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# The analysis of use of information and communication technologies in higher education institutions in the function of the students' scientific field

## Analiza primene informaciono-komunikacionih tehnologija u visokoškolskim ustanovama u funkciji naučnog polja studenata

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**Abstract**

*Modern ICTs are increasingly used in educational institutions whose main role is to facilitate and improve the teaching process. In order for the educational system to be successful, it must follow modern trends in the application of these technologies. The degree of application of these technologies in education is influenced by numerous factors, which is why their application differs from country to country, as well as between different educational institutions within a country. For this reason, thirteen higher education institutions that carry out their educational activity in the northern part of AP Kosovo and Metohija were selected for the subject of this research. Considering that the application of these technologies is influenced by numerous factors, the aim of this paper is to analyze the attitude of students from different scientific fields according to the degree of application of ICT in their higher education institutions. The results of the research were obtained by collecting data through student surveys, as well as their statistical processing using the appropriate statistical program.*
***Keywords*****:** *information and communication technologies, higher education institutions, scientific fields*

**Sažetak**

*Savremene IKT se sve više upotrebljavaju u obrazovnim ustanovama čija je osnovna uloga da olakšaju i unaprede nastavni proces. Da bi obrazovni sistem bio uspešan, on mora da prati savremene trendove u primeni ovi htehnologija. Na stepen primene ovih tehnologija u obrazovanju utiču brojni faktori što dovodi do toga da se njihova primena razlikuje od zemlje do zemlje, kao i od različitih obrazovnih ustanova unutar jedne zemlje. Iz tog razloga, za predmet ovog istraživanja odabrano je trinaest visokoškolskih ustanova koje svoju obrazovnu aktivnost obavljaju u severnom delu AP Kosovo i Metohija. Uzimajući u obzir da na primenu ovih tehnologija utiču brojni faktori, cilj ovog rada je da se analizira stav studenata iz različitih naučnih polja prema stepenu primene IKT u njihovim visokoškolskim ustanovama. Rezultat iistraživanja dobijeni su prikupljanjem podataka putem anketiranja studenata, kao i njihovom obradom primenom odgovarajućeg statističkog programa.*
***Ključne reči*****:** *informaciono-komunikacione tehnologije, visokoškolske ustanove, naučna polja*

## 1. Introduction

In the 21st century, also called the century of knowledge economy and the century of contemporary information technology use, it is clear that good education represents a strong driver of economic development in every country. The study of mutual relations between information technologies, education and economic growth resulted in an observation that the use of ICT in educational institutions represents an important determinant of economic development (Stankić et al., 2018).

On the other hand, the implementation of modern ICT in higher education institutions is an important prerequisite for adapting these institutions to the European higher education system. Universities must meet the expectations

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of modern society so as to be more flexible, open and competitive with the increasing implementation of modern ICT (Garcia-Valcarcel & Tejedor, 2009).

The success of the educational system is directly related to following the modern trends in the application of information and communication technologies (Teofilović & Isailović, 2020; Šarčević et al., 2022; Sović & Avramović, 2022). The degree of application of these technologies in education varies from country to country. Research has shown that the use of ICT in Serbia and Denmark differs significantly. A considerably lower level of application of these technologies was observed in Serbia than in Denmark. However, a common issue in both countries is the lack of IT equipment (Milenković, 2012). Present generations of students believe that the traditional model of education is outdated and they prefer learning assisted by information technologies. The teaching process, with the use of these technologies, enables easier and more successful learning in accordance with the curriculum. Teachers are expected to meet the needs of students through constant promotion of their competences and skills related to the use of IT (Marković-Blagojević et al., 2017).

Through their activities, teachers create an atmosphere that enables better use of IT in schools. Therefore, information and communication technologies play an important role in improving the teaching process (Sangra & Golzales Sanmamed, 2010).

