The study of ICT-use bybiology students before distance learning takes place during COVID-19 pandemic

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Abstract. The study was carried out before the pandemic Covid-19 broke out, changing the course of lectures into distance learning. The initial idea of this study was to determine the intensity and familiarity of prospective Biology teacher students and their descriptions of how they used the Software in lecturing and completing Blended learning-based Microteaching assignments. This study also wants to illustrate the familiarity of respondents from some software that supports learning and teaching in Microteaching courses. All 71 respondents were undergraduate students, 88.7% were female, and 11.3% were male, aged between 18-23 years. Students must work on assignments given at the beginning of the semester to conduct teaching simulation (microteaching). Through this activity, students will gain their own experience to prepare their performance in micro-teaching, such as arranging lesson plans, developing learning media, and making presentations that are appropriate for their class. Therefore, the data collected meets the requirements for analysis using statistical Software. The study found that pre-service Biology teacher students have a high preference for the use of Android-based smartphones, Whatsapp, and internet cellular connectivity to fulfill their course work. The benefits of this research are media information or application materials that can be used in distance learning

1. Introduction

Being a Biology teacher in the 21-st century requires several competencies to be able to cope with future challenges. These competencies include pedagogical skills, Biological science, and information technology [1]. Moreover, in recent years, education is facing a disruption era, that students have been confronted in the age of the Industrial Revolution 4.0. The age emphasizes the digital economy, artificial intelligence, big data, and robotic. It also demands the world of education, constructing creativity thought critical, technological mastery, and digital literacy skills [2].

Nowadays, modern society considers that mastering the necessary skills and concepts of ICT as an integral part of the fundamentals of 21-st century education. Therefore, various new educational models were developed to integrate ICT, especially web-based technology, into learning. The integration of the application will be more effective if the Biology teacher is familiar and able to utilize IT tools and applications [3]. In this context, Biology teachers should understand how to use ICTs as teaching and learning tools, manage their administrative work, and help students to use it. Thus, the integration of technology in these learning needs to be done since the education of prospective teachers in educational institutions [4].

Biology learning itself must be able to find solutions to real-life problems, including sustainable food production solutions, environmental protection, renewable energy, and improving human health. It can be accomplished if there is interdisciplinary learning, including technological support [5]. Biology learning also must be able to accommodate ways that educational technology can facilitate the teaching of biological concepts that are abstract, dynamic or complex, especially studies that study the learning process [5][6].

Therefore, teacher education institutions should prepare their students to be ready for these changes by reform their curricula and how to deliver the subject (learning methods) by adopting some learning technologies [7]. These transformations' purpose is to provide pre-service Biology teachers with ideas, examples, and experiences of using ICT for teaching and learning and with concrete tools for their professional work. The study focuses on the intensity of the pre-service

Biology students and their descriptions of how they use Software for completing their learning assignments[8].

Theoretical Context

In this section, we first highlight Biology education (pedagogy) use of technology, then outline the role of standard Software and social media for productivity aspects of learning, and finally discuss factors affecting the use of ICT for the pre-service Biology teacher education.

Biology education and technology use

Biology as science is now very dynamic; every day, there are discoveries both in terms of science and in teaching methods [9]. To be able to access and benefit from these latest discoveries, the academic community needs to be connected to the world of information through ICT. It is no exaggeration to say that arguing that ICT has become the main focus in many developed and developing countries, both in the world of biological science and its pedagogy [10].

Learning Media (e.g., Computer Assisted Instructional) are useful for students to visualize things that are difficult to see or carry into classrooms, such as human anatomy, internal cell structures of animals or humans, rare insects in the Amazon forest, deep-sea ecology, or penguin behavior at the north pole. Furthermore, micro world activities such as bacteria and viruses can be observed with the help of computer software in the form of animation. With ICT, all of this is available to students as if they were in an almost original form.[11], [12].

In terms of professional productivity, Software such as word processors, spreadsheets, and databases, are used to collect, manage, analyze, and send information from Biological research or field observations. The information technology device and Software (e.g., LMS, Learning Management System) also be able to manage communication between students, between students and instructors, events outside the classroom experience with students and instructors who are far away [13].

Pre-service Biology teachers' use of ICT

ICT is an abbreviation for "Information and Communication Technology" [14]. ICT is related to activities to access information, transfer, store, disclose, and share information through technology. UNESCO [15] explains that ICT technology includes radio, television, video, DVD, telephone (fixed and mobile), satellite systems, computer equipment, devices equipped with networks, and equipment provided by those technologies (e.g., teleconference video and electronic mail).

