

How Do Albanian Biology Student-Teachers Make Use of ICT During Their Master Studies?

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Abstract

With the development of information and communication technologies (ICT) and the increasing of online teaching materials, ICT is becoming an essential aspect of teachers' education and competencies. This paper aims to investigate how and why Albanian biology student-teachers use ICT during their master studies. The study method involved a survey (n = 56) of second-year biology student-teachers studying at the Faculty of Natural Sciences in two consecutive academic years, 2021-2022 and 2022-2023. The survey explored several topics, including general characteristics (age, gender, academic performance), access to digital equipment, digital competence, and the use of ICTs during studies. Our results show that students have low access to digital equipment. Students with high and average academic performance spent more time using ICT for study purposes than those with low academic performance ($p < 0.05$). More than 90% of students emphasize that access to digital equipment and training is crucial to help them integrate ICT in their classes as teachers.

Keywords

Student-teachers, ICT, Computer-assisted learning, Digital competence

1. Introduction

Technology was an important development of the 19th century, which brought substantial change in education and society. Technology and biology are considered a “fantastic duo” because both brought different perceptions, new developments in science, education, and innovation in learning methodology.

Technology offers many options to make a lesson attractive and friendly for students. So the teachers don't have to be limited to traditional teaching, and they may create engaging lectures to facilitate students' learning process [1]. It is also essential that teachers use various tools during the learning process. In this way, they stimulate active learning, and students share their thoughts with others [2].

To properly implement ICTs in their classes, teachers have to own some primary competencies; one of them is digital competence.

In Albania, technology reached the peak of its use during the COVID-19 pandemic. During isolation, lessons needed to take place online with different programs. Technical problems are always present during online teaching, and teachers should be able to deal with them to implement ICT properly in their classes [3]. In this case, it is essential to train teachers and future teachers to own digital competence, including information, collaboration, communication with others, digital space, privacy security, and problem solution.

Student teachers face personal and environmental challenges in developing their ICT skills. Research has shown that students' perception of the importance of ICT in education and their confidence in using ICTs plays a vital role in the motivation of students to use ICT [4].

Based on other studies, student-teachers have a positive attitude toward the use of ICT in teaching and learning. They are generally motivated to implement it when they become teachers [5, 6, 7].

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This paper aims to investigate how and why Albanian biology student-teachers use ICT during their master studies in the teacher education program.

2. Methods

This study took place at the Department of Biology, University of Tirana, Albania. The cohort being evaluated were second-year biology student-teachers (N=56) in two consecutive academic years, 2021-2022 and 2022-2023. The student-teachers were invited via email to fill out an online questionnaire composed of closed questions (i.e., Likert scale and frequency of use) and one open question.

After consulting the literature on this topic, the questionnaire is formulated and organized into three sections. The first section included questions on the students' general characteristics, such as age, gender, and academic performance. The second part had questions covering access to digital infrastructure (equipment, internet connection). The third section asked students about their digital competence and the use of ICTs during their master studies.

The data preprocessing and analysis are performed in SPSS 28.0. The data exploration is based on frequencies, descriptive statistics, and visualizations. The relationships between selected nominal variables in the questionnaire are tested using the Chi-square test for independence. We used the Chi-square goodness-of-fit test to test whether the cases in a single categorical variable were equal across categories. To compare the level of numerical variables within groups, we used the Kruskal-Wallis test.

3. Results

Survey results on student-teacher access to digital equipment show that only half have personal computers. More than half of the students did not access interactive whiteboards and video conferencing during their studies. A learning management system (LMS) was not accessed for practice by 58.9%, and a projection system by 32.1% of respondents (Figure 1).

Student-teachers use technology for study purposes 6.55 (± 4.44) hours/week on average, while the use of ICT for other purposes was 7.86 (± 6.85) on average. Time spent using ICT for study purposes was related to academic performance (Kruskal-Wallis test $X^2_{(2)}=14.7$; $p<0.001$). Based on pairwise comparison tests, students with high and average academic

