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The Effects of COVID -19 on Ethiopian Higher Education and their Implication for the Use of Pandemic-Transformed Pedagogy: 'Corona Batches' of Addis Ababa University in Focus

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Abstract

COVID-19-driven school closures have impacted teaching-learning globally in various countries. In Ethiopia, after closing for over six months, universities have reopened and continued the teaching-learning process, making efforts to employ pandemic-transformed pedagogy. Nevertheless, equity and access to learning for all seem to be undermined, particularly in utilising pandemic-transformed pedagogy. This study, therefore, was designed to assess the effects of the COVID-19 pandemic on Ethiopian higher education and their implications for the use of pandemic-transformed pedagogy, focusing on the 'corona batches' of Addis Ababa University (AAU). To achieve the study's objectives, an explanatory research design was employed involving academic staff, students, e-learning focal persons, and repository technical support specialists. Data for this study were gathered using three different instruments: documents, a questionnaire, and in-depth interviews. The results revealed that the coronavirus has had a disastrous effect on AAU activities by disrupting the academic calendar of the university and students' learning. The university was overstretched to continue the teaching-learning process. The crisis-response migration measures employed by AAU during the pandemic were found to be encouraging, but the delivery of online courses was not promising since most instructors had inadequate digital pedagogical skills. Students' inability to access electronic devices also seemed to hamper the usage of online learning during the pandemic. Further, even though the COVID-19 pandemic has changed traditional pedagogy, the University has given less attention to this issue. Based on the results, recommendations are made, and implications for Ethiopian higher education are presented.

Keywords: COVID-19, 'corona batches', digital pedagogy, e-learning and pandemic-transformed pedagogy.

1 Background

According to Huang et al. (2020), a novel coronavirus known as COVID-19 was discovered in the last month of 2019 at a seafood market in Wuhan, China. The outbreak originated in China right in the middle of Chunyun, a 40-day festival (in 2020, from 10 January 2020 to 18 February) centred on the Chinese Lunar New Year, which represents the largest annual migration of people on the planet (Abiad, 2020). Concerns about the pandemic were evident prior to 31 December 2019, when Beijing first notified the World Health Organization (WHO) of the outbreak. On 11 March 2020, the WHO declared COVID-19 to be a global pandemic (WHO, 2020). Since the outbreak of COVID-19, it has spread rapidly across the globe. At the time of finalising this article on 12 March 2021, the disease had spread to 223 countries (areas or territories), with 118,058,503 cases and 2,621,046 deaths. In early December 2020, the first mass vaccination programme started, and as of 10 March 2021, a total of 300,002,228 vaccine doses have been administered (WHO, 2021a).

The first confirmed case of COVID-19 in Ethiopia was reported on 13 March 2020. The victim was a 48-year-old Japanese citizen who had come to the country on 4 March 2020 from Burkina Faso (MoH, 2020). The number of COVID-19 victims in Ethiopia initially grew very slowly. For example, the number of cases from the beginning of the pandemic on 13 March 2020 to the end of April 2020 was insignificant (approximately 10 people). This number rose to 17 on 6 May 2020; most of the victims were returnees from Djibouti (7) and Somali Puntland (6). The number increased to 29 on 7 May 2020. The figure rose progressively to 35 (later reported as 34) on 18 May 2020. In two months, the country had reached more than 230 cases. After one year, on 12 March 2021, there were 169,878 confirmed cases of COVID-19, with 2,466 deaths reported to the WHO (WHO, 2021b).

According to data released by United Nations Educational, Scientific and Cultural Organization (UNESCO) (2020), 1 billion learners worldwide, from preschool to university, have not been able to attend teaching establishments temporarily as a result of the pandemic. Globally, more than 1 billion children are at risk of falling behind due to school closures aimed at containing the spread of COVID-19 (UNICEF, 2020). Even if some countries have begun to partially reopen primary schools, the threat of the disease has continued.

With effects across the globe, the COVID-19 pandemic has impacted teaching-learning in Ethiopia even though the higher education system is now characterised by rapid institutional and student enrolment expansion at both the undergraduate and postgraduate levels. Presently, in Ethiopia, higher education is facing serious challenges. That is, COVID-19-driven university closures have impacted teaching-learning in Ethiopian higher education. After the government announced school closures, including sporting events and public gatherings, for 15 days on 16 March 2020, all schools were shut down for an extended period (approximately eight months). Moreover, although

classes were reopened after the school closures, teaching-learning occurred under abnormal conditions.

Although the government of Ethiopia has come up with new initiatives to use information communication technologies in the higher education system during the COVID-19-driven university closures, the infrastructure related to information technology and instructors' familiarity with e-learning authoring tools and platforms have been questionable. For instance, as part of their response to COVID-19 disruptions, the Ministry of Science and Higher Education (MoSHE) and universities have been taking action to support learners in continuing their education remotely, which has resulted in a paradigm shift in pedagogy. Having reopened classes, the MoSHE and universities have also encouraged instructors to prepare online content and to deliver blended lessons by reducing conventional face-to-face instruction. However, university students in most parts of the country have been obliged to stay at home, where distance learning has not been arranged. In addition, many students do not have access to technology or a suitable learning environment at home; that is, access to the internet and devices that students use to employ online learning seems to be limited. Instructors' familiarity with e-learning authoring tools and platforms has also been problematic. This means that equity and access to learning for all seem to be undermined by pandemic-transformed pedagogy. This study, therefore, assessed the effects of the COVID-19 pandemic on Ethiopian higher education and their implications for the use of pandemic-transformed pedagogy, focusing on the 'corona batches' of Addis Ababa University (AAU).

In this study, 'corona batches' refers to undergraduate students who discontinued their classes due to the COVID-19 pandemic and resumed their semester courses during reopening. It is expected that the results will provide a clear picture of the effects of the COVID-19 pandemic on the 'corona batches' and will highlight the effective use of COVID-19-driven pedagogy to mitigate the impacts of the crisis. Further, the study serves as a timely response to students' learning during the COVID-19 pandemic scenario. Moreover, policymakers in the area of higher learning will benefit from the research.

2 Objectives

The objective of the research was to assess the effects of COVID-19 on Ethiopian higher education and their implications for the use of pandemic-transformed pedagogy, focusing on the 'corona batches' of Addis Ababa University.

