Access and Use of ICTs by Albanian Natural Science Students

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Abstract: Information and communication technologies (ICTs) are a powerful tool for training and developing new abilities and a suitable mechanism to create educational stimulation. This study aims to evaluate the access and use of ICTs by Albanian natural science undergraduate students. Four hundred ninety-one students studying at the Faculty of Natural Sciences, University of Tirana, participated in an e-questionnaire based-study. The findings show that about 83 per cent of students use the smartphone for their studies, and only half of them own and use a laptop. The software skill level was related to the academic performance and the program of study ($p=0.001$). Students find the course managing platforms and the recorded video lectures very helpful. Less than 10 per cent of students' state to have attended a Massive Open Online Course (MOOC), and students with a lower English level were less likely to have attended an online course ($p<0.0001$). In light of this findings, it is important to create and follow through with a plan to tackle students' main issues with technology access and use.

Keywords: ICTs, natural sciences students, Online learning, Software skills

Introduction

Information & communication technologies, the "phenomenon of the millennium" (Homiakova et al., 2017), refers to technologies such as radio, television, cellular phones, computers, network hardware & software and satellite systems that supply information through communications (Khan et al., 2015; Khan et al., 2011). The ICT literacy is the ability to solve problems using technology, and the ability to use ICT tools to access, and communicate information (Katz and Macklin, 2007).

A large area where ICT is used is certainly, education. "ICT is a powerful tool for training and developing the abilities, as well as bringing up the human being talents and a suitable mechanism to create educational stimulation" (Hu et al., 2018; Samari & Atashak, 2011). The ICT role in education is growing rapidly and will continue to expand in the 21st century. The first attempt to use ICTs in educational institutions was made in the 1960s (Katz, 2001). Whereas, regarding Albanian Universities, the level of ICT usage is lower compared to SEE countries and EU countries (Bekteshi, 2015). Implementation of the technology provides information retrieval, communication between students and teachers, and allows access to many abundant sources of information. Nowadays, with advances of ICT, teachers tend to adapt active learning activities such as peer learning, group work activities and collaborative argumentation (see Latifi & Noroozi, 2021; Latifi et al., 2020, 2021; Noroozi 2018, 2022; Noroozi et al., 2018; 2020; Valero Haro et al., 2019; 2022) which influence students' learning processes and outcomes (see Noroozi & Mulder, 2017; Noroozi et al., 2013, 2016, 2020).

Studies have shown that Information and Communication Technology has positively affected lesson delivery, learning outcomes such as conducting research, disseminating information, and student assessment (Dzakpasu & Adom, 2017). ICT also helps students learn autonomously, increase cognitive capacities and develop collaboration & sharing. Furthermore, the benefits of ICT are comprehensive for all students; as discussed in Lidström & Hemmingsson, (2014), students with physical disabilities use ICT to help with writing, spelling and communication. Despite, some studies report that helping students acquire ICT skills can increase their learning ability, other studies conclude that it distracts their learning (Abbas et al., 2019). Furthermore, many difficulties are encountered related to ICTs access in education, such as technological barriers, teacher-level barriers, institutional, technological system barriers and students-barriers (Suryani, 2010; Salehi & Salehi 2012).

This study aims to assess ICT access, usage, and literacy among Albanian students of Natural Sciences spanning the time-frame of the online learning period due to COVID-19 pandemic restrictions, namely social distancing and self-isolation protocols.

Method

Data Collection and Participants

The population of interest were undergraduate students studying at the Faculty of Natural Sciences, University

of Tirana (Albania). Students are invited via email to fill out an online questionnaire. The questionnaire was formulated based on other survey studies and had twenty-two closed questions, organized into two sections. The first section included eight questions on the students' demographic and academic characteristics, e.g., the study program, year of studies, age, gender, job status, infrastructure for online education. The second section asked students about their perception of technology-based learning. It included 14 questions on students' access and use of ICTs and their effect on their academic performance and learning experiences.

The questionnaire was first sent to 35 students to test and validate. After this step, the survey is finalized. The web-based survey was sent to students via email during the online learning period, May 16 2020, to May 17 2021. By May 17 2021, 491 students from natural sciences programs such as biology, biotechnology, chemistry, physics, mathematics, and computer science had participated in the study. The response rate was 15.1 % (491 out of 3252 invitations sent).