The importance and application of information and communication technologies in educational institutions is the subject of research by numerous researchers (Oliver, 2002; Nikolić & Ružić-Dimitrijević, 2010; Džigurski et al., 2013; Milićević et al., 2014; Milić et al., 2015; Mothibi, 2015; Nakaznyi et al., 2015; Petrović, 2016; Jocić et al., 2017; Ahmed et al., 2018; Kaljević, 2018; Milićević et al., 2021, Živković, 2023). The previous research on the implementation of these technologies included schools and faculties from AP Vojvodina and Central Serbia (Milenković, 2012; Matijašević et al., 2021; Milić et al., 2022). The lack of similar studies from AP Kosovo and Metohija was observed. For this reason, we considered it of interest to analyze the degree of application of information and communication technologies in higher education institutions that carry out their educational activity in the northern part of AP Kosovo Metohija. The aim of this research is to analyze the attitude of students from different scientific fields about the degree of application of information and communication technologies in their higher education institutions.

## 2. Methods of work

This paper analyzes the application of information and communication technologies at thirteen higher education institutions in the function of the scientific field of students. This research included ten faculties of the University of Priština with temporary head office in Kosovska Mitrovica. In addition, three departments within the Academy of Vocational Studies of Kosovo Metohija were analyzed.

These higher education institutions carry out their teaching activities in the northern part of the AP Kosovo and Metohija in four towns: Kosovska Mitrovica, Leposavić, Zvečan and Lešak. Within five scientific fields, this analysis included six higher education institutions in social-humanistic field, one in natural sciences-mathematics, four in technical-technological field, one in medical sciences and one in arts (Table 1).

A total of 508 students from the aforementioned thirteen higher education institutions took part in this research which had two phases. In the first phase, students were surveyed through hard copy questionnaires. In the second phase, the obtained results were processed using the statistical data processing program, IBM SPSS 23.0.

**Table 1.** Overview of higher education institutions per scientific field

| University/Academy | Faculty/Department | Place | Scientific field |
|---|---|---|---|
| University of Priština in Kosovska Mitrovica | Faculty of Technical Sciences | Kosovska Mitrovica | Technical-technological |
| | Faculty of Agriculture | Lešak | Technical-technological |
| | Faculty of Natural Sciences and Mathematics | Kosovska Mitrovica | Natural sciences-mathematics |
| | Faculty of Medicine | Kosovska Mitrovica | Medical sciences |
| | Faculty of Arts | Kosovska Mitrovica | Arts |
| | Faculty of Philosophy | Kosovska Mitrovica | Social-humanistic |
| | Faculty of Law | Kosovska Mitrovica | Social-humanistic |
| | Faculty of Economics | Kosovska Mitrovica | Social-humanistic |
| | Teacher Education Faculty | Leposavić | Social-humanistic |
| | Faculty of Sports and Physical Education | Leposavić | Social-humanistic |
| Kosovo and Metohija Academy of Applied Studies | Department Peć | Leposavić | Social-humanistic |
| | Department Uroševac | Leposavić | Technical-technological |
| | Department Zvečan | Zvečan | Technical-technological |

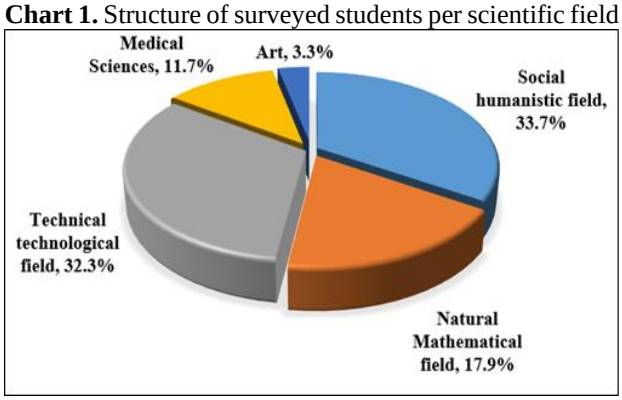
*Source:* Authors'