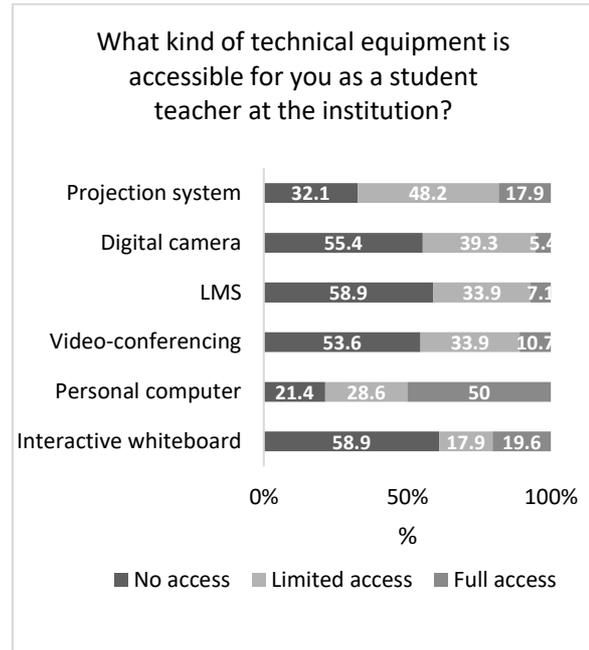


Figure 1: Access of biology student-teachers to technical equipment at the university.

performance spent more time using ICT for study purposes than students with low academic performance ($p<0.05$). No significant difference is observed between students with high and average academic performance ($p>0.05$), see Figure 2. Also, there was no statistically significant difference between different levels of academic performance for the time spent using ICT for other purposes (Kruskal-Wallis test $X^2_{(2)}=5.33$; $p=0.07$).

About 32.8% of students state they were involved in projects focusing on ICTs integration in teaching processes by their professors during their studies.

Half of the students use ICTs almost always for communication and networking, their own development and learning, work organization, keeping records, and preparing projects and lessons. More than 60% of the students use ICT to find digital learning resources (Figure 3).

Concerning the future integration of technology in their work as teachers, 66.10% of students state that to be confident and very confident to use it to support the teaching of specific concepts or skills, 69.6 % to support various student learning styles and to personalize learning, 64.3 % to enable teaching pupils with disabilities, and 74.8 % to foster pupils' ability to use technology in their education.

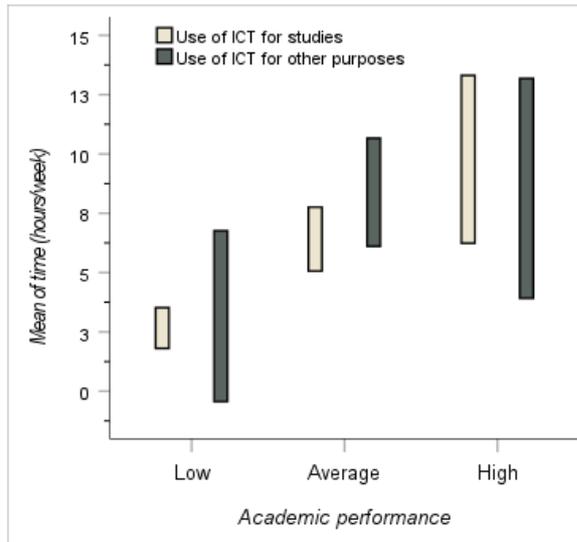


Figure 2: Mean (95% CI) of time (hours per week) student-teachers spend using ICT for studies and other purposes based on academic performance.

More than 90% of students emphasize that access to digital equipment is important to very important to help them integrate ICT into their future work as teachers (Table 1). Similar results are observed for the importance of training and courses to help in ICT integration.

Students think that including ICT in the curriculum would impact ICT's implementation in teaching processes. Time to practice is another important factor that would help student-teachers to improve their skills and incorporate ICT in their classes (Table 1).

Table 1

How significant are the following to help you as a future teacher in integrating ICT into teaching?

	Not important (%)	Somewhat important (%)	Important (%)	Very important (%)
Access to digital equipment	7.2	1.8	44.6	46.4
Training	3.6	12.5	42.9	41.1
ICT in the curriculum	5.4	8.9	48.2	37.5
Time to practice	1.8	16.1	50	32.1