The respondents' average age was 19.9 ± 1.4 years, 83.3% were females, and 16.7% were males. The majority (64.6 %) never worked during the studies, 20.2% used to be employed previously during their studies, but there were no longer, 8.8 % of students work part-time, and 6.5% of them have a full-time job. The majority of participants (62.1%) had an average academic performance. The English language level was beginner for 8.1% of students, intermediate for 58.5% and advanced for 33.4%. Most of the respondents' study biology and biotechnology (see Table 1). The distribution between years of study was about the same, with first-year students representing 36.3% of the sample, second-year students 31.2 %, and third-year students 32.6%.

Table 1. Study Program and Academic Performance of Students Who Participated in This Study

		Academic performance			
		Low	Average	High	Total
Study program	Biology	24 (4.9)	117 (23.8)	34 (6.9)	175 (35.6)
	Biotechnology	4 (0.8)	39 (7.9)	14 (2.9)	57 (11.6)
	Physics and Mathematics	31 (6.3)	39 (7.9)	7 (1.4)	77 (15.6)
	Chemistry	26 (5.3)	64 (13)	18 (3.7)	108 (22)
	Computer science	16 (3.3)	46 (9.4)	12 (2.4)	74 (15.1)
Total		101 (20.6)	305 (62.1)	85 (17.3)	491 (100)

Statistical Analysis

The statistical analysis is performed in SPSS 26.0. The analysis is run after the preprocessing step and data exploration, using frequencies, descriptive statistics, and data visualizations. The Chi-square test is used to test the relationships between demographic features of the respondents and nominal variables in the questionnaire. The nonparametric Mann Whitney test is run to test the difference between the medians of two groups for the

Likert scale questions (1 to 4 scale), considered as ordinal variables. The Kruskal Wallis test with pairwise comparisons is performed to test the difference between the medians of more than two groups for the Likert scale questions.

Results

Access to Internet and Technology Devices

Most of the respondents state they own a smartphone (84.7%), about 58.7% of them own a laptop, and 22.6% hold a personal or desktop computer (Fig. 1). About 76% of students have unlimited internet access, and the rest have limited internet provided by mobile companies. More than eighty per cent of the respondents state they access the internet and online materials, classes, via their smartphone (Fig. 1). It is interesting to see that unless 22.6% own a personal computer, only 1.2% state to access internet and online classes via it.
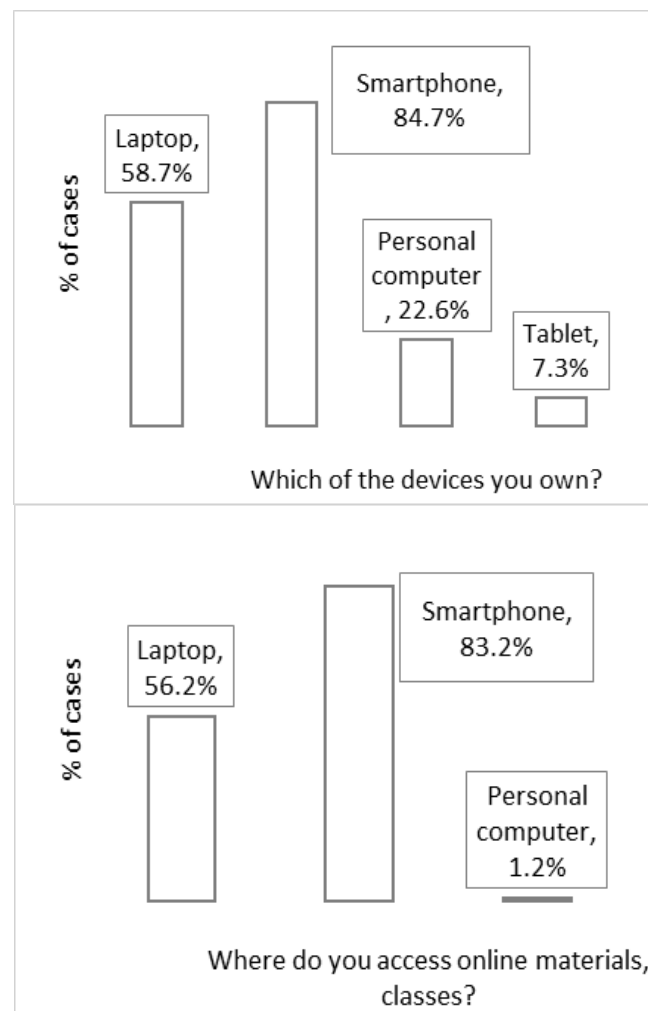

Figure 1. Devices Owned by Students and Access to Online Materials, Classes, and Internet.