## 3. Results and discussion

Out of 508 students, 173 students (33.7%) study in social-humanistic field, 92 (17.9%) in natural sciences-mathematics, 166 (32.3%) in technical-technological, 60 (11.7%) in medical sciences and 17 students (3.3%) in the field of arts (Chart 1). The results of the student survey, which are shown in Table 2, clearly show the trend of increasing application of information and communication technologies in the educational process at higher education institutions. Only 75 respondents (14.76%) state that lessons are delivered in the conventional

(traditional) manner. A total of 117 respondents (23.03%) states that lessons at faculties/schools of applied studies are increasingly delivered with the assistance of information and communication technologies, and 316 respondents (62.20%) claim that both methods of teaching are used. The results of the questionnaire on teaching assisted by information and communication technologies, depending of the students' scientific field, indicate that out of 117 respondents, 61 students (52.14%) study in the technical-technological field, 21 students (17.95%) in social-humanistic and the same number in natural sciences-mathematics, and only 2 students (1.71%) in the field of arts.

**Chart 1.** Structure of surveyed students per scientific field




*Source:* Authors'

**Table 2.** The attitude of students from different scientific fields towards the form of teaching at their higher education institutions

| Scientific field | Forms of teaching* | | | Total |
|---|---|---|---|---|
| | C | ICT | BF | |
| Technical-technological | 18 | 61 | 87 | 166 |
| Social-humanistic | 29 | 21 | 123 | 173 |
| Medical sciences | 19 | 12 | 29 | 60 |
| Natural sciences-mathematics | 9 | 21 | 62 | 92 |
| Arts | 0 | 2 | 15 | 17 |
| **Total** | *75* | *117* | *316* | *508* |

* Agenda: C – conventional; ICT – with the assistance of ICT; BF – Bouth forms

The analysis of the PC use at the higher education institutions (Table 3) shows that 304 students (59.84%) say that the one PC-one student model is applied at their faculty/school of applied studies, and 204 students (40.16%) claim that the one PC-several students model is applied.

**Table 3.** The attitude of students from different scientific fields towards the model of computer application at their higher education institutions

| Scientific field | Model of PC use* | | Total |
|---|---|---|---|
| | O | S | |
| Technical-technological | 138 | 28 | 166 |
| Social-humanistic | 84 | 89 | 173 |
| Medical sciences | 30 | 30 | 60 |
| Natural sciences-mathematics | 46 | 46 | 92 |
| Arts | 6 | 11 | 17 |
| **Total** | *304* | *204* | *508* |

* Agenda: O – one student-one PS; S – several student-one PS

Although faculties/departments in the majority of the scientific fields are characterized by approximately the same number of student statements for both models, the one student-one PC model dominates at higher education institutions in the technical-technological field. Out of 166 respondents form technical-technological field, 138 (83.13%) say that one student-one PC model is applied, whereas 28 respondents (16.87%) say that the several students-one PC models is applied.

Analyzing the results of the survey on the possibility of e-learning using the Moodle tool (Table 4) it can be seen that 154 surveyed students (30.31%) state that there is such an option at their faculty/department, and 354 students (69.69%) that there is no option for this form of learning at their faculty/ departments. It is clear that the higher education institutions within the social-humanistic, natural sciences-mathematics and art fields do not have such an option. 95 respondents from the institutions of technical-technological field say that their institutions have this option, and 71 respondents from the same field claim that their institutions do not provide this option, meaning that this tool is installed at some faculties/departments, whereas at others it is not. It is quite certain that the possibility of e-learning using Moodle exists at the Faculty of Medicine in Kosovska Mitrovica.