For pre-service teacher education, experience in the use of technology, both in terms of quality and quantity, is an essential factor influencing the adoption of technology for them [16]. Therefore, the use of ICT for teaching purposes has become a necessity to train individuals who form information society. This need has made it mandatory to implement teacher training applications with a contemporary perspective, which is one of the critical dimensions of the process of social education [17][18].

To provide technology integration competencies, The teacher education institutions have to include introductory technology courses in their curriculum [19], mainly focusing on developing technical knowledge and skills. This course aims to equip pre-service teachers with ICT competencies that they can transfer to their teaching practices in the future [4]. However, based on research from Kay[20], most of the pre-service teachers still do not effectively sufficiently ready to integrate technology into their classrooms. Moreover, the pre-service tea education should not only focus on how to use technology but also how technology intersects pedagogical knowledge and content (in this case, biological science), as by the TPACK concept [21][22].

This study aims to describe the familiarity of the pre-service Biology teacher of some software that supports learning and teaching in the Microteaching course. Based on a previous study [23], the Software consists of four groups: (a) productivity software (office), (b) social media (i.e., video-based, image-based, text-based), (c) cloud storage, (d) correspondence software (e-mail, blog, and forum), and (e) LMS.

2. Method

A. Research methodology

This study uses survey research that aims to collect data and find a general picture of the use of Software along with pre-distance learning tools (e-learning) by prospective Biology teacher students in the Teaching and Education Faculty, Muhammadiyah University, Surakarta. The data has been collected through submitting written questions with Google Form, and additional information was compiled based on discussions with related samples.

B. Participants

Participants in this research are 71 pre-service Biology teachers who are taking Microteaching class. They have ever taken media and strategy learning courses previous semester. The types consist of 19-21 students in each class

C. Data Collection

The research carried out by the project-based learning method that allows students to learn by experiential learning [24], where the design is depicted in figure 1. However, in the beginning, we conducted a literature review as initial research because this step is significant for defining problems and research questions. The initial research also useful for describing the research goal and what the project can be finished and engage with the technology. Therefore, this first step is very determined for the next level.

Figure 1. Research-flow diagram

The second step is to give an assignment project about teaching simulation in a micro class. The students have to be a teacher that is teaching a specific topic in Biology lesson for grade 10 to 12 high school. This simulation needs to use a learning strategy that also requires multimedia and Software, both in productivity or to submit the assignment. Tools for finishing the project is up to students. They are independent to choose any software or hardware related. They also have the independence to select any topics that will be presented on the teaching simulation, as long as still covered Biology topic in the senior high school (SMA). During conducting the project, they can communicate with the lecturer by sending text, audio, or video through social media. The students also submit a report about their lesson plan or presentation draft by the productivity software like word processing and spreadsheet software. They may finish the project for about 1-4 weeks, regarding their turn, and they have to submit their plan by LMS Software.

After finishing the project, the students should fill out an online questionnaire that provided by google form. The available questions are about tools or devices to accomplish the project and assignment. The frequency in using the Software to tackle the project were recorded through a questionnaire. Then, the collected data from the poll is analyzed by descriptive statistics [24], next presented on the paper. Finally, the conclusion is made according to the data and its analysis.

D. Data Analysis

The students should do assignments given at the beginning of the semester to perform teaching simulation (microteaching). Through these activities, the students will get experience by themselves to prepare their performance in microteaching, such as arranging a lesson plan, developing learning media, and making a suitable presentation for their class. Therefore, the data collected is qualified to be analyzed using statistical Software. Descriptive statistics were calculated to answer research questions. The description should explain the research questions, about the students' familiarity with the Software, based on the demographic data and the using-software frequency [23].

3. Results and Discussion

A. Descriptive Statistics

All 71 respondents were pre-service Biology teacher that undergraduate students, 88.7% are female, and 11.3% are male. All of the respondents were between 18–23 years old. Furthermore, the devices usually used for making the connection to the Internet were a smartphone (87.3%), notebook (12.7%), iPad (0 %), and desktop PC (0 %). The way they connected with the Internet for submitting course assignments was personal Wi-Fi from their dormitory (52.1%), mobile internet provider (42.3%), Wi-Fi from campus (1.8%), and other connections (1.8%) see Table 1.