A total of 156 students (31.8%) state they have no addiction to the internet, the rest is moderately or strongly addicted. There was a relationship between time spent on the internet and the addiction to the internet (Chi-square test, $\chi^2_{(8)}=113.4$, $p<0.0001$).

About 6.3 % did not spend time on social media every day, 19.1% spent less than one hour per day, 45.6 % spent 2 to 3 hours, 20.6% spent 4-5 hours, and 8.4% spent more than 6 hours. Time spent on social media is moderately correlated with the total time spent online (rho=0.43, $p<0.0001$). The most frequent social media is Instagram, with 86.5% of students using it. Twitter is used by 13.1 % of students, LinkedIn by 11.2%, and ResearchGate by 5.3%. There was no difference between males and females, study programs, academic performance levels, and work status categories for the time spent on internet and social media ($p>0.05$).

Software Skills and Attitude toward Technology-based Education

More than half of the students find the course managing platforms and the recorded video lectures helpful to very helpful (Fig. 2). The software skills were low to moderate for most of the participants (Table. 2) and related to the program of study (Kruskal Wallis test, $\chi^2_{(4)}=18.66$, $p=0.001$). The computer science students had a higher level of software skills compared to the other programs, which according to pairwise comparisons, showed no difference with each other ($p>0.05$). The findings show that the higher the academic performance, the higher the software skills level (Kruskal Wallis test, $\chi^2_{(2)}= 48.11$, $p<0.0001$). Pairwise comparisons showed that the software skills were significantly different for all groups (Fig. 3). Students seem to heavily lack programming skills with around 50% being not literate with it and only 11.4 % being good users. A limited use of online libraries and journals as well as eBooks is observed from the results (see Table. 2).

