

THE COVID-19 PANDEMIC: ITS IMPACTS ON STUDENTS' DIGITAL CAPABILITIES

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Abstract

The Covid-19 Pandemic has affected human life in various aspects. Study and work in the year of 2020 to 2021 had to be done fully online. This condition has pushed people to improve their digital skills so that they could continue working, learning, and communicating efficiently and effectively in any situation. Digital capability should indeed be developed because it has become a requirement for any endeavor in the future. Students have been among those whose digital skills must be upgraded. The pandemic has forced them to increase their digital capabilities. This research was conducted to determine digital literacy of STBA LIA Yogyakarta students pre- and post-the Covid-19 pandemic. Ninety (90) students filled out a survey concerning their digital skills before and after the pandemic. This quantitative descriptive research was to see the increase in the 5 elements of student digital capabilities as proposed by JISC. The findings showed that students' abilities in the five elements have improved quite a lot. The number of students with 'good; and 'very good' abilities increased and the number of students with 'weak' and 'very weak' abilities decreased. Students with 'good' and 'very good' abilities after the pandemic were evenly distributed across four elements. A slight increase was indicated in the digital creation, problem solving and innovation abilities, albeit still in the 'average' category both before and after the pandemic.

Keywords: digital capabilities, digital skills, digital literacy, Covid-19 pandemic

INTRODUCTION

Technology that is developing so rapidly requires users to be wiser in using it. In 2020 and 2021, the use of technology became more widespread as a result of the Covid-19 pandemic, including in education. The pandemic condition forced teachers and students to utilize technology in teaching learning.

Digital literacy is crucial in today's society as technology continues to evolve rapidly, and digital platforms play an increasingly significant role in various aspects of life, including education, work, communication, and civic engagement. It empowers individuals to participate effectively in the digital world, navigate digital challenges, and leverage technology for personal and societal development. According to UNESCO, digital literacy is related to life skills as it involves not only technology but also the ability to learn, to think critically, to be creative, and to be innovative in order to develop digital competence (Setiawan, 2018).

According to Pradana (2018), there are four basic principles in digital literacy. The first is understanding where people have the ability to understand the information presented on the internet as a communication medium, either implicitly or explicitly. Second, there is mutual dependence and complementarity of the information presented. Third, there is a social role in it,

and the last is curation or the community's ability to access, understand and store information to be processed as a positive message.

Research conducted by Naz, Raheem, Khan, and Muhammad (2022) showed that digital literacy improved student performance in college and that students who were computer literate outperformed those who were not. Additionally, computer-savvy female students outperformed male students. Non-computer-addicted students performed better than computer-addicted students, and computer-savvy students performed better academically in coeducational institutions, and vice versa.

Other research by Tang and Chaw (2016) stated that digital literacy was a prerequisite for students to be effective in learning in a blended learning environment. This research also shows that direct meeting was more effective than online interaction. Despite the convenience brought by digital technology and the respondents having a certain level of digital literacy, they still found the need to meet in classrooms. This research also highlights that in implementing blended learning, teachers had to know their level of digital literacy in learning. Tan and Wang quoted Ng's opinion that if students are introduced to and given the opportunity to use educational technologies that they are unfamiliar with, they will be able to learn to use them. They would not use instructional tools unless there is a specific necessity. This statement shows that students will learn to use digital tools if the teacher directs them to use them. Perdana, Yani, Jumadi, and Rosana (2019) even suggested forcing the students to learn digital literacy skills and these skills must be integrated into the curriculum. Yustika and Iswati (2020) supported Perdana's suggestion by arguing that higher levels of digital literacy positively affected the high output of learning outcomes to student academic performance of the students. Saria (2022) also supported this opinion by showing that improving students' digital literacy and their ability to use information technology is important, especially when it comes to getting them ready for self-directed learning. These skills are important to do because in the future, digital literacy skills will be really needed both in the world of work, education, and social interactions.