**Table 4.** The attitude of students from different scientific fields towards the implementation of e-learning using Moodle in their higher education institutions

| Scientific field | E-learning using Moodle | | Total |
|---|---|---|---|
| | A | NA | |
| Technical-technological | 95 | 71 | 166 |
| Social-humanistic | 0 | 173 | 173 |
| Medical sciences | 59 | 1 | 60 |
| Natural sciences-mathematics | 0 | 92 | 92 |
| Arts | 0 | 17 | 17 |
| **Total** | *154* | *354* | *508* |

* Agenda: A – Applies; S – Not applicable

According to the results, the respondents believe that the main factor impacting the use of information and communication technologies at the faculties/departments (Table 5) is the presence of ICT equipment at their institutions (275 respondents, or 54.14%), and that the second most important factor is the activity and expertise of teaching staff (171 respondents, or 33.66%). Still, 62 respondents (12.20%) say that the activity of the Management of faculties and departments is the main factor in the implementation of these technologies.

This sequence of factors is the same with respondents in the four scientific fields, with a small exception of arts, where respondents believe that the most important factor is the activity and expertise of teaching staff, and the second most important the presence of contemporary IT at the institutions.

**Table 5.** The attitude of students from different scientific fields towards the factors that influence the application of ICT at their higher education institutions

| Scientific field | Factors impacting the use of ICT* | | | Total |
|---|---|---|---|---|
| | E | P | M | |
| Technical-technological | 57 | 93 | 16 | 166 |
| Social-humanistic | 61 | 89 | 23 | 173 |
| Medical sciences | 11 | 41 | 8 | 60 |
| Natural sciences-mathematics | 33 | 46 | 13 | 92 |
| Arts | 9 | 6 | 2 | 17 |
| **Total** | *171* | *275* | *62* | *508* |

* Agenda: E – Expertise and activity of teachers; P – Presence of ICT at faculties/schools; M – Management activities of faculties and departments

The results of the students' survey on their attitude as to whether the curricula follow the development of modern ICTs (Table 6) show that out of 508 respondents, 410 (80.71%) are satisfied, and 98 respondents (19.29%) are not satisfied.

**Table 6.** The attitude of students from different scientific fields towards following of modern ICT curricula at their higher education institutions

| Scientific field | Evaluation of the monitoring of ICT curricula* | | | | | Total |
|---|---|---|---|---|---|---|
| | S | P | I | N | IA | |
| Technical-technological | 82 | 68 | 6 | 1 | 9 | 166 |
| Social-humanistic | 40 | 86 | 34 | 3 | 10 | 173 |
| Medical sciences | 13 | 33 | 7 | 3 | 4 | 60 |
| Natural sciences-mathematics | 25 | 50 | 11 | 1 | 5 | 92 |
| Arts | 3 | 10 | 3 | 0 | 1 | 17 |
| **Total** | *163* | *247* | *61* | *8* | *29* | *508* |

* Agenda: S – Sufficient; P – Partial; I – Insufficient; N - Not at all; IA - I am not sure

A total of 163 respondents (32.09%) rates this question with "sufficient", 247 (48.62%) with "partial", 69 (13.58%) with "insufficient" and "not at all", and 29 (5.71%) are "not sure". The analysis of answers per scientific field shows that "partial" is the most frequent answer in case of higher education institutions in all fields, "sufficient" is at the second place, whereas "insufficient" is at the third place (the exception is the technical-technological field, in which "not sure" is ranked third).

With regards to the question on Wi-Fi at the analyzed higher education institutions (Table 7), 434 respondents (85.43%) claim that there is Wi-Fi at their institutions, whereas 74 (14.57%) say that it does not exist at their institutions. Out of 434 respondents who replied positively to this question, 266 believe that the speed is low, and 168 that the speed is satisfactory. In terms of scientific fields, most of respondents from the four scientific fields are not satisfied with the speed. There are also negative answers in the institutions from these scientific fields, unlike the field of arts, where there are no negative answers.