Table 2. Use and Experience with Software and Online Applications

| Statement	I do not use % (N)	Limited use %(N)	Good use %(N)	Very good use %(N)	Median
Microsoft Word	50 (10.2)	36 (7.3)	160 (32.6)	245 (49.9)	3.0
Microsoft Excel	60 (12.2)	146 (29.7)	185 (37.7)	100 (20.4)	3.0
Microsoft PowerPoint	31 (6.3)	77 (15.7)	165 (33.6)	218 (44.4)	3.0
Programming software	246 (50.1)	112 (22.8)	77 (15.7)	56 (11.4)	1.0
Statistical software	160 (32.6)	170 (34.6)	125 (25.5)	36 (7.3)	2.0
Plagiarism software	311 (63.3)	99 (20.2)	69 (14.1)	12 (2.4)	1.0
Google apps	61 (12.4)	99 (20.2)	172 (35)	159 (32.4)	3.0
Searching engines	50 (10.2)	51 (10.4)	134 (27.3)	256 (52.1	4.0
Online libraries/journals	236 (48.1)	130 (26.5)	89 (18.1)	36 (7.3)	2.0
eBooks	194 (39.5)	141 (28.7)	98 (20)	58 (11.8)	2.0
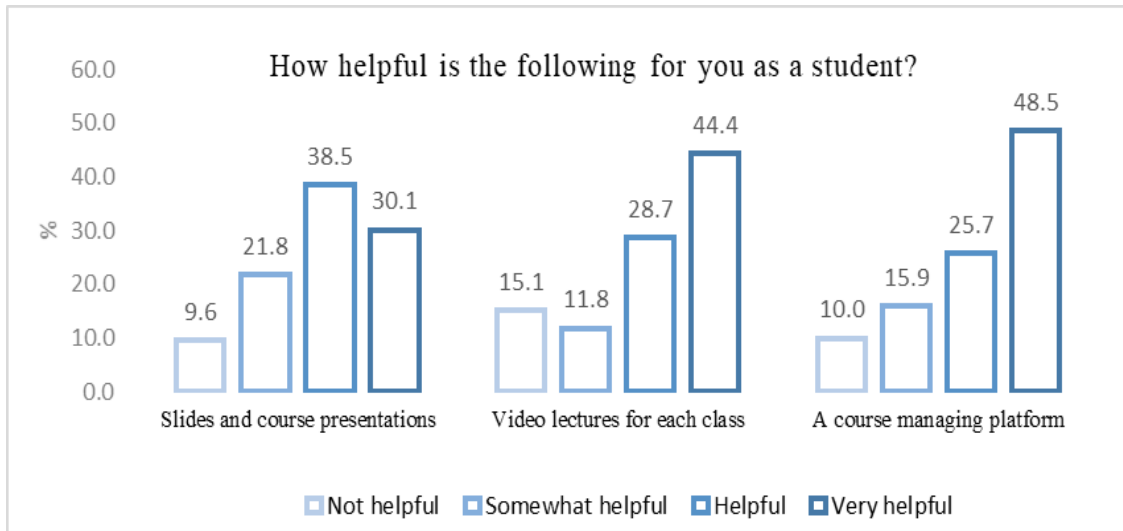
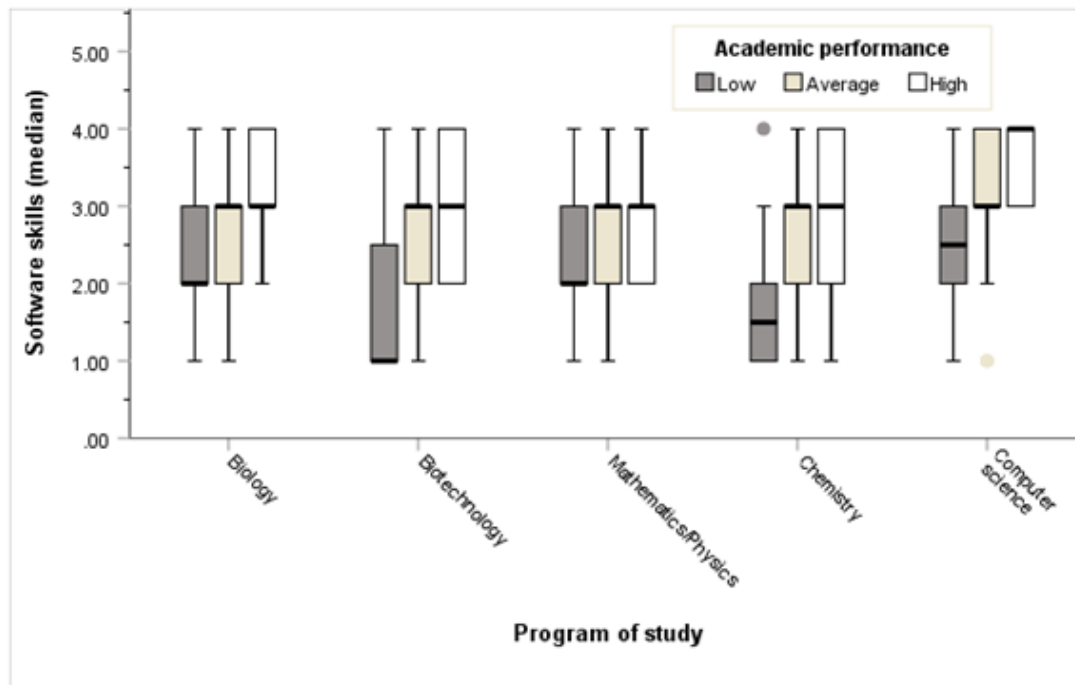Figure 2. Students' Perception of Technology-Based Education

Figure 3. Software skills (median for all software) by study program and academic performance

Less than 10 per cent of students state to have attended a Massive Open Online Course (MOOC); the majority had never heard of an online course and have no information that they exist. Computer science students showed a higher level of MOOC attendance compared to other programs ($\chi^2_{(12)}$= 48.201, p<0.0001; Fig. 4). The English level seems to impact the attendance of MOOCs. Students with lower English levels are more likely to have attended an online course ($\chi^2_{(9)}$= 31.41, p<0.0001).
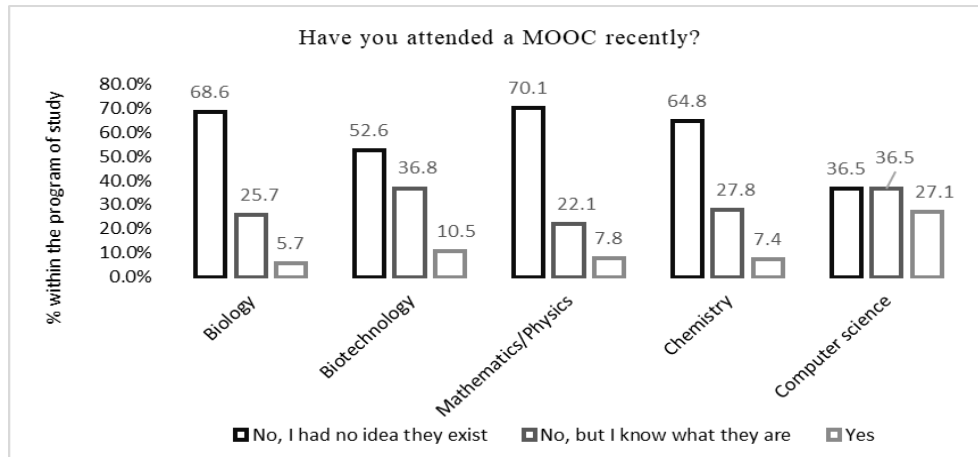
Figure 4. Attendance of Massive Open Online Courses (MOOCs) by Study Program.