JISC (2019) propose six elements for digital capabilities framework. They are 1) ICT proficiency, 2) Information, data, and media literacy (critical use), 3) Digital creation, problem solving, and innovation (creative production), 4) Digital communication, collaboration, and participation (participation), 5) Digital learning and development (development), and 6) Digital identity and wellbeing (self-actualizing). ICT proficiency serves as pre-requisite for or backbone of all the other capabilities and Digital identity and wellbeing is an additional element. The other four elements are capabilities in the digital practice. It is good for students to master these capabilities so that in the future they can survive better in today's technological developments.

Generation Z students is considered not to have too many obstacles in using technology as they are seen as the tech-savvy generation (Don Tapscott in Ajmain, 2020). According to a survey conducted by UNICEF in 2021, the majority of young people in ASEAN had a moderate level of digital literacy. The majority of respondents in Indonesia stated that they had good digital literacy (44%), moderate abilities (28%), and excellent level of digital literacy (19%) respectively. Only 2% had poor abilities (UNICEF, 2021). The results of the survey also showed that 65% of the respondents stated that it was very important to have digital literacy and 25% said it was important. Only 2% said it was not important. The survey indicates that young people in Indonesia have started to understand the importance of having digital literacy. The main reason why they thought digital literacy was important for their future was because it helped them acquire other skills and learn better. They also prioritized information search and discovery, helping them prepare for the job market and contributing to confidence and self-determination. Only few young people said that digital literacy would enable them to handle more demanding tasks, such as creating digital content, effectively solving problems, and staying safe online.

The results of measuring the 2021 Indonesian Digital Literacy Index held by the Ministry of Communication and Information in collaboration with the Kata Data Insight Center (KIC) also revealed that the 2021 Indonesian Digital Literacy Index reached 3.49 on a scale of 1-5 or showed an increase from the previous year's achievement of 3.46. The 2021 Indonesian Digital Literacy Index was measured through a face-to-face survey of 10,000 respondents in 514 districts/cities in Indonesia. The characteristics of respondents were internet users aged 13-70 years. From the survey it was found that digital culture got the highest score (3.90), followed by digital ethics (3.53), and digital skills (3.44). Digital security got the lowest score of 3.10 or slightly above medium. This digital literacy index measurement is not only to determine the status of digital literacy in Indonesia, but also to ensure that efforts to increase people's digital literacy are more on target (Setiawan, 2018).

Research by Wardhani, Hesti, and Dwityas (2019) reported that the three highest digital literacy skills mastered by students are media literacy, communication and information technology literacy, and information literacy skills. From this information, we could further determine what abilities needed to be encouraged more. The two-year pandemic had forced students to learn various digital skills in order to survive in learning. Therefore, this research was carried out to examine students' digital skills before the COVID-19 pandemic and after two years of the pandemic.

METHOD

Respondents

This research was descriptive quantitative using a survey design to find out the level of digital literacy of STBA LIA Yogyakarta STBA LIA Yogyakarta students before and after the pandemic. Data were obtained from students of the undergraduate and diploma programs in English batches 2018-2022.

Data Collection

An online questionnaire was distributed to the students batches 2018-2022. The questionnaire contained ten Likert scale questions related to digital capabilities of STBA LIA Yogyakarta students before and after the two years of the COVID-19 pandemic. The five-point Likert scale choices ranged from 'very good' to 'very weak'. The questions explored five of the six elements of digital capabilities framework proposed by JISC (2019) which consist of: 1) ICT proficiency, 2) Information, data, and media literacy (critical use), 3) Digital creation, problem solving, and innovation (creative production), 4) Digital communication, collaboration, and participation (participation), 5) Digital learning and development (development), and 6) Digital identity and wellbeing (self-actualizing). The sixth element was not asked because, according to JISC, this element is an additional element regarding self-actualization.

Data Analysis

The data obtained are presented in tables based on the five digital capabilities framework. They were then analyzed descriptive quantitatively.

RESULTS AND DISCUSSION

Results

Ninety (90) students of the undergraduate and diploma programs batches 2018-2022 responded to the questionnaire. Table 1 shows the respondents' ICT proficiency regarding ICT-based devices, digital capture devices, web browsers, and search engines.