More specifically, the research attempts to:

- identify current practices and challenges associated with teaching-learning methods in view of COVID-19;
- examine crisis-mitigation measures taken by Addis Ababa University;
- explore academic staff's adoption of educational technologies to provide technology-assisted lessons and to introduce new learning content;
- identify how students have been learning under the pandemic; and

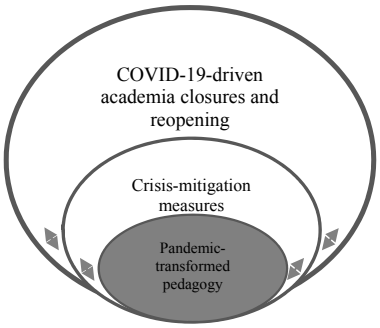
- propose remedial measures to mitigate the effects of the pandemic on the higher education system.

3 Method

3.1 Research Design and Conceptual Model of the Study

The main objective of this study was to collect data on the effects of the COVID-19 pandemic on Ethiopian higher education specific to the 'corona batches' of AAU. It also explored the use of COVID-19-driven pedagogy. To achieve the objectives of the study, an explanatory research design with a qualitative approach was employed, with a quantitative approach as a supplement. That is, this study investigated how teaching-learning has looked during the COVID-19 era, involving academic staff who have taught 'corona batches' in different faculties of AAU and their students.

The following conceptual framework was used in the study as a model, which has been generated from sources in the literature. The model represents the variables that were investigated in the study. These variables are interrelated to each other, as demonstrated by the arrows in the model. The variables in the largest circle generate the variables in the other two circles, and each of them affects the others in turn.



Note: Author's design

Figure 1: Conceptual model of the study

The outbreak of coronavirus, an acute respiratory illness transmitted through respiratory droplets and contact, has caused multiple social and economic effects. Since it is contiguous, it has spread unpredictably throughout the world at an alarming rate. The disease has rapidly reached areas with high population densities, including urban areas, camps and camp-like settings, and often overburdens weak health care systems (UN, 2020). Thus, as the World Bank (2020) claimed, school closures are a critical pillar of social distancing tools to mitigate the spread of the illness and to avoid an acceleration of cases that would put a strain on health services. School closures slow down the spread of contagion. In this sense, Ethiopia declared school closures soon after the outbreak and the first coronavirus case was confirmed. The MoSHE also announced mandatory university

closures, and students were obliged to return home. School closures due to COVID-19 have affected learners nationwide. This study, hence, identified current practices and challenges associated with teaching-learning methods in view of COVID-19.

According to David (2020), digitised materials can be used to alleviate problems related to the COVID-19 pandemic. From this perspective, countries took various crisis-mitigation measures to continue teaching-learning after the novel coronavirus emerged. Countries devised contingency plans for COVID-19 and adopted multiple learning delivery modalities ranging from low-tech to high-tech (i.e., from instructional radio and television that are more easily available to economically disadvantaged groups to web-based platforms). The government of Ethiopia persuaded universities and schools to continue teaching-learning using available technological tools. For instance, the MoSHE organised online forums on how to utilise e-learning during the pandemic. The question we must ask is 'Is the Ethiopian education system designed to adapt rapidly to such a problem'? Therefore, the study aimed to assess the crisis-mitigation measures taken by Addis Ababa University. It also explored academic staff's adoption of educational technologies to provide technology-assisted lessons and to introduce new learning content.

The crisis-mitigation measures (i.e., teaching-learning modalities) employed in the education sector have changed the traditional pedagogy. For example, schooling has shifted towards 'de-schooling'. Conventional face-to-face instruction switched to being delivered via screens. The modality of giving lessons has also changed during the pandemic; lessons have been delivered in fully online and blended formats. The role of instructors has also been transformed; that is, instead of only using the usual 'talk and chalk', the pandemic has forced instructors to develop digital lessons and deliver them virtually. Their instructional communication with students has become both asynchronous and synchronous. Self-paced and class-paced learning have also been introduced.

According to Hindle (2007), an understanding and application of ICTs for teaching-learning in technical and pedagogical dimensions should be taken into account in such a situation. Capabilities in technology and media-related skills are required to design and develop e-learning courses. For instance, knowledge and skills of courseware authoring tools (special-purpose tools that create interactive e-learning content) are essential. Moreover, teachers need to be ICT-literate with regard to which technology is available and how it might be used. Above all, as Mishra & Koehler (2006) asserted, teachers' knowledge of the common intersection of technology, pedagogy, and content is paramount. Thus, the study was concerned with the effects of pandemic-transformed pedagogy on students' learning and instructors' quality of teaching.

3.2 Research Setting and Participants

The study was conducted at Addis Ababa University, which is the pioneer higher education institute in the country, established in 1950. AAU currently offers 73 undergraduate and 366 graduate programmes (96 PhD programmes, 210 Master's programmes, and 60 specialty and subspecialty courses) at its 10 colleges, two technology

institutes, and 11 research institutes (four of which run graduate programmes). The MoSHE has recognized AAU as a research university (AAU, 2020a).

Academic staff of the university were the target participants of the study. The study also involved students, e-learning focal persons, and repository technical support specialists. While academic staff were randomly selected, students were selected purposefully. That is, email accounts of faculty members from various disciplines were randomly selected, and a link to the questionnaire was sent. Student participants were intentionally selected based on their ability to elucidate the COVID-19-driven teaching-learning process. Moreover, availability sampling was employed to choose e-learning focal persons and repository technical support specialists.

3.3 Instruments of Data Collection

To gather data for the study, three different instruments: documents, a questionnaire, and in-depth interviews, were used. That is, documents, such as meta-data of AAU's e-learning portal, institutional repository and webpage content, guidelines for handling the effects of the pandemic and online learning, and written correspondence, were reviewed and analysed digitally. Considering COVID-19 pandemic, a questionnaire was administered to academic staff using Google Forms, and 76 valid responses were obtained. In-depth telephone interviews were also conducted with a 'corona batch' of 15 students.

Both qualitative and quantitative data analysis techniques were carried out to analyse the data, and the results were interpreted and discussed in relation to the specific research objectives and the conceptual model of the study. To analyse the quantitative data, descriptive statistics, such as frequencies and percentages, were generated in Google Forms. The qualitative data were organized manually and interpreted by integration with the quantitative data.

4 Results

This section is devoted to the presentation and analysis of the results of the study under five sub-sections. The first sub-section presents the status of teaching-learning at AAU in the time of the COVID-19 pandemic. The practices and challenges associated with teaching-learning methods in view of COVID-19 are addressed. The second sub-section describes the findings related to the educational (crisis-mitigation) measures that AAU has taken during the COVID-19 crisis. The third sub-section discusses the outcomes of the COVID-19 pandemic and the push towards online learning; that is, academic staff's adoption of educational technologies to provide technology-assisted lessons and to introduce new learning content is explored. Results related to the state of academic staff's use of technology and students' learning are presented in the fourth sub-section. The last sub-section deals with the strategies for using sustainable pandemic-transformed pedagogy.

