Physics undergraduate students' perceptions of online learning during the transition period to the new normal era

E Surahman1 and E Sujarwanto\*1

1Physics Education, Siliwangi University, Tasikmalaya, Indonesia.

\*corresponding author: eko.sujarwanto@unsil.ac.id

**Abstract**. The Covid-19 pandemic forced the Indonesian government to release learning from home policy. This policy also applies to the Physics Education of Siliwangi University. This study aims to know undergraduate students' perceptions of online learning during the transition period from face-to-face learning to online learning in Physics context. Undergraduate students' perceptions of online learning are seen from aspects of access to technology, technology for learning, online learning readiness, and attitude towards digital technology literacy. The data is collected by an online survey method. This research shows that most undergraduate students have sufficient facilities for online learning and have a positive attitude towards digital technology literacy. Another finding from the study is that the majority of undergraduate students have difficulty accessing the fast internet (83.87%). Undergraduate students like a combination of online media learning and offline media learning (90.32%), but they do not like full online learning (98.06%). This research indicates that teachers should support students at online learning by providing proper Physics learning material and media. This research is expected to suggest better online learning and literacy technology in Physics context in the new normal era.

1. Introduction

The Covid-19 pandemic poses significant challenges to human life globally. The prevention of the spread of the Covid-19 Pandemic is trying to be overcome by implementing the PSBB policy and implementing health protocols. PSBB and lockdown have had a significant impact on the education sector[1][2]. The impact on Indonesia’s education sector includes eliminating the National Examination and the temporary closure of schools and universities. The community certainly needs to adapt as soon as possible to face this situation. Community adaptation to face the Covid-19 Pandemic is called a new normal. New normal is as a way of life in the Covid-19 Pandemic situation. New normal is a community effort to keep running life by implementing health protocols. One of the new normal behavior is keeping physical distance. Keeping physical distancing has an impact on the learning system in the form of learning from home policy. Learning from home policy also applies to higher education in Indonesia, with most learning online[3].

For students, online learning requires students to have a higher level of independence, discipline, responsibility, self-regulated learning, and technology literacy. Technological literacy is needed to face the 21st century and the 4.0 industrial revolution. Fundamental opinions that serve as references for technology studies and technological literacy include the works of Mitcham and Pearson & Young [4][5][6][7]. The technology consists of objects, knowledge, activities, and will [8]. Meanwhile, technological literacy is an understanding of the nature and history of technology, basic hands-on technology abilities, and the ability to think critically about technological developments [9]. This definition leads to the domain of technological literacy, namely knowledge, thinking, and acting patterns, skills [9]. Technology literacy is crucial during online learning.

An amount of research reported about the COVID-19 pandemic related to the implementation in higher education. Crawford et al. reported that there are universities that are still conducting offline lectures by implementing physical distancing. Some universities are implementing online learning in full, and some are implementing blended learning [3]. Bao reports a case study of students who have difficulty on online learning due to a lack of adequate learning attitudes, lack of discipline, lack of appropriate teaching materials, and the right learning environment[2]. Reimers et al. added that education needs to be innovative and flexible with technology mediation in the New Normal era[1]. Those research have not examined online learning in terms of technological literacy and in terms of Physics context.

Online learning is new to the majority of students. Students at this time are still in a transition period to online learning. Then, they need to be well prepared. Thus, it is necessary to study students' readiness in online learning and attitudes towards technological literacy during the transition to the new normal era. This study aims to know the response of students of physics education at Siliwangi University to online learning. Besides, this study aims to analyze online learning from a technological literacy perspective.

1. Methods

This research uses a survey method. Respondents are 155 students of Physics Education at Siliwangi University consist of 75 first-year students, 60 second-year students, and 20 third-year students. The survey was conducted online using a questionnaire in May 2020. The survey was conducted online using Microsoft Form. Questionnaire focus on categories “access to technology”, “application of technology for learning”, “online learning readiness”, and “attitudes towards digital technology literacy”. The survey results were processed qualitatively descriptively using percentages.

1. Result and Discussion
   1. *Access to Technology*

There are five items to reveal aspects of access to technology. Access to technology shows the availability of smartphones, the availability of notebooks or computers, the availability of an operating system that can support online learning, and the quickness of the internet for accessing information using devices (smartphones/computers, laptops).