Table 1
Students' ICT proficiency

No.	Questions	Frequency & Percentage					
		Very Good	Good	Average	Weak	Very Weak	
Q1	Your ability to use ICT-based devices (laptops, tablets, smart phones, desktop computers)	Before pandemic	8 (8.9%)	33 (36.7%)	41 (45.6%)	6 (6.7%)	0 (0%)
		After pandemic	32 (35.6%)	43 (47.8%)	13 (14.4%)	1 (1.1%)	0 (0%)
Q2	Your ability to use a web browser and search engines	Before pandemic	13 (14.4%)	34 (37.8%)	35 (38.9%)	7 (7.8%)	0 (0%)
		After pandemic	29 (32.2%)	46 (51.1%)	10 (11.1%)	3 (3.3%)	0 (0%)
Q3	Your ability to use digital capture devices (camera, video camera, audio recorder)	Before pandemic	11 (12.2%)	34 (37.8%)	29 (32.2%)	12 (13.3%)	3 (3.3%)
		After pandemic	28 (31.1%)	42 (46.7%)	14 (15.6%)	4 (4.4%)	0 (0%)

The number of respondents who stated that their ability to use ICT devices was 'good' and 'very good' increased from 41 to 75 respondents. This improvement was also indicated in their ability to use a web browser and search engines with the number rising from 47 (52%) to 75 (83%) and in their ability to use digital capture devices rising from 45 (50%) to 70 (78%) after the pandemic.

The respondents' ability in critical use, including information, data, and media literacy before and after pandemic, is presented in Table 2.

Table 2
Students' ability in information, data, and media literacy

No.	Questions	Frequency & Percentage					
		Very Good	Good	Average	Weak	Very Weak	
Information Literacy							
Q1	Ability to find information in wikis, blog posts, scholarly journals, and e-books	Before pandemic	9 (10%)	25 (27.8%)	34 (37.8%)	17 (18.9%)	3 (3.3%)
		After pandemic	24 (26.7%)	46 (51.1%)	13 (14.4%)	5 (5.6%)	1 (1.1%)
Q2	Ability to use the information for						

	writing assignments and presentations					
	Before pandemic	9 (10%)	29 (32.2%)	41 (45.6%)	7 (7.8%)	2 (2.2%)
	After pandemic	29 (32.2%)	45 (50%)	14 (15.6%)	1 (1.1%)	0 (0.0%)
Q3	Ability to share information with other students digitally					
	Before pandemic	10 (11.1%)	28 (31.1%)	44 (48.9%)	4 (4.4%)	2 (2.2%)
	After pandemic	35 (38.9%)	37 (41.1%)	13 (14.4%)	2 (2.2%)	2 (2.2%)
Q4	Ability to understand the rules of plagiarism and use appropriate referencing for online materials					
	Before pandemic	6 (6.7%)	27 (30%)	32 (35.6%)	18 (20%)	5 (5.6%)
	After pandemic	30 (33.3%)	36 (40%)	20 (22.2%)	2 (2.2%)	1 (1.1%)
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Media Literacy						
Q1	Ability to access digital media for entertainment and cultural enjoyment					
	Before pandemic	11 (12.2%)	38 (42.2%)	35 (38.9%)	3 (3.3%)	0 (0.0%)
	After pandemic	33 (36.7%)	43 (47.8%)	10 (11.1%)	2 (2.2%)	0 (0.0%)
Q2	Ability to edit and upload digital media for sharing					
	Before pandemic	7 (7.8%)	35 (38.9%)	34 (37.8%)	12 (1.3%)	1 (1.1%)
	After pandemic	29 (32.2%)	43 (47.8%)	15 (16.7%)	1 (1.1%)	0 (0.0%)
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Data Literacy						
Q1	Ability to record and use personal data to support your own learning and personal development					
	Before pandemic	9 (10%)	28 (31.1%)	41 (45.6%)	8 (8.9%)	3 (3.3%)
	After pandemic	23 (25.6%)	50 (55.6%)	15 (16.7%)	0 (0.0%)	0 (0.0%)
Q2	Ability to ensure your personal data is secure and use privacy settings					
	Before pandemic	9 (10%)	34 (37.8%)	32 (35.6%)	11 (12.2%)	2 (2.2%)
	After pandemic	33 (36.7%)	35 (38.9%)	16 (17.8%)	4 (4.4%)	1 (1.1%)