4.1 AAU in the time of the COVID-19 Pandemic

At the epicentre of the virus, AAU took the necessary steps to continue face-to-face instruction. There were restrictions regarding who could enter the university. Only staff members and students were allowed to enter the university's compound, with sanitary measures taken at each gate of the campus. No one was allowed to enter the university without adhering to hygienic regulations (washing or sanitising one's hands) and wearing a face mask. Classes continued in this manner for approximately two weeks. However, when the first confirmed case of COVID-19 was reported in Ethiopia on 13 March 2020, things changed. Based on the MoSHE's letter to 45 public universities dated 16 March 2020, the university suspended face-to-face teaching-learning, as the ministry urged all universities to discontinue face-to-face teaching-learning and informed them that they should restrict students' movement off campus. The ministry imposed a university-wide lockdown for two weeks and initiated distance learning options; universities were instructed to deliver lessons through email communication and any forms of online learning (MoSHE, 2020a). After two weeks, the university closed classes and decided to clear students from its various campuses. Mobility was also banned across the campuses. Staff were told to remain in lockdown at home; a stay-at-home order was in effect. Everywhere was deserted for approximately two months.

Having announced a 14-day self-quarantine mandatory for anyone entering the country from overseas, the government started to use public universities in the capital for quarantine (first Addis Ababa Science and Technology University, and then Kotebe Metropolitan University). Some campuses of Addis Ababa University, such as the main campus at 6 kilo, the Addis Ababa Institute of Technology at 5 kilo, the College of Natural and Computational Sciences at 4 kilo, and the College of Health Sciences at Sefere-Selam, partially served as quarantine sites. This trend was extended to other public universities, such as Dire Dawa, Jigjiga, and Semera, which are located in the eastern part of the country. A number of returnees from Djibouti, Somali Puntland, and Middle Eastern countries were under quarantine at those universities.

Gradually, AAU's administration encouraged academic staff to continue teaching graduate students remotely through a variety of online platforms and electronic textbooks. However, most instructors were reluctant to deliver classes virtually. Since most of the graduating classes of postgraduate students had completed their coursework, thesis and dissertation defences took place. The defences were completed both face-to-face and virtually. While some of them took place remotely online, most defences were held face-to-face only in the presence of internal and external examiners and the examinee. Finally, AAU graduated 5,742 students, who were able to complete their courses in different fields of study, with a virtually held commencement on Saturday, 25 July 2020. In total, 244 students (including those with medical specialties) graduated with PhDs, and 3,128 students graduated with an MA/MSc. The remaining 2,370 students were from undergraduate programmes and were enrolled in the continuing education programme (AAU, 2020b).

On 7 September 2020, the University Managing Council (which comprises the president, vice presidents, deans, directors, and other key officers) held a virtual meeting on the reopening of classes. The president chaired the meeting, while the Office of the Academic Vice President presented the guidelines for reopening undergraduate classes. Next, a survey report on AAU's online learning practices from students' perspectives was presented. Some colleges also shared their teaching practices during the pandemic. These discussions revealed that online learning was not uniform across the university, and some instructors were not considerate of the circumstances of COVID-19.

Afterwards, the MoSHE announced its plan to reopen the country's 45 public universities despite the disease continuing to spread nationwide. In addition, the ministry circulated the guidelines for reopening classes among higher learning institutions, along with a four-page evaluation checklist (MoSHE, 2020b). A task force from the MoSHE assessed state-owned universities by using the checklist, and four universities were allowed to reopen for the first time. Addis Ababa University was among them and reopened undergraduate classes in November 2020. According to the university's supplementary academic calendar, to complete the second semester of the 2019/2020 academic year, graduating classes were registered from 2–3 November 2020 in Phase I (AAU, 2020c). Classes were held for approximately 45 days, and 4,078 students who

Table 1. The number of undergraduate students the AAU admitted during reopening

College/Institute	Phase I (graduating classes)	Phase II (3rd-year & >year-II students of three-year undergraduate programmes)	Phase III (1st-year and 2nd-year students)
Addis Ababa Institute of Technology	1,076	1,149	1,097
Architecture, Building Construction and City Development	426	389	474
College of Natural and Computational Sciences	451	416+115=531*	855-416=439**
College of Health Sciences	816	922	1,054
College of Veterinary Medicine and Agriculture	78	77	191
College of Education and Behavioral Studies	84	+103*	459-103=356**
College of Business and Economics	620	760*	1,340-760=580**
College of Law and Governance Studies	100	93	116
College of Social Sciences	246	265*	582-265=317**
College of Humanities, Language Studies, Journalism and Communication	228	35+280=315*	640-280=360**
College of Performing and Visual Arts	140	155	249
Total	**4,265**	**4,759**	**5,233**

** Year II students of three-year undergraduate programmes were included*
*** Only 1st-year students were admitted*

Source: The Office of the Academic Vice President of AAU

were able to conclude their courses in different fields of study and graduated on 26 December 2020. Of those graduates, 804 were postgraduate students, including those with medical specialties (AAU, 2020d).

At first, the university planned to admit undergraduate students in three phases (phase I, graduating classes for 45 days; phase II, 3rd-year and above students and year II students of three-year undergraduate programmes for 45 days; and phase III, 1st-year and second-year students for 61 days), as shown in Table 1 (AAU, 2020e). However, the university revised its calendar and admitted all non-graduating undergraduate students on 29 December 2020 for 67 days (AAU, 2020f).