The small number of iPad and PC-desktop users can be caused by the lack of popularity of the two devices among Biology Education students. iPad is included in a piece of expensive equipment compared to the same method based on Android. Meanwhile, Desktop PCs were not chosen because of the lack of flexibility of this device, both in terms of size, mobility, and ease of connecting to the internet/Wi-Fi.

B. Familiarity by Demography

Demographically, from 11.3% or eight male respondents, 5 of them (62.5%) more often used smartphones to connect to the Internet than laptops. The smartphones are more practical than laptops, both in terms of size, current time, ease of connection on the Internet, and more diverse applications that can be used for multi-activity (productivity and communication). In fact, for only digital assignments, only three people used home/dorm Wi-Fi.

Meanwhile, five other respondents continued to use tethering connections from their mobile internet provider of smartphones to collect digital assignments. Itis maybe due to the high level of mobility of male respondents, so they are not dependent on internet connections from their dormitories or homes. Besides, this can be caused by the unavailability of Wi-Fi facilities in the dormitory, so they use personal connections from their mobile smartphones.

Meanwhile, from the 63 female respondents, only six respondents (9.52%) were among those who used laptops to connect to the Internet. In contrast, around 57 people (90.58%) preferred to connect to the Internet using smartphones, both for communicating or doing assignments. Statistically, 34 of these female respondents (53.97%) preferred to use private Wi-Fi from the dormitory/home to send digital tasks compared to using mobile connection facilities (39.68%) or connected with agency/campus Wi-Fi and other connections (3.17%). For female respondents, being at home or boarding to do assignments at night is more comfortable and safe for them. This reason is one of the advantages of digital learning, where users can exchange information without having to find difficulties in using real transportation to be able to connect with others [13].

C. Familiarity with Software of productivity

The Software of productivity, such as a word processor or spreadsheet, does not occupy a high position from the frequency of use (see Table 2). Word processors are used every day by 33% of respondents and are used every 2-3 days by respondents, e.g., spreadsheet software. Excel use is even lower, namely 0% who use it every day, followed by 11% of respondents who use it 2-3 times a week.

Moreover, the Biology Education department is not too demanding of laboratory lab reports in the form of digital files. The task of an ordinary laboratory lab report is assigned with handwriting, so it doesn't use the word processor application much. Moreover, spreadsheet applications (Excel), this Software is not very popular with Biology Education students, because the Software is commonly used to process data, rather than being used as the author of articles or reports.

The number of respondents who use search engines every day has a ratio of 94% of the total respondents. This ratio is quite high because search engines are an essential requirement for students who need information in a short time based on keywords. Pre-service Biology teacher students are very familiar with this search engine technology to do assignments and find information: articles, images, videos, and audio-related tasks in Microteaching courses.

The use of e-mail is quite high. Roughly, 21.12% of all respondents use e-mail every day. As many as 78.87% of respondents use an e-mail with a frequency of 2-3 times a week. The use of e-mail is still fair because currently e-mail technology (e.g., Google mail or Gmail), which was once more popular as a means of sending files, is now integrated with other online applications such as cloud computing, App's market place, social media, digital payments, or tool for logging-in in online games.

Finally, the use of LMS (e.g., Schoology) in the Microteaching course is of significant importance. This Software of learning management is used by lecturers to organize learning digitally. LMS as the Software provides facilities in the form of the ability to plan, deliver, and manage learning activities in a class organization, including online content, virtual classrooms, and guided instructor programs. LMS has a focus on managing students, recording their progress, and performance in all types of activities that are part of the training. Facilities such as discussion forums, chat, e-mail, learning evaluation tools, user management, and electronic material management must be available so that users can learn in a learning environment that is not much different from the classroom atmosphere[25], [26].

The data depict that only four people (5.6%) use it every day (see Table 2). The highest percentage using LMS was 48 respondents (67.6%) in 2-3 times a week. Indeed, in the assignment of teaching simulations, each student must collect their assignments and projects through the LMS, as well as announcing the lectures also partially sent through the LMS. Based on the data stated, most students use LMS only when they will collect their assignments. The preference of the Biology teacher pre-service students to utilize LMS is still limited toward the distribution of task files, not to the optimum stage to use the features in LMS (Schoology).