The respondents' ability in finding information in wikis, blog posts, scholarly journals, and e-books rose steeply after the pandemic from 'average' (37.8%) to 'good' (51.1%). Similar improvement is also seen in their ability to use the information for writing assignments and presentations rising from 'average' (45.6%) to 'good' (50%). In addition, the number of respondents who answered 'good' and 'very good' in ability to share information with other students increased from 38 (42.2%) to 72 (80%). The number of respondents with 'good' and 'very good' ability to understand the rules of plagiarism and use appropriate referencing for online materials also rose from 33 (37%) to 66 (73%).

Regarding media literacy, before the pandemic, 42.2% of the respondents had a good ability in accessing digital media for entertainment and cultural enjoyment. After the pandemic there was a slight increase to 46.7%. Similar result was also noticeable in the ability to edit and upload digital media for sharing. There was an increase from 38.9% to 47.8%.

In the data literacy section, the survey results show that 45.6% of respondents had an 'average' ability in recording and using personal data to support learning and personal development before the pandemic, while after the pandemic there were 55.6% of respondents with 'good' ability. Furthermore, the number of students who admitted to have 'good' ability to ensure the security and privacy of their personal data increased from 43 (47.8%) to 68 respondents (75.6%).

Students' creative production encompassing digital creation, problem solving, and innovation can be seen in Table 3.

Table 3
Students' ability in creative production

No.	Questions	Frequency & Percentage				
		Very Good	Good	Average	Weak	Very Weak
Digital Creation						
Q1	Your ability to design and create new digital materials, e.g., posts, digital videos, digital stories, presentations, and info graphics					
	Before pandemic	8 (8.9%)	27 (30%)	35 (38.9%)	16 (17.8%)	3 (0%)
	After pandemic	28 (31.1%)	39 (43.3%)	18 (20%)	3 (3.3%)	0 (0%)
Q2	Your ability to capture, edit, and produce digital media e.g., video, and audio					
	Before pandemic	11 (12.2%)	22 (24.4%)	38 (42.2%)	10 (11.1%)	7 (7.8%)
	After pandemic	22 (24.4%)	43 (47.8%)	20 (22.2%)	2 (2.2%)	1 (1.1%)
Digital Research and scholarship						
Q1	Your ability to collect research data using					

	digital tools e.g., data capture, video, and audio					
	Before pandemic	5 (5.6%)	31 (34.4%)	34 (37.8%)	14 (15.6%)	5 (5.6%)
	After pandemic	23 (25.6%)	42 (46.7%)	20 (22.2%)	3 (3.3%)	0 (0.0%)
Q2	Your ability to design online surveys					
	Before pandemic	10 (11.1%)	21 (23.3%)	35 (38.9%)	19 (21.1%)	4 (4.4%)
	After pandemic	23 (25.6%)	37 (41.1%)	23 (25.6%)	2 (2.2%)	3 (3.3%)

In the creative production element, the respondents' ability in digital creation, digital research, and scholarship has improved after the pandemic. The number of respondents with 'good' and 'very good' ability in designing and creating new digital media increased from 35 to 67 respondents. It also happened to the ability to capture, edit, and produce digital media which rose from 33 to 67.

Table 3 also illustrates data of students' ability in collecting research data using digital tools and designing online survey. Most students (37.8%) had 'average' ability in collecting research data using digital tools before the pandemic. After the pandemic, the number of students with 'good' and 'very good' ability increased from 36 students to 65 students. As for the ability to design online surveys before the pandemic, most students had moderate ability. After the pandemic, their ability was mostly at 'good' level. Apart from that, the number of students who had 'very good' ability increased from 10 to 23.