**Table 7.** The attitude of students from different scientific fields towards having Wi-Fi at their higher education institutions

| Scientific field | Possession of Wi-Fi* | | | Total |
|---|---|---|---|---|
| | SS | LS | N | |
| Technical-technological | 83 | 72 | 11 | 166 |
| Social-humanistic | 49 | 104 | 20 | 173 |
| Medical sciences | 9 | 37 | 14 | 60 |
| Natural sciences-mathematics | 18 | 45 | 29 | 92 |
| Arts | 9 | 8 | 0 | 17 |
| **Total** | *168* | *266* | *74* | *508* |

* Agenda: SS – Yes-satisfactory speed; LS – Yes-low speed; N – No

In terms of ICT use, 508 students rate eight questions from the questionnaire differently depending on the scientific field of their faculties/departments (Table 8). The question on the quality of the Internet is rated with an average of 3.83. Observing this question in different scientific fields, it may be noticed that the respondents provided the lowest rating (3.67) in the natural sciences-mathematics field, and the highest in arts (4.00). Students evaluated the help of information and communication technologies in their learning with an average score of 3.71, with the lowest score (3.37) is in the field of medical sciences, and the highest (4.41) in the field of arts.

The results of the survey showed that students rated their knowledge in the field of information and communication technologies with an average score of 3.55. Replies to this question are characterized by a small range of ratings in different scientific fields (3.41-3.69) i.e., students from the natural sciences-mathematics and arts believe that their knowledge is the poorest (3.41 each), as well as the students of medical sciences (3.42), and the students from the technical-technological field believe their knowledge is the best (3.69). The surveyed students assessed the degree of application of information and communication technologies at their higher education institutions with an average score of 3.32. Observed by scientific fields, the lowest score of this degree is in the medical field (2.88) and the highest in technical-technological field (3.63). The surveyed students assessed the contribution of ICTs to the quality of the teaching process with an average score of 3.77. The analysis by scientific field leads to the conclusion that the contribution in the medical field has the lowest score (3.27) and the highest in the field of arts (4.06). The students rate the contribution of ICTs to the student motivation with an average of 3.56. The lowest contribution was observed in the answers of students from the medical field (3.13), and the largest in the field of technical and technological sciences (3.81). The surveyed students rated the contribution of ICTs to the participation of students in classes with an average score of 3.57. Although the ratings are quite similar, in this matter, depending on the scientific field, it can be noted that the lowest rating is in the medical field (3.20), and the highest in the technical-technological field (3.76). The surveyed students assessed the contribution to more successful acquisition of knowledge with the help of information and communication technologies, and thus to more successful passing of exams, with an average rating of 3.68. The lowest contribution was recorded in the medical field

(3.32), and the highest in the technical-technological and art fields (3.88 each).

The analysis of the ratings from the student survey on eight questions about the application of ICTs at selected higher education institutions depending on their scientific field therefore shows that the total average rating is 3.62. Technical-technological field has the best ratings, with six highest average ratings. On the other hand, medical sciences have six lowest average ratings.