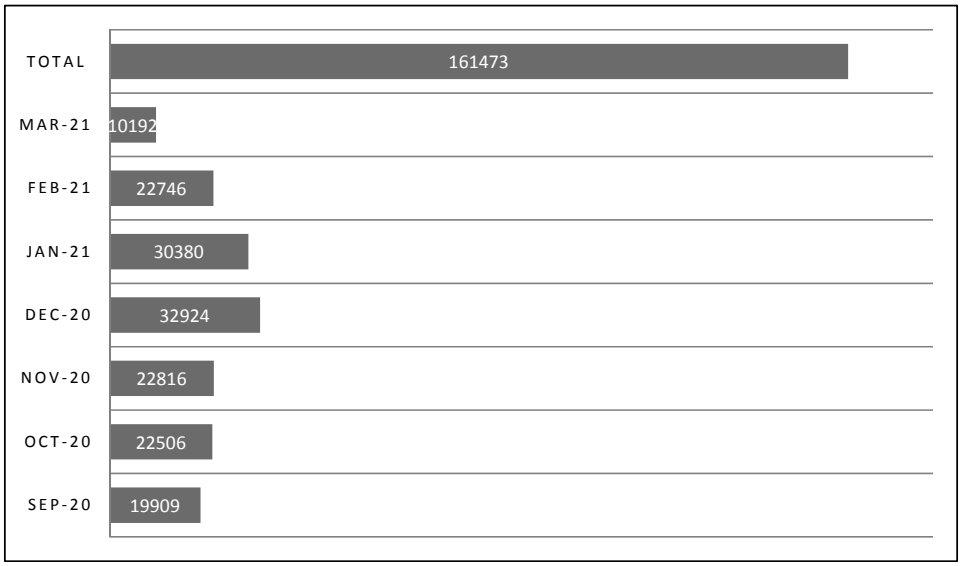
4.2 Educational measures that AAU has taken during the COVID-19 crisis

To alleviate problems related to the pandemic, the university organised a series of training sessions on online learning entitled 'A Hands-on Training on Online Collaboration Google Suite Tools' in May 2020. The training involved academic staff and was conducted online. The training sessions were mainly focused on online collaboration using Google Suite services, with a special emphasis on Google Meet and Google Classroom. The training sessions also accommodated issues related to using AAU's e-learning platform (http://elearning.aau.edu.et) to upload course materials.

Meanwhile, the university financed the digital curriculum and materials before and during the pandemic. For instance, Addis Ababa University's Institutional Repository (AAU-IR) has made digital reading materials available. It has also facilitated digital preservation and scholarly communication (please see Figure 2) (AAU, 2021a).

Figure 2: Screenshot of AAU's Institutional Repository (accessed on 10 March 2021)

As per the metadata of AAU-IR, approximately 161,473 users viewed the repository and downloaded 98,708 digital reading materials from September 2020 to 10 March 2021. As indicated in Figure 3 (below), the repository had the highest number of visitors in December 2020 (32,924) and January 2021 (30,380) after the reopening of undergraduate classes. This may be because the university admitted all non-graduating undergraduate students on 29 December 2020, and students made efforts use digital resources. The response obtained from a repository technical support specialist supported this. He mentioned that since the university began to admit undergraduate students, the number of visitors to the repository has increased. In fact, he said that postgraduate students and graduating classes of undergraduate students have widely used the repository when writing their term papers, senior essays and theses.



Source: AAU Libraries (accessed on 10 March 2021)

Figure 3: Visitors to AAU's Institutional Repository (from September 2020–10 March 2021)

In addition, the university upgraded its e-learning portal (the AAU e-learning portal) and developed guidance manuals for teachers and students. A number of teaching-learning materials (lecture notes, modules and supplementary reading materials) have been made available using the portal in Portable Document Format (PDF), Microsoft PowerPoint (MSPP) and Microsoft Word (MSW) formats since the onset of the pandemic (AAU, 2021b).

Figure 4: Screenshot of AAU's e-learning portal (accessed on 10 March 2021)

For instance, at the time of writing this article on 10 March 2021, the university has made more than 85 course materials for undergraduate programmes available that can be accessed with guest privileges (please see Figure 5). Materials have also been uploaded for approximately 20 courses for postgraduate programmes. However, the number of instructors who use the portal as an instructional tool is very low (fewer than 20 instructors have used the platform). Of AAU's colleges/institutes, only the African Center of Excellence for Water Management (ACEWM) has consistently used the portal as an instructional tool. According to a discussion held with an e-learning platform focal person, other colleges have used the portal to share course materials for undergraduate students with guest access.

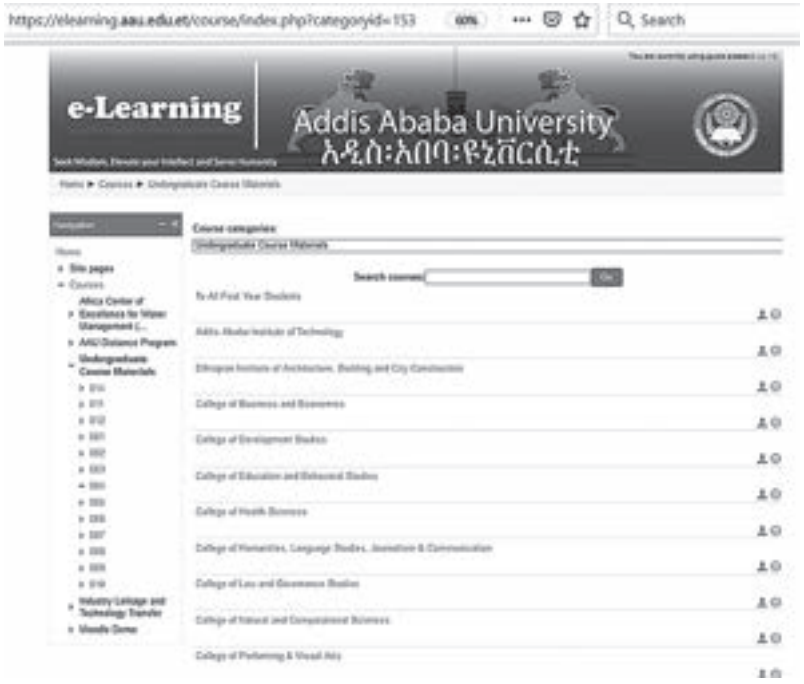


Figure 5: Screenshot of AAU's e-learning portal: Available course materials for undergraduate students (accessed on 10 March 2021)

Moreover, according to the data obtained from AAU's Learning and Teaching Technologies Team, 80,237 people have visited the e-learning portal since March 2020. The number of visitors to the portal in one year (during the pandemic) is presented in Table 2 (below).