Table 4 tells about the students' participation which consists of digital communication, collaboration, and participation.

Table 4
Students' ability in participation

No	Questions	Frequency & Percentage				
		Very Good	Good	Average	Weak	Very Weak
Digital Communication						
Q1	Ability to communicate with other people in a range of digital media e.g., email, presentations, texts, photo sharing, video conference, and Instagram/Twitter posts					
	Before pandemic	13 (14.4%)	31 (34.4%)	29 (32.2%)	12 (13.3%)	4 (4.4%)
	After pandemic	31 (34.4%)	44 (48.9%)	13 (14.4%)	0 (0.0%)	0 (0.0%)

Digital Collaboration						
Q1	Ability to work in digital teams, groups, and projects to produce shared outcomes or meet shared goals					
	Before pandemic	5 (5.6%)	31 (34.4%)	35 (38.9%)	15 (16.7%)	3 (3.3%)
	After pandemic	21 (23.3%)	49 (54.4%)	14 (15.6%)	4 (4.4%)	0 (0.0%)
Q2	Ability to take part in a collaborative online environment e.g., webinars, and discussion groups					
	Before pandemic	6 (6.7%)	22 (24.4%)	38 (42.2%)	17 (18.9%)	6 (6.7%)
	After pandemic	21 (23.3%)	44 (48.9%)	18 (20%)	4 (4.4%)	1 (1.1%)
Digital Participation						
Q1	Ability to share digital resources e.g., links, images, and texts					
	Before pandemic	12 (13.3%)	33 (36.7%)	38 (42.2%)	3 (3.3%)	2 (2.2%)
	After pandemic	34 (37.8%)	40 (44.4%)	14 (15.6%)	1 (1.1%)	0 (0.0%)
Q2	Ability to post reviews, comments, 'likes' etc on public forums					
	Before pandemic	16 (17.8%)	27 (30%)	35 (38.9%)	8 (8.9%)	2 (2.2%)
	After pandemic	31 (34.4%)	41 (45.6%)	12 (13.3%)	3 (3.3%)	0 (0.0%)

Table 4 illustrates students' ability in participation element which includes digital communication, collaboration, and participation before and after the pandemic. The students' digital communication ability greatly improved. The number of respondents with 'good' and 'very good' ability went up from 44 respondents to 75 respondents. The number of students who had poor and very poor ability decreased from 16 students to 0. Their digital collaboration also shows good development. Before the pandemic, most students had an 'average' ability in working in digital teams, groups, and projects to produce shared outcomes or meet shared goals. After the pandemic, most students had a 'good' ability. In collaborative online environment, the ability changed from 'average' (42.2%) to 'good' (48.9%). In digital participation, before the pandemic, most students had an 'average' ability in sharing digital resources and posting reviews, comments, "likes" on public forum. After the pandemic, this ability became 'good' with 44.4% of the respondents.

Table 5 outlines students’ digital learning and development.

Table 5
Students’ digital learning and personal development

No	Questions	Frequency & Percentage					
		Very Good	Good	Average	Weak	Very Weak	
Q1	Your ability to use digital learning resources e.g., quizzes, online tutorials, simulations	Before pandemic	7 (7.8%)	26 (28.9%)	38 (42.2%)	15 (16.7%)	3 (3.3%)
		After pandemic	28 (31.1%)	45 (50%)	14 (15.6%)	1 (1.1%)	0 (0.0%)
Q2	Your ability to use digital media to discuss with tutors and other students	Before pandemic	9 (10%)	24 (26.7%)	40 (44.4%)	13 (14.4%)	3 (3.3%)
		After pandemic	23 (25.6%)	46 (51.1%)	16 (17.8%)	2 (2.2%)	1 (1.1%)

The students’ ability to use digital learning resources like quizzes, online tutorials, and simulations rose from ‘average’ (42.2%) to ‘good’ (50.0%). Similarly, their ability to use digital media to discuss with tutors and other students improved from ‘average’ before the pandemic to ‘good’ after the pandemic.

