0.05$). LSD test was applied to determine between which groups the intra-group significant difference occurred.

Table 8. LSD Test Results

Digital Devices	Comparison of Possessed Digital Devices	Mean Difference	Std. Error	Sig.
Computer	Smartphone	-0.185	0.292	0.526
	Computer, Smartphone	-0.470	0.289	0.104
	Tablet, Smartphone	-0.365	0.320	0.255
	Computer, Tablet, Smartphone	-0.636*	0.290	0.029
Smartphone	Computer	0.185	0.292	0.526
	Computer, Smartphone	-0.285*	0.067	0.000
	Tablet, Smartphone	-0.180	0.153	0.241
	Computer, Tablet, Smartphone	-0.451*	0.073	0.000
Computer, Smartphone	Computer	0.470	0.289	0.104
	Smartphone	0.285*	0.067	0.000
	Tablet, Smartphone	0.105	0.148	0.480
	Computer, Tablet, Smartphone	-0.166*	0.062	0.008
Tablet, Smartphone	Computer	0.365	0.320	0.255
	Smartphone	0.180	0.153	0.241
	Computer, Smartphone	-0.105	0.148	0.480
	Computer, Tablet, Smartphone	-0.271	0.151	0.074
Computer, Tablet, Smartphone	Computer	0.636*	0.290	0.029
	Smartphone	0.451*	0.073	0.000
	Computer, Smartphone	0.166*	0.062	0.008
	Tablet, Smartphone	0.271	0.151	0.074

LSD test results, which were conducted to determine which groups had significant intra-group differences, revealed that as the variety of digital devices possessed by students increase, so does their level of use of information, media and technology skills.

4. Discussion and conclusions

Male students especially enjoy higher usage levels of programming, problem-solving, and security skills than female students. Programming, particularly involving executing algorithms to create digital artifacts, requires creating content to enhance students' creativity (Gretter & Yadav, 2016). Therefore, it is seen as a skill that female students, not only male students, should also command.

Another study finding is that students who took information and communication technologies courses show higher levels of skills than other

students. Course content is believed to be especially important for the development of 21st-century skills. Moto et al. (2018) stated that literacy in “information, media, and communication technologies” plays an essential role in education and argues that students need to use technology to learn basic courses, think critically, solve problems, use information effectively, communicate, and work collaboratively.

The types of school students attend also make a significant difference in terms of “information, media and communication skills”. It was determined that the skills of students studying in private high schools were higher than other students. It was also found out that the students with the lowest levels of “information, media and technology skills” use were theological school students. It is clear that the structures of schools and the programs they include are effective in the 21st century skills of students. In this context, a system that will develop the “information, media and technology skills” of students in all types of schools needs to be established. Kivunja (2015) mentioned that the use of information, media and digital technologies in the school environment is a necessity and underlined that this is important not only for students but also for teachers.

Another result obtained from this research is that students' possession of digital devices reveals a difference between their levels of “information, media and technology skills” usage. It was determined that students who have multiple digital devices in their possession enjoy higher levels of “information, media and technology skills” usage compared to other students. It can be claimed that students who have a computer, tablet and smartphone at the same time show more positive developments in “information, media and technology skills” compared to students who possess only one of these devices. It is recommended that schools should be inspected by the Ministry of National Education and that learning and teaching environments should be supported with technology. Students should be provided with a variety of digital devices they can use in their learning activities. Curricula should be evaluated and designed to develop the 21st century skills of technology-assisted students. In addition, although school types may differ in terms of programs, it is recommended that course contents in all schools should be designed with a view to develop the levels of “information, media and technology skills” of students. Last but not least, researchers are recommended to conduct studies to determine the levels of “information, media and technology skills” usage by students studying at different levels of education and compare their results with the findings of this study.

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