Table 2. Visitors to AAU's e-learning portal (from 1 March 2020–1 March 2021)

S/No.	Details	Frequency
1.	Average total visitors per month	6,686
2.	Average front page and digital content visitors per month	3,183
3.	Total visitors from the AAU community (account users)	4,182
4.	Average monthly visitors from the AAU community	349
5.	Total visitors with guest access	37,851
6.	Average monthly guest access visitors	3,154

Source: AAU's Learning and Teaching Technologies Team

As shown in Table 2 above, an average of 6,686 users visited the portal per month, and 3,183 of them visited the front page and accessed digital content. Of all visitors, 4,182 were from the AAU community, who had the privilege to access the portal using their accounts (account users), and 349 of them visited the platform per month. Visitors with guest access accounted for 37,851 visitors, with 3,154 visitors monthly. The interview data

also revealed that the number of visitors has increased during the pandemic. However, the number of users with accounts (with personal usernames and passwords) was not as expected. This is because the majority of the portal's end users accessed it to view the content uploaded or to download available teaching materials freely by using a guest account. Most instructors did not use the platform to deliver e-learning classes.

4.3 The COVID-19 Pandemic and the Push towards Online Learning

School closures due to the coronavirus are affecting learners worldwide. According to David (2020), by the end of March 2020, over 180 countries had closed their schools, affecting 87.4% of learners (over 1.5 billion students). Likewise, UNESCO (2021) reported that two-thirds of an academic year has been lost on average worldwide due to COVID-19 school closures. Schools have been fully shut down for an average of 3.5 months (14 weeks) since the beginning of the pandemic. However, after one year, as of 5 March 2021, many countries have fully or partially reopened their schools. There are still approximately 26 country-wide closures, as illustrated in Figure 6.

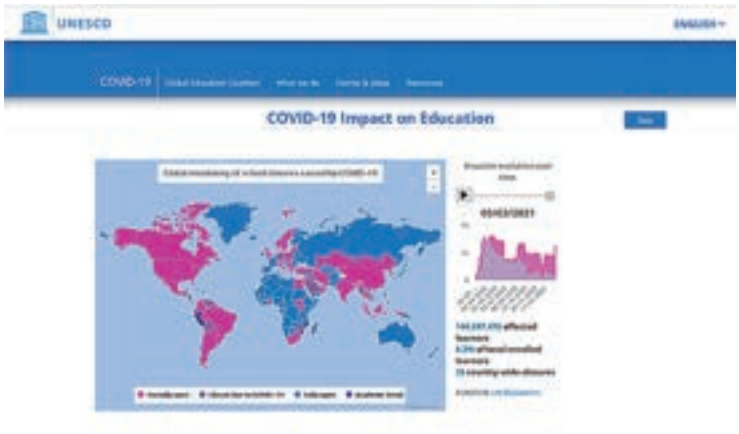


Figure 6: Screenshot of UNESCO's dashboard on the impact of COVID-19 on education (accessed on 5 March 2021)

The pandemic tested the capacity of various countries to use educational technologies. David (2020) asserted that we should not spend our time talking about the theory of e-learning or invest heavily in highly sophisticated e-learning infrastructure. Instead, we should explore the existing educational technologies (EdTechs) readily available in the country. For instance, the Ethiopian government organised educational programmes for primary school students on national radio. For secondary students, there is an instructional television programme the Plasma TV programme and Ethiopian Educational Television (EETV). There are also ICT infrastructures for students who attend higher learning institutes. Most primary school teachers and students are accustomed

to radio lessons, while most secondary school teachers are familiar with instructional television (known as 'Plasma'). University students and instructors also have experience using several educational technologies along with face-to-face instruction.

As part of the response to the COVID-19 pandemic, the Ministry of Education (MoE) and Regional Education Bureaus (REBs) took initiatives to utilise the existing EdTechs in the general education sector of the country. For instance, the City Government of Addis Ababa's Education Bureau encouraged primary school students to follow pre-planned radio lessons transmitted via its FM programme. The Bureau announced the programmes on TV and posted the schedule of each lesson door-to-door for community residents. In addition, the Education Bureau of Ormia has started to produce television lessons that have been broadcast on the Oromia Broadcast Network (a regional state-owned TV station). Furthermore, some private schools in Addis Ababa have struggled to launch their own EdTech solutions as a quick start during the outbreak of COVID-19. They have shared learning materials (simplified notes and worksheets) using Telegram and SMS. Some schools have also made content available on their websites, whereas few have tried to develop video lessons, which require high bandwidth.

The Ministry of Science and Higher Education (MoSHE) has been implementing a range of interventions. For instance, the MoSHE organised online forums on how to utilise e-learning to alleviate problems related to the pandemic. The Ethiopian Education and Research Network of the MoSHE has also made teaching and learning materials available on its e-learning portal/website (EthERNet, 2021). Moreover, some universities announced that classes would continue through online platforms. For instance, AAU's learning platform (e-learning.aau.edu.et) was launched. In a live discussion arranged by Ethiopian Television (ETV) on 8 May 2020, the President of AAU mentioned that online classes for all postgraduate and undergraduate distance and continuing students would be given using the platform. The university also planned to conduct thesis defences virtually using Google Meet.

Even though the MoSHE and universities have been asking instructors to prepare online content and offer online classes, the infrastructure related to information technology and instructors' familiarity with e-learning authoring tools and platforms have been limited. Students' responses during the interviews seemed to reinforce this. The students mentioned that almost all of their instructors have delivered lessons using the face-to-face modality. Although students were informed during their orientation that classes would be delivered using a blended approach, instructors have confined their teaching to the classroom. Only a few instructors have shared teaching materials and provided assignments using students' Telegram groups, and none of them have delivered courses online. Students who participated in the study further mentioned that the majority of students do not have electronic devices (such as laptops, tablets, and smartphones) to engage with online learning. Although the students acknowledged the availability of internet connectivity on the university campus, they also questioned the knowledge and skills of their instructors in using instructional technologies.

From the interview results, it can be inferred that although the university has ensured infrastructure for the internet, the inaccessibility of electronic devices to students seems to have hampered the use of online learning. The knowledge and skills of instructors in developing and delivering e-learning courses seem to be questionable. The results obtained from the instructors also confirmed this, as discussed below.

4.4 The state of academic staff's use of technology and students' learning

In addition to the data collected using documents and interviews, attempts were made to assess instructors' use of technology for instructional purposes. To gather relevant data, a questionnaire for an online survey was designed using Google Forms, considering the COVID-19 pandemic. Then, an email message was sent to the Office of AAU's ICT Director to circulate the link of the online survey among the university community. The office disseminated the link through the group email accounts of AAU staff. Responses were accepted for approximately five months between 25 October 2020 and 28 February 2021, and 76 respondents completed the questionnaire. The respondents were from different colleges and institutes of the university with various disciplines. As illustrated in Figure 7, the majority of the respondents were male (78.4%); female respondents accounted for only 21.6%. This may be because the majority of academic staff at AAU are male. Most (54.1%) of the respondents held Master's degrees; PhD degree holders accounted for 39.2%. Further, many of the respondents (27.7%) had 11–15 years of work experience in higher education institutions, and 27% had 6–10 years of experience. The results further indicated that most (44.6%) of the participants in the survey were assistant professors, whereas 39.2% were lecturers.