Discussion

In general, by comparing the digital skills pre- and post-pandemic, STBA LIA Yogyakarta students’ digital literacy increased. Two years of pandemic has compelled them to develop their digital skills. Lectures had to be given online to reduce the risk of spreading the virus. All activities previously carried out offline had to be carried out online. Lecturers often gave online assignments such as making videos, taking online quizzes, and various other activities that were rarely done during offline lectures.

In the ICT proficiency category, there were no students who had ‘very poor’ ability in using ICT equipment. This is understandable because the students belong to Generation Z who use ICT equipment especially cell phones in daily basis. Their capabilities were mostly sufficient (45.6%) before the pandemic hit. After the pandemic ended, the majority said that their abilities were good (47.8%) and very good (35.6%). After the pandemic, 83% of students felt their ICT skills were in the ‘good’ and ‘very good’ category. Apart from global ICT skills, the number of students who had ‘good’ and ‘very good’ skills in digital capture skills increased from 45 students to 70 students. The use of web browsers and search engines was also a highlight in this category. There were no

students who stated that they could not use web browsers and search engines. Most students stated that they had sufficient abilities before the pandemic. After the pandemic, 75 (83%) students stated that they had 'good' and 'very good' skills in using web browsers and search engines.

Information literacy consists of the ability to find information online, to use it in writing and presentations, to share this information with colleagues, and to understand plagiarism rules and use appropriate references when working on assignments. Before the pandemic, students were encouraged to look for information sources on the internet. Looking for appropriate and trustworthy sources had actually been taught since before the pandemic. The results of the questionnaire show that there were still students who felt that their abilities in information literacy were not very good. Regarding the ability to search for information online and understanding of plagiarism rules before the pandemic, there were still quite a lot of students who said their abilities were not good. In this category, of the four aspects asked, the majority of respondents had 'average' abilities. After the pandemic, most respondents stated that their abilities were in the 'good' and 'very good' category.

In the media literacy category, most of the students who belong to Generation Z and are used to using technology, especially cell phones, stated that their abilities were mostly 'good' and 'very good' in using technology to access media for entertainment purposes and to edit and upload media to share with others. Only 3 people stated that they had poor abilities in accessing media for entertainment purposes. The number of students who stated they had 'good' and 'very good' abilities increased by 25%.

Data literacy category includes recording and using personal data to support learning and personal development and ensuring personal data security. In this category, the majority of students stated that they had moderate abilities before the pandemic in the ability to record and use personal data. After the pandemic, 81% of students stated that they had 'good' and 'very good' abilities or experienced quite a lot of improvement. In the personal data security section, there were 43 people who stated they had 'good' and 'very good' abilities. After the pandemic, the number increased by 25 students.

In the digital creation aspect, two questions were asked about designing and creating new digital materials, as well as capturing, editing and producing digital media. Of the 90 respondents, before the pandemic, the majority stated they had moderate ability in designing and creating new digital materials. Even though belonging to Generation Z, 19 respondents stated that their abilities were in 'weak' and 'very weak' categories. The pandemic sharpened the respondents' abilities in this aspect because after the pandemic, there were no respondents whose abilities were in weak or very weak. Most abilities are in the 'good' and 'very good' category with 75% of respondents. The ability to capture, edit and produce digital media such as video and audio changed from 'average' to 'good'. Even though there were still 3 respondents who said their abilities were not

good, there were 65 respondents who said they had ‘good’ and ‘very good’ abilities after the pandemic.

Apart from the ability to produce media, students were also required to be able to carry out research by searching for data online. Most students stated that they had ‘average’ abilities in searching for research data using digital tools before the pandemic. After the pandemic, most students said they had ‘good’ abilities. In online survey design skills, there were still quite a lot of students who said their skills were not good (23 respondents) and after the pandemic this number decreased to 5 respondents. Students with ‘good’ and ‘very good’ abilities increased from 31 to 60 respondents.

Due to limited access to face-to-face meetings with other people, students' abilities in online communication had increased quite significantly, from 44 students who stated they had ‘good’ and ‘very good’ abilities, it rose to 75 students. The good thing about this category is that after the pandemic there were no students who stated their abilities were weak.