Items related to smartphone availability reveal that 94.84% (147) of respondents own and can use smartphones for online learning. Furthermore, seven students use ordinary cellphones and smartphones. There is one student who feels no need to use a smartphone. There were 75.48% (117) students who had their laptop or computer, 19.35% (30) took turns with family or friends, there were even 5.16% (8) respondents who did not have a notebook or computers. Furthermore, as many as 83.87% (130) of respondents stated that they could use a notebook or computer equipped with an operating system for learning. There is 9.67% (15) of respondents ask for help from family or friends to access a notebook or computers for studying, and the rest still do not use it but feel the need to have access to an operating system to be used in learning.

As many as 78.06% (121) of respondents state that they can use a smartphone to access information, and 21.94% (34) of respondents can sometimes use smartphones/computers to access information. One of the constraints in accessing information using a smartphone is the internet problem that is not fast. Only 16.13% (25) of respondents state that they could access the internet fastly. Even 6.45% (10) state that they could not access the internet when they were in their domicile area and 77.42% (120) of respondents state that they had a reasonably slow internet network. Then, there are 83.87% (130) of respondents could not access the internet properly.

Access to technology is an essential aspect of online learning. Based on the results related to aspects of access to technology, the critical point obtained is that most students have been able to access online learning facilities in the form of laptops/computers or smartphones and can search using these devices to find information and learn. Technology and information have developed rapidly, then smartphones or laptops are no longer a luxury for most people. Devices have become very important in the era of online learning. However, there are still respondents who do not have support in laptops/computers for studying. Besides, a fast internet network can only be accessed by a minority of respondents. The same thing was reported by Kapasia et al. and Khalil et al., who stated that students who undergo online learning experience serious problems related to the internet network's fast running [12][11]. Apart from devices, internet networks are the central infrastructure in online learning. Bao stated that we need to ensure that students are actively and effectively involved in online learning[2]. Then, teachers must reduce obstacles related to access to technology. It can be reduced by giving more time to work on assignments and studying material independently, providing independent assignments that can train students to find information on the website, providing teaching materials earlier than lecture schedule, and changing file sizes.

* 1. *Application**of Technology for Learning*

The aspect of applying technology to learning consists of 5 items. Aspects of applying technology to learning are related to storing paperless files, using email to communicate, and using software to do assignments. Besides, applying technology to learning also reveals perceptions of the urgency of using devices in online learning and perceptions of the technology used to complete tasks.

Applying technology to learning is related to the use of online storage media. This relationship is because the material and the assignments' results need to be stored in the soft-file form. As many as 61.29% (95) of respondents still use offline storage media, namely print outs, hard disks, and USB drives. Meanwhile, 38.71% (60) of respondents have used online storage media.

Using email and using software are the most basic ways to communicate in the digital age and online learning era. The majority of respondents used email as a medium of communication, as many as 104 students (67.10%). Furthermore, 30.32% (47) of respondents state that they always use specific software to study and do assignments. Meanwhile, 60.65% (94) of respondents state that they often use specific software to do assignments and study and 9.03% (14) respondents state that they only occasionally use specific software to study and do assignments.

Another thing that was revealed in applying technology for learning was the perception of the urgency of using devices in online learning and the perception of the technology used to complete tasks. As many as 94.19% (146) respondents believe that devices are essential in online learning, and 5.81% (9) think that devices are not always crucial in online learning. Another aspect of applying technology for learning is related to the perception of technology for task completion. As many as 39.35% (61) of respondents stated, technology was not related and even hindered the collection of assignments. Meanwhile, 60.65% (94) of respondents thought that technology made the task easier.

Students need to take advantage of the rapid development of information technology to study physics concepts independently[12]. It can be started by taking advantage of things like saving the results of doing assignments and books in soft files and then storing them online and offline and using specific software to complete the task. This behavior can provide benefits to students in online learning that demands more studying independently.

* 1. *Online* *Learning Readiness*

Students' online learning readiness needs to be supported by the University. Support from universities in online learning is providing free internet quota and providing a learning application system. Besides, students need to understand the consequences of online learning. As many as 50.97% (79) of respondents stated that they understood the consequences of learning online. Almost half of the respondents (45.81%) still do not understand the consequences of learning online, and the rest do not understand the consequences of learning online (3.23%). Understanding the consequences of online learning is essential to make the right decision about student online learning habits.