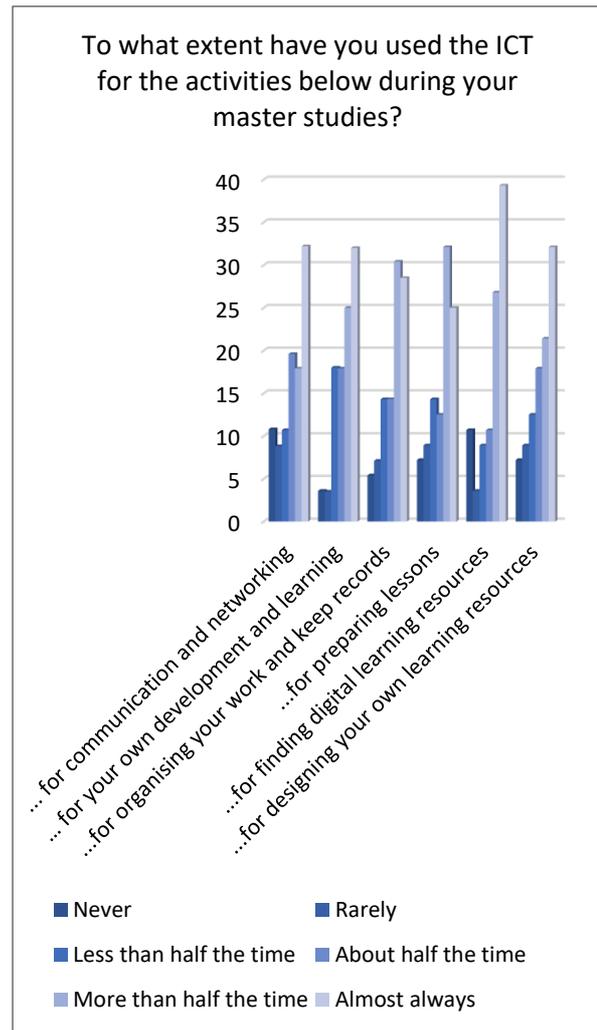


Figure 3: Use of technology for specific study activities by biology student-teachers.

4. Discussion

The recent decade's teaching and learning methods have changed how teachers and students practice their study sessions. Nowadays, the education system does better combine classic learning with e-learning. The perception and inclusion of technology by student-teachers can be impacted by various factors, which according to Ertmer et al. [8], were categorized into first and second-order barriers. Although this categorization is outdated, the ideas still apply today, with instances of these obstacles being referred to as school or teacher-related barriers, respectively, as described in [9].

Our study shows that the most frequent drawback to technology integration is a need for more digital equipment, which would constitute

an example of a first-order or school-related barrier. Hew & Brush [10] report that the use of ICT in teaching practices depends on the availability and access to digital equipment, time constraints, and adequate technical support. Lack of access to personal computers could be a problem regarding the student teacher's ICT literacy and the subsequent integration into teaching [11]. However, this effect should be accounted for by guaranteeing appropriate infrastructure such as interactive whiteboards, projection systems, and video-conferencing, among others, responsibility for which falls mainly on the institution. Low access rates to technical equipment could be the direct consequence of the scarcity of said equipment or the poor organization of resources. The school could possess the right amount of equipment but has not yet ensured success for all its users. Time is also a factor that impedes the access and further use of ICT for teaching purposes. Student teachers, similarly to teachers, should be granted enough time to not only access but also acquaint themselves with hardware and software to be able to work their way around equipment and fully prepare materials for their lessons, particularly online and multimedia content, as this would be much more engaging to students.

So-called blended learning, which has advantages in the execution of a lesson that may be carried out electronically or in person, is one of the lesson models that can be used for technological advancement [12]. Therefore, students can engage in learning and access assigned lesson materials or assignments [13]. Using a wide range of scientific materials, diverse knowledge, and studying strategies offered online due to information and communication technology can highly represent a more qualitative learning process for a better performance of students who know how to benefit from it. However, to learn how to use media, students must be able to improve their independence first. As our study shows, even though students tend to use more online hours for other purposes than for studying, they still manage to incorporate ICT for their development and learning, for keeping records or preparing projects and lessons, as well as for finding digital learning resources, regardless of the lack of appropriate digital devices. As reflected in our results, learning to use technology opportunities and self-build new skills greatly impacts a student teacher's academic progress [13]. Almost the same amount of students who use ICT for learning

purposes state that to be confident enough to use technology to teach specific concepts and skills or integrate different learning styles. In the case of ICT, younger student teachers will grow up with extended experience in using new technologies in their daily lives [14].

The results of this short study indicate that student teachers' engagement with ICT is worthy of further critical investigation.

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