Apart from increasing communication skills using digital media, respondents also stated that their collaboration skills had also increased. This is shown by the increase in the number of respondents who had ‘good’ and ‘very good’ abilities from 40% to 78% in their ability to work in a team and share the results of their performance. Regarding participation in online collaboration such as webinars and online discussion groups, the majority of respondents also stated that they were in the ‘good’ and ‘very good’ categories compared to before, most of whom in the ‘average’ category.

This collaboration capability was also accompanied by online participation capabilities. The ability to share digital sources and the ability to post reviews and comments on public forums for most respondents improved from fair to good. After the pandemic, no respondents stated that their abilities were ‘very poor’.

The final category of digital literacy is digital learning and personal development. In this category, questions were asked regarding the use of digital learning resources such as quizzes, tutorials and simulations; and use of digital media for discussions with others. In this category, most respondents had sufficient abilities before the pandemic and become ‘good’ after the pandemic. Respondents with ‘good’ and ‘very good’ abilities also increased, and the number of respondents with poor and very weak abilities decreased after the pandemic.

Table 6
Percentage of respondents
in the ‘good’ – ‘very good’ and ‘weak’- ‘very weak’ categories

	Good- Very Good		Weak - Very Weak	
	Before	After	Before	After
ICT Proficiency				

A. Using ICT devices	46%	83%	7%	1%
B. Can use web browser and search engine	47%	75%	8%	3%
C. Can use digital capture devices	50%	78%	17%	4%
Average	48%	79%	11%	3%
Critical Use (Information, Data, and Media Literacy)				
Information Literacy				
A. Can find information in wikis, blog, etc.	38%	78%	22%	7%
B. Can use information for writing assignments and presentations	42%	82%	10%	1%
C. Can share information with other students	42%	80%	7%	4%
D. Can understand the rule of plagiarism and use appropriate referencing for online materials	37%	73%	26%	3%
Media Literacy				
A. Can access digital media for entertainment and cultural enjoyment	54%	83%	3%	2%
B. Can edit and upload digital media for sharing	47%	79%	14%	1%
Data Literacy				
A. Can record and use personal data to support my own learning and personal development	41%	81%	12%	0%
B. Can ensure my personal data is secure and use privacy setting	48%	76%	14%	6%
Average	44%	79%	13.5%	3%
Creative Production (Digital Creation and Digital Research and Scholarship)				
Digital Creation				
A. Can design and create new digital materials	39%	74%	21%	3%
B. Can capture, edit, and produce digital media	37%	72%	19%	3%
Digital Research and Scholarship				
A. Can collect research data using digital tools	40%	72%	21%	3%
B. Can design online surveys	34%	67%	26%	6%
Average	38%	71%	22%	4%
Participation (Digital Communication, Collaboration, and participation)				
Digital Communication				
Can communicate with other people in a range of digital media	49%	83%	18%	0%
Digital Collaboration				
A. Can work in digital teams, groups and projects to produce shared outcomes or meet shared goals	40%	78%	20%	4%
B. Can take part in collaborative online environment	31%	72%	26%	6%
Digital Participation				
A. Can share digital resources	50%	82%	6%	1%
B. Can post reviews, comments, 'likes' etc on public forums	48%	80%	11%	3%
Average	44%	79%	16%	3%

Development (Digital Learning and Personal Development)				
Digital Learning and Personal Development				
A. Can use digital learning resources	37%	81%	20%	1%
B. Can use digital media to discuss with tutors and other students	37%	77%	18%	3%
Average	37%	79%	19%	2%

The table above shows that the number of students with 'good' and 'very good' abilities in all abilities had increased. Meanwhile, the number of students with 'weak' and 'very weak' abilities had all decreased, with two abilities even decreasing to 0%, that is the ability to record and use personal data to support learning and personal development, as well as the ability to communicate with other people in a range of digital media.