Furthermore, only 1.94% (3) respondents are interested in online learning as a whole, and the rest (98.06%) do not like full online learning. When learning online, as many as 90.32% (140) of respondents liked learning media in a variety of print and digital formats, 3.23% (5) of respondents stated that online learning sources were sufficient, and 6.45% (10) of respondents did not like various learning resources in digital and online formats. The perception of the comparison between the convenience of online learning systems and face-to-face learning shows that 11.61% (18) of respondents stated that online learning is more straightforward than face-to-face learning. Meanwhile, 16.77% (26) of respondents stated that learning online and face-to-face learning are the same, and 58.06% (90) stated that online learning is more complicated than face-to-face learning. Even 13.55% (21) stated that online learning systems could not replace face-to-face learning. Convenience in browsing websites means that a person knows how to find information on a website, use search engines, and know which websites need to be visited to find information. The survey results showed that 52.90% (82) of respondents stated that they were comfortable in searching for scientific information through the website, 37.42% (58) of respondents were not comfortable yet, and 9.68% (15) of respondents often felt worried.

The research by Kapasia et al. and Khalil et al. on online learning readiness revealed that online learning causes boredom, anxiety, and frustration[11][10]. Those discomfort of online learning because students cannot do a practicum, have difficulty understanding complex mathematical formulations, and challenging to improve science process skills. Even though, science process skills are a critical for undergraduate physics students[13][14]. The discomfort of online learning should be reduced. This discomfort can be done by using a combination of online-offline media and involving the surrounding environment as a learning media. In the physics context, offline learning supports the quality of physics’ hands-on activity, science process skills, prevent misconception, reduce mathematics anxiety. On the other hand, online learning supports technology literacy, as an alternative media to deliver more complicated concepts in Physics, such as Quantum Mechanics[12], and as a physics web-based assessment[15][16].

* 1. *Attitude* *Towards Digital Technology Literacy*

In this study, a positive attitude towards digital technology literacy is shown by identifying related digital ethics, themes that link technology literacy and global problems, and digital security and responsibility. The survey results of attitudes towards digital technology literacy are presented in table 1, table 2, and table 3.

**Table 1**. Result about digital ethics

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Question** | **1 & 2 is true** | **3 & 4 is true** | **1 & 5 is true** | **It’s all true** |
| Which is included in Technology Literacy?   1. Security in online source search 2. Knowing the code of ethics in online publications 3. Understand the principles of someone's privacy 4. Understand the concept and terms of plagiarism (Plagiarism) 5. Understand the terms of citation and plagiarism | 9,68%  (15) | 6,45%  (10) | 8,39%  (13) | 75,48  (117) |

**Table 2**. Result about themes that link technology literacy and global problems

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Question** | **1, 2, & 3 is true** | **2 & 4 is true** | **3 & 5 is true** | **It’s all true** |
| Which of the following themes are relevant to 21st Century Learning:  1. Global Awareness  2. Financial Literacy  3. Civic Literacy  4. Health Literacy  5. Environmental Literacy | 20%  (31) | 6,45%  (10) | 7,74  (12) | 65,81  (102) |

**Table 3**.Result about digital security and responsibility

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Statement** | **Agree** | **Uncertain** | **Disagree** | **Not interested** |
| It is essential to understand the latest technology, and it is essential to use it for the prosperity of educational outcomes in the future. Technology integration into the lecture process is essential to do well and wisely | 76,77% | 20,65% | 0,65% | 1,94% |
| Technology has opened up possibilities for learning new skills and new cultures. The millennial generation is responsible for understanding and maximizing the potential of technological developments and warding off harmful influences. | 72,90% | 25,81% | 0% | 1,29% |

Based on Table 1, Table 2, and Table 3, most students already have initial literacy related to technology, namely a positive attitude towards digital ethics, themes that link technology literacy and global problems, and digital security and responsibility. When viewed from the perspective of Young and Pearson's technologic literacy, students already know aspects of the ways technology shapes human history and people shape technology also understands that technology reflects the values ​​and culture of society[9]. Technological developments can be used to support online learning at home[3][17]. Examples of technology that have an impact on education include the internet and Android networks. The internet is used as a learning resource apart from books and educators. Android's use as a basis for learning media is one of the learning styles in the 21st century[18].

Teachers must help the student to reduce depression, anxiety, boredom, and frustration. Bao mentions the principles of online learning when new normal[2]. First, the principle of appropriate relevance. The material coverage and the difficulty level of the material are adjusted to students' academic readiness and online learning behavior. Second, the principle of effective delivery. Online learning is characterized by a low concentration of learners, so that educators need to adjust the method and speed when delivering material. Third, the principle of sufficient support. Students need to be guided in reflection, pre-study tutorials, and written guides for online study preparation. Fourth, the principle of quality participation. Educators need to find ways to measure the degree of participation of students when learning online. Fifth, the principle of preparing a backup plan. Educators need to prepare a backup plan if the original plan does not work out to continue online learning.