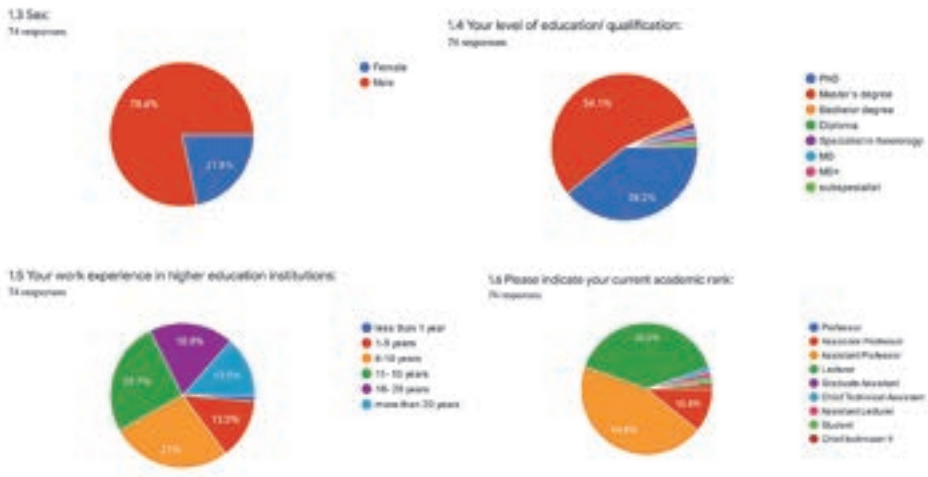


Figure 7: Backgrounds of the instructors who took part in the survey

In the survey, efforts were also made to examine instructors' familiarity with e-learning content authoring tools. Most of the academic staff were familiar with technological tools, such as YouTube, Google Docs and the Microsoft suite. They were also familiar with e-learning authoring tools such as Gomo, Canvas, Camtasia, Adobe Captivate and the iSpring Suite. Some of them (17.11%) reported that they were not acquainted with any of the authoring tools.

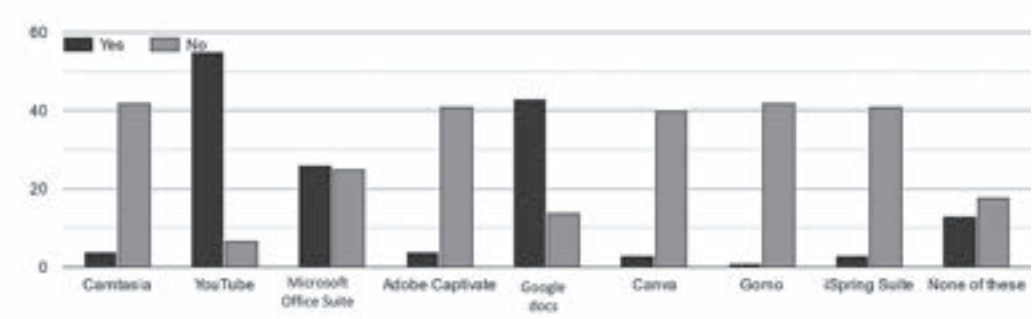


Figure 8: E-learning content authoring tools that academic staff were familiar with.

Moreover, as shown in Figure 9, Zoom, Google Meet, Skype, Microsoft Teams and Google Hangouts were familiar communication (virtual learning delivery) tools. Of these, most instructors said they used Zoom and Google Meet most often.

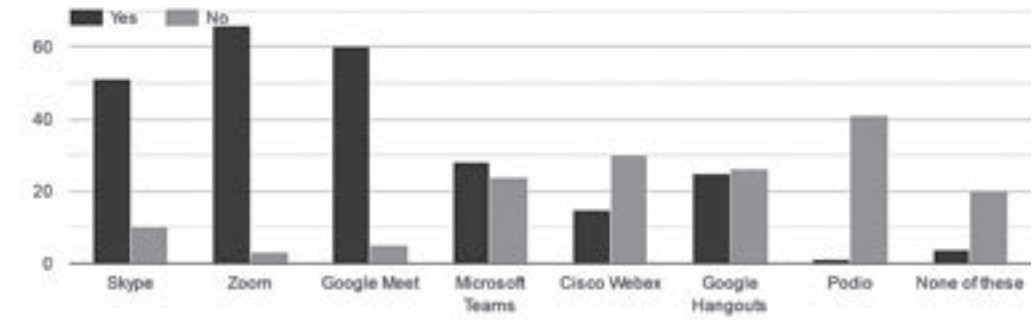


Figure 9: Victual learning delivery tools that academic staff were familiar with.

In addition to academic staff's familiarity with e-learning content authoring and delivering tools, the survey also explored the state of instructors' use of technology for instructional purposes. Efforts were made to assess the accessibility of electronic devices and the use of the internet and synchronous text chat or voice. Almost all of the respondents (96.05%) said that they had laptop computers. Furthermore, the majority indicated that they had mobile phones with touch screens (89.47%) and desktop computers

(78.95%), while only 50% used tablet computers.

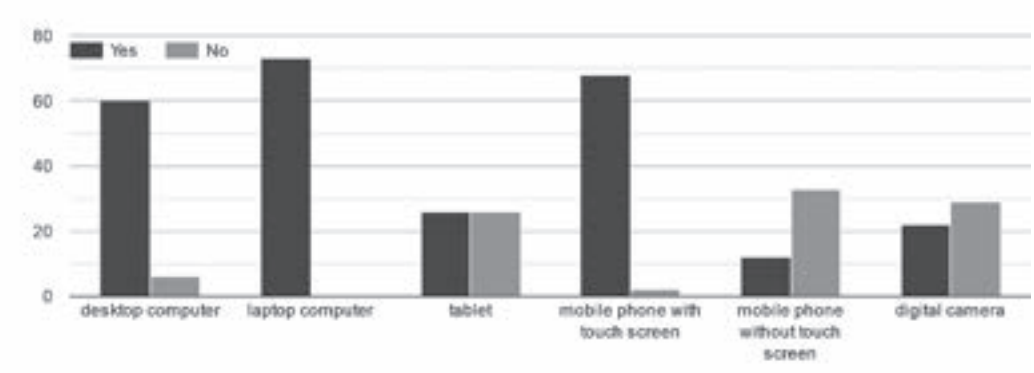


Figure 10: Electronic devices that academic staff have.