This indicates that during the pandemic, there was an increase in students' abilities regarding digital literacy. Lectures conducted online with online assignments also forced students to learn more about these skills. The ability that increased the most was the ability to use digital learning resources such as quizzes, online tutorials and simulations. From 33 respondents (37%), it increased to 73 (81%) respondents. Before the pandemic, not many lecturers gave training or assignments using quizzes, tutorials, online simulations. After the pandemic, many exercises were given using online quizzes. Apart from that, students were also given materials in the form of learning videos and were encouraged to use videos on YouTube.

The second ability that showed significant increase (from 31% to 72%) was the ability to take part in collaborative online environments, e.g. webinars and discussion groups. During the pandemic, seminars were held online, giving rise to the term webinar (web seminar). This activity was very rarely carried out before the pandemic. That is why this ability is among those that had increased quite a lot.

The ability to use information for writing assignments and presentations, store and use personal data to support individual learning and personal development, and use digital media to discuss with tutors and other students experienced the same increase, i.e. 36 respondents (40%). This ability increased because lectures were conducted online so that students had to be able to work on online assignments and presentations, save them, and even discuss them online with lecturers and fellow students.

Apart from increasing ability, there was a decrease in the number of respondents who stated that their ability was 'weak' and 'very weak'. The three biggest declines were the ability to understand plagiarism rules and use appropriate referencing for online materials. The number of respondents from 23 people (26%) decreased to 3 people (3%). By frequently doing assignments online, students often used a quick way to do assignments by copying and pasting from the

internet or from friends' work. This had encouraged lecturers to emphasize the importance of knowing the rules of plagiarism and the use of references.

Other declining abilities include designing online surveys (from 26% to 6%) and working in digital teams, groups, and projects to produce shared outcomes or meet shared goals (from 26% to 6%). This decrease in numbers shows that students who previously did not understand how to create online surveys or work in groups to produce something online were starting to understand how to do it.

Table 7

Average students' ability per element before and after the COVID-19 Pandemic

Element	Before	After	Difference
ICT Proficiency	3.4 (average)	4.1 (good)	0.7
Critical Use	3.3 (average)	4.0 (good)	0.7
Creative Production	3.2 (average)	3.9 (average)	0.7
Participation	3.3 (average)	4.0 (good)	0.7
Development	3.2 (average)	3.9 (average)	0.7

Table 7 illustrates the average increase in respondents' abilities per digital capabilities element. All elements increased by 0.7 points. Three elements show an increase in category, from the adequate to good category, namely the elements of ICT proficiency, Critical Use, and Participation. Meanwhile, the other two elements (Creative Production and Development) remain in the average category. Students increase their abilities because they are forced by circumstances that require them to learn various kinds of digital skills. This is in line with research conducted by Ng (Tan and Wang, 2016) which states that students will learn to use digital technology if they are given the opportunity to use it, even Perdana et al (2019) suggest forcing them to learn digital literacy.

This research is also in line with research conducted by Sari and Yoni (2021) which stated that the Covid-19 epidemic had some beneficial effects on students' learning experiences in terms of technological literacy. Some of the abilities that increased were digital skills, the eagerness and willingness to participate in online training and seminars, their sense of competition, their excitement for teamwork, the addition of new networks, and the flexibility of the learning process. The survey also found that, compared to pre-pandemic conditions, lecturers and students had a

more thorough understanding of the internet and digital literacy. Similar results were also obtained in research conducted by Syahrin et al. (2023). The research discovered that the majority of students believed that the COVID-19 pandemic-accelerated online learning greatly increased their level of digital competency.

Conclusion

All in all, the digital literacy of STBA LIA Yogyakarta students improved after the pandemic. The number of students with 'good' and 'very good' abilities as shown in this research increased quite a lot and those with 'weak' and 'very weak' abilities became less. The ICT proficiency, Critical Use and Participation elements increased from 'average' to 'good', while the Creative Production and Development elements remained in the 'average' category even though the numbers increased. The pandemic encouraged students to hone their digital skills in terms of collaboration, participation, searching for information, producing media, and other abilities that indirectly develop their skills which will be much needed in the future.

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