**Table 8.** Student evaluations of the application of ICT at their higher education institutions

| Scientific field | Statistical | Survey question (Ratings: 1, 2, 3, 4, 5) Quality of the Internet | Assistance of ICT in learning | Your knowledge of ICT | Degree of use of ICT at faculties/departments | Extent to which the ICT contribute to quality of lesson | Extent to which the ICT contribute to student motivation | Extent to which the ICT contribute to student participation in lessons | Extent to which the ICT contribute to a more successful passing of exams |
|---|---|---|---|---|---|---|---|---|---|
| Technical-technological | Frequency | 166 | 166 | 166 | 166 | 166 | 166 | 166 | 166 |
| | Minimum | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 |
| | Maximum | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| | Mean | 3.80 | 3.83 | 3.69 | 3.63 | 4.01 | 3.81 | 3.76 | 3.88 |
| | Std. Deviation | 1.093 | 0.908 | 0.808 | 0.917 | 0.835 | 0.894 | 0.861 | 0.879 |
| Social-humanistic | Frequency | 173 | 173 | 173 | 173 | 173 | 173 | 173 | 173 |
| | Minimum | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Maximum | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| | Mean | 3.88 | 3.64 | 3.51 | 3.16 | 3.62 | 3.43 | 3.53 | 3.60 |
| | Std. Deviation | 1.024 | 1.083 | 0.926 | 0.985 | 1.037 | 1.080 | 1.087 | 0.951 |
| Medical sciences | Frequency | 60 | 60 | 50 | 60 | 60 | 60 | 60 | 60 |
| | Minimum | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Maximum | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| | Mean | 3.97 | 3.37 | 3.42 | 2.88 | 3.27 | 3.13 | 3.20 | 3.32 |
| | Std. Deviation | 1.025 | 0.901 | 0.869 | 0.976 | 1.039 | 1.112 | 1.038 | 1.214 |
| Natural sciences-mathematics | Frequency | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 |
| | Minimum | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Maximum | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| | Mean | 3.67 | 3.73 | 3.47 | 3.36 | 3.89 | 3.66 | 3.54 | 3.66 |
| | Std. Deviation | 1.335 | 1.110 | 1.063 | 0.979 | 0.895 | 1.072 | 1.083 | 1.009 |
| Arts | Frequency | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 |
| | Minimum | 1 | 3 | 2 | 1 | 2 | 1 | 1 | 1 |
| | Maximum | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| | Mean | 4.00 | 4.41 | 3.41 | 3.29 | 4.06 | 3.53 | 3.47 | 3.88 |
| | Std. Deviation | 1.275 | 0.712 | 1.064 | 0.985 | 0.899 | 1.125 | 1.125 | 1.166 |
| ***Total*** | Frequency | *508* | *508* | *508* | *508* | *508* | *508* | *508* | *508* |
| | Minimum | *1* | *1* | *1* | *1* | *1* | *1* | *1* | *1* |
| | Maximum | *5* | *5* | *5* | *5* | *5* | *5* | *5* | *5* |
| | Mean | *3.83* | *3.71* | *3.55* | *3.32* | *3.77* | *3.56* | *3.57* | *3.68* |
| | Std. Deviation | *1.117* | *1.017* | *0.929* | *0.989* | *0.974* | *1.046* | *1.023* | *0.994* |

*Source:* Authors' calculation

The additional analysis indicates that, with regards to the scientific field of the faculty/departments variable, statistically highly significant differences in ratings are confirmed: ICT as assistance to learning (F=4.596, p=0.001), ICT degree at the faculty/departments (F=8.618, p=0.000), on-line student service operating (F=9.136, p=0,000), operating of the website of the faculty/departments (F=4.437, p=0.002), efficiency of use of e-mail in communication between students and student service (F=13.322, p=0.000).

Statistically highly significant differences were also confirmed in the assessment of the variables: ICT contribution to the quality of the teaching process (F=8.727, p=0.000), ICT contribution to better student motivation (F=5.888, p=0.000), ICT contribution to more effective student participation in the teaching process (F=3.564, p=0.007), while for the variable Contribution of ICT to more successful passing of exams, no statistically significant difference was found in the ratings (F=1.758, p=0.136).

The results of the survey on the frequency of use of computers, programs and equipment in the function of the scientific fields of the surveyed students are shown in Table 9.

**Table 9.** The attitude of students regarding the frequency of use of computers, programs and equipment at their higher education institutions