Discussion

This study was conducted to assess ICT use and literacy among Albanian natural sciences students of during the online learning period due to COVID-19. The most popular device used by students is the smartphone (84.7% own it), followed by the laptop and the desktop PC. A vast percentage of surveys admit to accessing the internet and online class sessions primarily via smartphone, despite increased perplexities in typing, revision, and researching, resulting from the generally smaller size of the screen and lower processing power along with minimum memory (in comparison to higher-end devices). These differences may negatively impact the overall online education and classroom experience (Xhelili et al., 2021; Lorente et al., 2020). New skills have become essential to fully leverage the power of computer systems, specifically software skills, which allow users to perform tasks and duties through applications and programs. In our survey, the link between software skills and the program of study was evident. As expected, students in Computer Science programs had an easier time getting around computer software than other students. A relation was also apparent regarding academic performance, with higher levels of academic performance being tied to higher levels of software skills. Many studies have reported the positive role of ICT use in student academic performance (Sendogdu and Koyuncuoglu, 2022; Huang et al., 2021; Chiao & Chiu, 2018; Flores et al., 2013), but there are also studies that have concluded that its impact is weak and related to other factors as well (Hu et al., 2018; Zhang & Liu, 2016).

Students show a positive attitude towards technology-based education, with most stating that course managing platforms and recorded video lectures are of great help. However, only a few students have attended a Massive Open Online Course (MOOC), most of which were part of Computer Science programs. Moreover, many had never attended a MOOC and were unaware of their existence. MOOCs may seem like a better option for Computer Science students because of their unlimited implementations on computer-based systems and seamless experience beyond the borders of the physical classroom. In contrast, students pursuing a degree in Biology, Biotechnology, Mathematics, Physics, and Chemistry may have an adverse experience with MOOCs given the irreplaceable in-person instruction needed to master concepts in these subjects, notably through

practical work in labs and facilities. Despite the huge information provided by MOOCs for student's achievement (Zhang et al., 2019; Zutshi et al., 2013), studies have reported that the majority of students who attend MOOCs are already graduated and come from highly developed countries (Reich & Ruipérez-Valiente, 2019). Students with lower English proficiency levels were also more likely to have attended MOOCs. This shows that low to moderate English proficiency levels is a problem for Albanian students and serve as an additional reminder to constantly push in reducing the barriers of language. This raises the importance of MOOC based local education, as reported by Ruipérez-Valiente et al., 2019.

The time spent on the internet was related to the level of addiction or maladaptive behaviors. In addition, time spent on social media and time spent online resulted in being correlated. A popular social networking site among students is Instagram which is frequently accessed and used by 86.5%. These findings are unsurprising, given the young age of our sample, 19.9 ± 1.4 years on average. According to the Institute of Statistics (2019), 93.1 per cent of the Albanian youth population used ICTs daily to explore and collect resourceful information. Nearly half of the kids, teens and young adults of this generation have been estimated to log about 6-10 hours a day online. Inevitably, they are expected to show better technology proficiency than previous generations, earning them the nickname "digital natives" (Meade, 2020).

Conclusions and Recommendations

Our findings show that the majority of the Albanian natural sciences students use the smartphone for their studies, and only half of them own and use a laptop. The software skill level is low to moderate and seems to be related to the academic performance and the program of study. Most of the students find the course managing platforms and the recorded video lectures very helpful, despite they had low levels of MOOC attendance.

In the light of our findings, it is important to create and follow through with a plan to tackle the main issues Albanian students face the uptake of ICT-based services and goods with further socio-economic growth in mind. Government incentives and subsidies can help prioritize technology-based education in schools and universities and set concrete actions to enhance the availability, affordability, and accessibility of ICTs in education. Additionally, the supply of relevant and local online content in the Albanian language would be favorable, especially to students looking for sources of academic materials without having to face the constraint of language barriers. It would only be fair for Albanian youth to reap the benefits of technology at their own pace and comfort.

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