Most of the participants also reported that they had internet access at home (64.4%), and many of them indicated that they spent approximately 20 hours each week on the internet. As shown in Figure 11 (below), the majority (58.1%) had experience using synchronous (at the same time) text chat or voice tools, such as Skype, Facebook, WhatsApp, Messenger, Imo, Viber, and Telegram, at home or in the workplace. The results of the survey similarly revealed that respondents frequently used e-learning resources, such as video, audio and virtual environments.

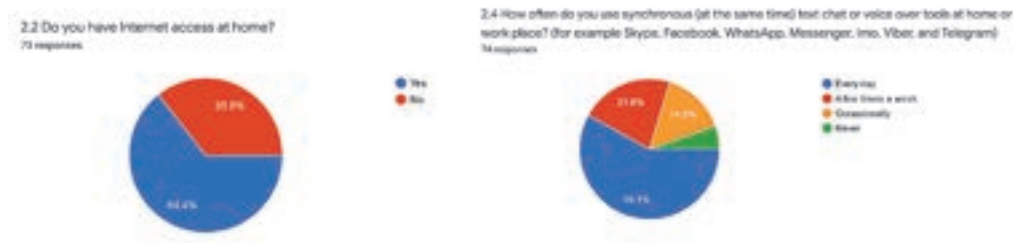


Figure 11: Respondents' use of the internet and synchronous text chat or voice

Currently, there are various learning management systems (LMSs) and interesting e-learning apps that help academic staff in higher education design, develop and deliver e-learning courses. Modular Object-Oriented Dynamic Learning Environment (Moodle), for example, is a learning management system widely used to create training programmes, enrol learners and then report on completion. In addition to Moodle, there are other open-source LMS solutions, such as Docebo, eFront, Dokeos, Claroline, ATutor, ILIAS, OLAT, Sakai CLE, and Open eLMS. Respondents were asked to rate the e-learning management systems that they had used or accessed during their academic careers. As shown in Figure 12, most of the academics said they had used or accessed Moodle (35.53%) and

Blackboard (35.53%). Very few had gained access to LMSs, such as Open edX (7.90%), Canvas (5.26%) and Schoology (3.95%). Edmodo was not familiar to the respondents, and some of them did not use any kind of LMS.

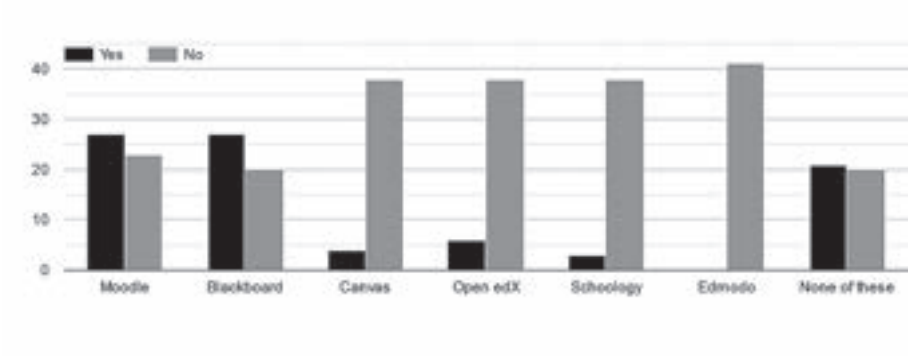


Figure 12: E-learning management systems used or accessed by the respondents.

4.5 Strategies for using sustainable pandemic-transformed pedagogy

As stated earlier, the COVID-19 pandemic has changed conventional pedagogy since teaching has been performed remotely using instructional technology. Lessons have been delivered in fully online and blended approaches. To use effective and sustainable pandemic-transformed pedagogy, respondents (instructors, students and e-learning focal persons) were asked about the mechanisms/strategies that need to be devised. As discussed below, creating awareness on the contribution of ICTs to teaching-learning, empowering all stakeholders through various training approaches, fulfilling basic infrastructures and maintenance, and administrative issues were mentioned as solution strategies, among others.

a) Raising awareness

The awareness of students and teachers needs to be updated, as suggested by the informants. Students are supposed to know about the contributions of ICTs in their curriculum. Teachers should also have a better understanding of the technology needed to facilitate the use of ICTs. In addition, different administrative parties who have a role in fulfilling ICTs should have a better understanding of the technology. Therefore, there should be a mechanism for creating a common understanding among these stakeholders.

b) Providing Capacity-Building Training

The majority of the respondents mentioned that there should be capacity-building training for instructors on technology-based instructions. The training should accommodate issues such as developing and delivering e-learning courses. Technological pedagogical content knowledge (TPACK) should also be integrated into the training.

c) Facility/Resource Fulfilment

Making ICT infrastructures available is the other major point mentioned by the respondents. Ensuring internet access through cable and Wi-Fi and providing adequate

computers (either tablets or laptops) for students and teachers were some of the strategies mentioned as a solution for employing pandemic-transformed pedagogy.

d) Improving Administrative Support

Providing the necessary administrative support is another strategy mentioned as a solution by instructors and e-learning focal persons. Instructional leaders, such as the Academic Vice President, deans and department heads, are expected to be aware of pandemic-transformed pedagogy. To obtain the maximum benefit, their attitudes towards remote learning should be supported adequately. They should allocate a sufficient amount of money for ICT inputs for teaching-learning as well. Preparation of a manual for employing online or hybrid instruction should be considered. There should also be a clear manual on how to utilise technology-based instruction. Above all, AAU's educational ecosystem should be revisited. For instance, multiple teaching delivery modalities should be adopted; that is, instead of merely focusing on face-to-face learning, screen-to-screen learning or a combination of both should be implemented. The design and development of materials should be given emphasis, rather than making a large effort to deliver classroom-based lessons.