1. Conclusion

This research shows that most undergraduate students have sufficient facilities for online learning and have a positive attitude towards digital technology literacy. Another finding from the study is that the majority of undergraduate students have difficulty accessing the fast internet. They like a combination of online media learning and offline media learning. However, they do not like full online learning (98.06 %), and about half of them feel convenient in finding information and scientific literature online (52.90%). This research indicates that teachers should support students at online learning by providing proper Physics learning material and media. This research is expected to suggest better online learning and literacy technology in Physics context in the new normal era.

References

[1] Reimers F M, Schleicher A and Ansah G . 2020 *Schooling Disrupted, Schooling Rethought: How the Covid-19 Pandemic is Changing Education*

[2] Bao W 2020 COVID ‐19 and online teaching in higher education: A case study of Peking University *Hum. Behav. Emerg. Technol.* **2** 113–5

[3] Crawford J, Butler-Henderson K, Rudolph J, Glowatz M, Burton R, Paola M and Lam S 2020 COVID-19: 20 Countries’ Higher Education Intra-Period Digital Pedagogy Responses Crawford, *J. Appl. Learn. Teach.* **3** 1–20

[4] Kelley T R and Knowles J G 2016 A conceptual framework for integrated STEM education *Int. J. STEM Educ.* **3** 1–11

[5] Ritz J M 2011 A Focus on Technological Literacy in Higher Education *J. Technol. Stud.* **37** 31–40

[6] France B 2018 Modeling in Technology Education: A Route to Technological Literacy 611–21

[7] Skophammer R and Reed P A 2014 Technological Literacy Courses in Pre-Service Teacher Education *J. Technol. Stud.* **40** 68–80

[8] C. Mitcham 1994 *Thinking through Technology: The Path between Engineering and Philosophy* (Chicago: University of Chicago Press)

[9] Pearson G and Young A T 2002 *Technically Speaking: Why All Americans Need to Know More About Technology* (Washington DC: National Academies Press)

[10] Kapasia N, Paul P, Roy A, Saha J, Zaveri A and Mallick R 2020 Impact of lockdown on learning status of undergraduate and postgraduate students during COVID-19 pandemic in West Bengal , India *Child. Youth Serv. Rev.* **116** 1–5

[11] Khalil R, Mansour A E, Fadda W A, Almisnid K, Aldamegh M, Al-nafeesah A, Alkhalifah A and Al-wutayd O 2020 The sudden transition to synchronized online learning during the COVID-19 pandemic in Saudi Arabia : a qualitative study exploring medical students ’ perspectives *BMC Med. Educ.* **20** 1–10

[12] Devore S and Singh C 2020 Interactive learning tutorial on quantum key distribution *Phys. Rev. Phys. Educ. Res.* **16** 10126

[13] Sujarwanto E and Putra I A 2018 Investigasi keterampilan proses sains terintegrasi mahasiswa pendidikan fisika Universitas KH. A. Wahab Hasbullah *Momentum Phys. Educ. J.* **2** 79–85

[14] Putra I A and Sujarwanto E 2017 Analisis Keterampilan Proses Sains Peserta Didik Melalui Bahan Ajar Multimedia Interaktif Alat Ukur dan Pengukuran dengan Pendekatan Behavioristik *Momentum Phys. Educ. J.* **1** 91–102

[15] Wilcox B R and Pollock S J 2019 Investigating students’ behavior and performance in online conceptual assessment *Phys. Rev. Phys. Educ. Res.* **15** 20145

[16] Nurjannah A, Gani A, Evendi E, Syukri M and Elisa E 2020 Question webs-based learning: Science process skills and scientific questioning skills of students on harmonic motion topic *Momentum Phys. Educ. J.* **4** 38–48

[17] Sintema E J 2020 Effect of COVID-19 on the performance of grade 12 students: Implications for STEM education *Eurasia J. Math. Sci. Technol. Educ.* **16** 1–6

[18] Calimag J A N N V, Miguel P A G, Conde R S and Aquino L B 2014 Ubiquitos learning environment using android mobile application *IMPACT Int. J. Res. Eng. Technol.* **2** 119–28