| Scientific field | Statistical | Survey question: The frequency: 1) every day, 2) several times a week, 3) once a week, 4) several times a month, 5) they are not used | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | The frequency of PC use | The frequency of video projector use | The frequency of video-conference equipment uses | The frequency of use of audio and video equipment for recording and broadcasting | The frequency of use of MS Office | The frequency of use of distance learning programs | The frequency of use of social networking programs for the purpose of learning (Facebook…) | The frequency of use of electronic materials from *on-line* platforms |
| Technical-technological | Frequency | 166 | 166 | 166 | 166 | 166 | 166 | 166 | 166 |
| | Minimum | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Maximum | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| | Mean | 2.27 | 1.87 | 3.60 | 3.87 | 2.04 | 4.35 | 3.28 | 3.61 |
| | Std. Deviation | 1.212 | 1.085 | 1.444 | 1.402 | 1.103 | 1.215 | 1.537 | 1.435 |
| Social-humanistic | Frequency | 173 | 173 | 173 | 173 | 173 | 173 | 173 | 173 |
| | Minimum | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Maximum | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| | Mean | 2.88 | 2.55 | 4.19 | 4.35 | 2.82 | 4.56 | 3.03 | 4.00 |
| | Std. Deviation | 1.474 | 1.158 | 1.173 | 1.082 | 1.261 | 1.008 | 1.480 | 1.225 |
| Medical sciences | Frequency | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| | Minimum | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Maximum | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| | Mean | 2.97 | 1.70 | 3.92 | 4.27 | 2.35 | 3.80 | 3.37 | 3.88 |
| | Std. Deviation | 1.518 | 1.154 | 1.418 | 1.191 | 1.516 | 1.232 | 1.583 | 1.342 |
| Natural sciences-mathematics | Frequency | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 |
| | Minimum | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Maximum | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| | Mean | 2.60 | 1.80 | 3.67 | 4.05 | 2.38 | 4.28 | 3.12 | 3.74 |
| | Std. Deviation | 1.468 | 1.092 | 1.483 | 1.394 | 1.405 | 1.234 | 1.589 | 1.496 |
| Arts | Frequency | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 |
| | Minimum | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Maximum | 4 | 4 | 5 | 5 | 5 | 5 | 4 | 5 |
| | Mean | 2.00 | 1.82 | 3.24 | 3.65 | 2.59 | 4.59 | 1.94 | 2.53 |
| | Std. Deviation | 0.866 | 0.883 | 1.715 | 1.498 | 1.583 | 1.176 | 1.144 | 1.375 |
| ***Total*** | Frequency | *508* | *508* | *508* | *508* | *508* | *508* | *508* | *508* |
| | Minimum | *1* | *1* | *1* | *1* | *1* | *1* | *1* | *1* |
| | Maximum | *5* | *5* | *5* | *5* | *5* | *5* | *5* | *5* |
| | Mean | *2.61* | *2.07* | *3.84* | *4.11* | *2.42* | *4.35* | *3.13* | *3.76* |
| | Std. Deviation | *1.409* | *1.164* | *1.395* | *1.292* | *1.319* | *1.172* | *1.537* | *1.389* |

*Source:* Authors' calculation

The average value of the frequency of computer use at the analyzed faculties/departments is 2.61. The art field has the lowest average value (2.00) which corresponds to a frequency of computer use of several times a week, and the medical field has the highest one (2.97), corresponding to a frequency of computer use of only once a week.

When asked about the frequency of use of video projectors, surveyed students claim that these devices are used more than twice a week on average (mean value 2.07). Observed by scientific fields, students claim that video projectors in the medical field (mean value 1.70) are used most often (between daily and several times a week), and in the social-humanistic field (mean value 2.55) the least often (from once a week up to several times a week). The mean value of the frequency of video-conference equipment is 3.84, which means that the equipment is used more frequently than several times a month. The equipment is most frequently used in the field of arts (mean value 3.24), and least frequently in social-humanistic field (mean value 4.19). Answering the survey question about the frequency of use of equipment for audio and video technology, students stated that the equipment was used quite rarely at their higher education

institutions (average value 4.11), which corresponds to the frequency of a little less than a few times a month. This type of equipment is most frequently used in the field of arts (3.65), and least frequently in social-humanistic field (4.35). The mean value of the frequency of MS Office program use is 2.42, indicating the intense use of this program - in the interval between once a week and several times a week. Observed by scientific fields, this program is most often used in higher education institutions that belong to the scientific field of technical and technological sciences (2.04), and least often in institutions from the field of social and humanistic sciences (2.82). Based on the average value of the frequency of application of distance learning programs (of 4.35), it can be concluded that the analyzed faculties/departments use them quite rarely. These programs are most often used in the medical field (3.80), and least often in institutions from the social and humanities field (4.56).