Moreover, according to students in observing lecture meetings, using LMS is not satisfactory in terms of practicality. This statement is supported by previous research by Dias (2013)[27], which states that the lack of LMS usage training for students influences satisfaction level in the Software. The attitude of consistency and the confidence of the lecturers in using LMS also affect the motivation to use LMS.

The existence of text chat like Whatsapp (WA) has a significant effect on the low motivation of students using LMS. They prefer WA to exchange files, discuss, form project groups, and make audio or video calls. The LMS they use is only for collecting assignments, considering that the direct assessment is carried out by the lecturer in the LMS, and recapitulated in the gradebook facility within the LMS.

Therefore, 100% of respondents use Whatsapp every day (very high intensity of use). The familiarity of using WA by the Biology teacher pre-service students exceeds daily intensity (everyday access) using, e.g., social media. Facebook and Twitter (52.11%), more than, e.g.,Youtube (73.2%), and Photo focused social media, e.g., Instagram (87.3%). That is because WA has access and sharing capabilities from and to all these social media web sites. Not all respondents want to spend their mobile internet access quota to access videos or photos on social media, but want to access them through WA along with forum chat in groups or inside WA Status. The speed of responding to messages via WA compared to social media is also the reason for respondents to access them regularly in one single day.

Table 1. Statistic Description

Ratio		Most used gadget				Most used Internet connection			
Female	Male	Mobile smartphone	iPad	Laptop	PC desktop	Mobile internet provider	Campus Wi-Fi	Personal Wi-Fi	others
88.7%	11.3%	97.3%	0%	12.7%	0%	42.3%	2.3%	52.1%	2.3%

Table 2. Software familiarity of the pre-service Biology teacher (n= 71)

Tools/software	med	var	SD	Every day	2–3 times/week	Once a week	2–3 times/month	Once a month	Never
Word processing (e.g. Microsoft word)	2.5	204.8	14.3	33	31	4	1	1	1
Spread sheet (e.g. Excel)	12.5	75.1	8.67	0	11	21	14	23	2
E-mail	9.5	85.81	9.26	15	30	10	9	7	0
Search engine	1	609.14	24.68	67	2	1	0	0	1
Cloud storage (e.g. Dropbox, Google drive)	10	34.14	5.84	8	23	9	11	15	5
Forum	6.5	210.81	14.52	2	7	6	4	8	44

Tools/software	med	var	SD	Every day	2–3 times/week	Once a week	2–3 times/month	Once a month	Never
(e.g. Kaskus, Mojok.co)									
Text chat (e.g. WhatsApp, Line)	0	700.14	26.46	71	0	0	0	0	0
LMS (e.g. schoology)	4.5	275.47	16.60	4	48	12	2	5	0
Social media (e.g. Facebook, twitter)	7	149.14	12.21	37	16	6	8	3	1
Web video (e.g. YouTube)	3.5	335.14	18.31	52	11	3	4	0	1
Photo focused (e.g. Instagram)	2	506.14	22.50	62	5	2	0	2	0
Blog (e.g. Blogspot, WordPress)	4.5	140,48	11.85	28	29	5	4	4	1
Photo focused (e.g. Instagram)	2	506.14	22.50	62	5	2	0	2	0
Blog (e.g. Blogspot, WordPress)	4.5	140,48	11.85	28	29	5	4	4	1

4. Conclusions

This study found that pre-service Biology teacher students have a high preference for the use of Android-based smartphones, both for assigning tasks, communicating, or getting information in various fields. For connectivity with the Internet, Biology teacher candidates choose to use the mobile internet provider to do their assignments, because of the ease of access, high mobility, and independence of access. In terms of productivity, the use of LMS software, which is expected to provide facilities in the e-learning program, turns out to not get the preferences of the students. They use LMS only to fulfill the requirements for sending assignments; the functions of notification, communication, community, and social media functions are less widely used. It is precisely the text chat software, WhatsApp, with the practicality of the response system, the ease of forming a discussion, ease of file sharing. Itmakes an audio-video call community that occupies the highest familiarity (reaching 100%) for respondents students. Based on the conclusion, the following suggestions are recommended:

a. Consistency and self-confidence of lecturers to use LMS need to be improved. It is intended that students get convenience in the learning model utilizing this Software.
b. Further studies on research instruments to find out the intensity of Software used for certain subjects must be specific so that students' responses indicate clarity of course correlations and Software used.

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