5 Discussion

Since its appearance in March 2020, the coronavirus has had a disastrous effect on AAU's activities. It has disrupted the university's academic calendar, and learning has not been business as usual. Interestingly, AAU took the necessary steps to protect its students and staff from the pandemic. The services AAU has provided for the community via quarantine or isolation centres also seem to be encouraging. Moreover, the efforts that AAU has made to continue the teaching-learning process in the time of the COVID-19 pandemic can be seen as exemplary. However, as the data indicated, the use of remote learning has been minimal across the university. AAU could not continue with undergraduate programmes for a couple of months during COVID-19-driven university closures. Moreover, having reopened classes, the university has returned to traditional face-to-face instruction, and its instructors seem not to be considerate of the circumstances of COVID-19. Students have been overburdened with the very tight schedule that the university employed to complete previously discontinued classes. Even though it is difficult to talk about the educational performance of 'corona batch' students without assessing the teaching-learning process or evaluating students' achievements following the university closures, most of the students who participated in this study mentioned that they had great difficulty catching up with their educational backlogs. The university's reopening action plan and supplementary academic calendar to complete the second semester of the 2019/2020 academic year support this. Semester classes were scheduled to overcome insufficient course contact hours (AAU, 2020c; AAU, 2020d).

In the COVID-19 era, higher education institutions have taken different educational measures to mitigate the effects of the pandemic. For example, utilising online learning

to mitigate the impacts of the pandemic has become popular. In view of this, AAU encouraged its staff members to continue teaching-learning virtually during the pandemic. Having reopened classes, the university devised a directive to deliver lessons through a blended approach. According to the university's action plan for reopening classes, the duration of face-to-face instruction was supposed to be shorter than it was before, assuming that classes were supported by technology-based instruction (AAU, 2020e). The actual practice was different; classes were delivered via conventional face-to-face instruction.

As discussed, the university has financed the digital curriculum and materials and made digital reading materials available. The number of users of the university's Institutional Repository and e-learning platform increased during reopening (AAU, 2021a). This may be because the students made efforts to use digital resources. In fact, this finding says nothing about whether instructors made students use digital materials. The study also did not adequately address instructors' use of the e-learning portal to design, develop, and deliver e-learning courses. The few users with user accounts signifies this.

The COVID-19 pandemic has forced the global physical closure of businesses, sporting activities and schools by pushing all institutions to migrate to online platforms. It has also initiated the digital transformation of higher education (Adedoyin and Soykan, 2020). The results of the study concerning AAU's digital transformation due to the COVID-19 pandemic reveal that the university explored existing instructional technologies that are readily available and tried to use them. For example, the university launched an e-learning platform (e-learning.aau.edu.et) and used cloud-based instant messaging software known as Telegram. The application Google Meet was also used. The internet network infrastructure that the university invested in heavily before the onset of the pandemic has contributed to adopting these tools. However, the practice was slightly slow, and the delivery of online courses was not promising.

In conventional face-to-face learning, the largest effort is in the delivery of classroom sessions. Conversely, what is needed in e-learning is the design and development of structured materials. Currently, there are various learning management systems (LMSs) and attractive e-learning apps that help academic staff in higher education design, develop, and deliver e-learning courses and track students' progress. For instance, academic staff often use e-learning content creation tools, such as Camtasia (a screen recording and editing software), YouTube, Microsoft Office Suite (the most popular e-learning authoring tool), Adobe Captivate, Zoom, Google Meet and Microsoft Teams. Institutions also use various LMSs to create, deliver, administer and report on training courses and programmes. When designing the present study, it was hypothesised that instructors would be familiar with at least the most commonly used learning management systems (e.g., Moodle) and virtual learning delivering tools, such as Zoom and Google Meet. The findings were in line with this assumption. Most academic staff have used or accessed Moodle and Blackboard. Zoom and Google Meet were also the principal e-learning

delivery tools that the majority of staff were familiar with. In addition, academic staff were familiar with e-learning content authoring tools, such as YouTube, Google Docs and the Microsoft suite. However, the required technological knowledge and skills needed to adopt these technological tools effectively were found to be limited. Moreover, the inaccessibility of electronic devices to students seemed to hamper the utilization of online learning during the pandemic. The involvement of managers, instructional designers, subject matter experts, web developers and media editors, course administrators (online facilitators and tutors) and technical support specialists did not appear to be encouraging.

As stated earlier, the modality of delivering lessons has changed during the pandemic; lessons have been delivered in fully online and blended approaches. This has changed traditional pedagogy. That is, the novel coronavirus has introduced new pandemic-transformed pedagogy. To use sustainable pandemic-transformed pedagogy, creating awareness of the contributions of ICTs to teaching-learning, empowering all stakeholders through various training approaches, fulfilling basic infrastructures and maintenance, and administrative issues were suggested as solution strategies, among others.

6 Conclusion and Implications

6.1 Conclusion

The experience of the COVID-19 pandemic has provided an abundance of lessons for Ethiopian higher education. Based on the findings of this study, it is reasonable to conclude that COVID-19 has had a disastrous effect on the higher education system of Ethiopia in general and Addis Ababa University in particular. First, it disrupted the academic calendar across the nation and hindered students' learning. The university was overstretched to continue the teaching-learning process. AAU did its best to mitigate the crisis. The crisis-response migration measures employed by AAU during the pandemic were found to be exemplary compared to those of other universities. AAU's digital transformation due to the COVID-19 pandemic has been encouraging. The ICT infrastructures that the university implemented before the COVID-19 pandemic have contributed greatly in this regard. Nevertheless, the delivery of online courses was not as required since instructors' digital pedagogical skills and facilities were not adequate. The study further confirms that traditional pedagogy has been transformed due to COVID-19. The disease has widely introduced pandemic-transformed pedagogy since lessons have been delivered in fully online and blended approaches. This has been practised less at AAU; lessons have been widely delivered in the conventional face-to-face format. The instructional leadership towards pandemic-transformed pedagogy has not been satisfactory.

6.2 Implications

Even though this study shows the effects of COVID-19 on the 'corona batches' of Addis Ababa University and fills in some gaps in knowledge, some areas remain unexplored. It is crucial for future studies to investigate the impact of pandemic-transformed pedagogy on students' academic achievement. Further studies can also be carried out to examine the effects of the pandemic on instructors' professional competency. Moreover, since this study was delimited to AAU, the largest and oldest higher learning institution in Ethiopia, a similar study could be carried out on emerging universities in the country.

Meanwhile, the idea of pandemic-transformed pedagogy has significant implications for Ethiopian higher education in general. As there is something special and different about teaching with or without technology, it is necessary to train academic staff regarding the connections between technology, content and pedagogy. Likewise, instead of talking about the theory of online or virtual learning in forums/conferences, universities need to exploit their technological resources as much as possible and provide hands-on training on designing and delivering e-learning courses. Faculties should also capitalise on the usability of e-learning tools rather than their nobility.

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