The results of students' answers to the survey question about the frequency of using social network programs for the needs of the teaching process showed that the mentioned programs are used once a week (average value is 3.13). These programs are used least often by the faculty from the medical field (3.37), and most often by the faculty from the art field (1.94). Based on the results of the survey on the frequency of use of online platforms for downloading electronic materials, it can be noted that the analyzed institutions use them several times a month (average value is 3.76). Observed per scientific field, these materials are most frequently used in the field of arts (2.53), and least frequently in social-humanistic field (4.00).

If the results of the survey on eight questions about the frequency of use of computers, programs and equipment at the analyzed faculties/departments are collectively considered, it can be noted that the institutions from the field of social and humanistic sciences show the least, and institutions from the field of arts show the most frequent application of the mentioned parameters of ICT. In addition, a supplementary analysis of the impact of the variable of scientific field of the higher education institution on the frequency of use of computers, programs and equipment was performed. In all eight cases, statistically highly significant differences in evaluation were obtained:

- Frequency of computer use (F=6.123, p=0.000);
- Frequency of video projector use (F=4.330, p=0.002);
- Frequency of video conference equipment use (F=5.345, p=0.000);
- Frequency of using the equipment for audio and video recording and broadcasting (F=3.730, p=0.005);
- Frequency of using MS Office (F=7.943, p=0.000);
- Frequency of using distance learning programs (F=5.117, p=0.000);
- Frequency of using social networks for the needs of the teaching process (F=3.568, p=0.007);
- Frequency of using electronic materials from online platforms (F=5.428, p=0.00).

## 4. Conclusion

The use of ICT in higher education institutions is influenced by numerous factors. For this reason, this paper analyzes the attitudes of students from different scientific fields according to the degree of use of these very important technologies in their institutions. The research was conducted based on the results of a survey that included 508 students from thirteen higher education institutions, and the data obtained were processed using statistical methods.

The results of these researches clearly show that the analyzed higher education institutions are increasingly using modern information and communication technologies. Only 14.76% of the surveyed students claim that the teaching process is carried out in a traditional form, whereas 85.24% say that the teaching process is assisted by the information and communication technologies or the combination of these two forms. Furthermore, 59.84% of respondents claim that the one PC-one student model is applied at classes, and 40.16% that the one PC-several students model is applied.

Analyzing the factors that impact the degree of application of information and communication technologies the most, the surveyed students ranked the equipment of institutions with these technologies as first (54.14%), the activity and expertise of the teaching staff as second (33.66%), and management activities of their faculties/departments as third (12.20%). A detailed analysis of the results of the survey on following the curricula of modern information and communication technology led to the conclusion that 80.71% of the surveyed students were satisfied, and 19.29% were dissatisfied. A total of 85.43% of the respondents claims that Wi-Fi is available at most of the higher education institutions, with 14.57% saying that Wi-Fi is not available at their institutions.

By considering the ratings of the surveyed students on the degree of application of information and communication technologies at their higher education institutions in the function of the scientific field, it is noted that the average ratings range from 3.32 to 3.83. Students gave the highest number of maximum average marks to the technical-technological field, and the highest number of minimum average marks to the medical field.

The mean values of students' attitudes about the frequency of use of computers, programs and equipment at higher education institutions in the function of their scientific field range from 2.07 to 4.35. Observed by scientific fields, the mentioned parameters are least often used in the social-humanistic field, and most often in the art field. This analysis showed that there are differences in the application of ICTs at the analyzed faculties/departments and that they depend on the scientific field of these institutions. Therefore, the results of this research, as well as the difficult conditions in which the analyzed higher education institutions operate, indicate that the results are good, but that it is necessary to continue with significantly greater investments in the modernization of these

institutions with modern information and communication technologies.

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