



Digital Transformation of Audio-Visual Communication Technology in the Education Sector During the Pandemic

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ABSTRACT

Pandemi telah mengganggu berbagai aktivitas manusia terutama dalam sistem pendidikan yang membuat siswa terpaksa beralih dari pembelajaran tatap muka ke pembelajaran *online*. Dukungan dari guru dan orang tua sangat penting bagi siswa untuk beradaptasi dalam situasi ini. Penggunaan platform Audio Visual seperti Google Meetings, Zoom, Microsoft Teams dan Website Internal Sekolah telah menghilangkan batasan waktu dan tempat dengan mengadopsi perangkat Teknologi Informasi dan Komunikasi (TIK) seperti smartphone, laptop, komputer tablet, dll. Penelitian ini bertujuan untuk menganalisis pengaruh wabah Covid-19 terhadap transformasi digital di sektor pendidikan. Pendekatan kualitatif dengan metode literature review digunakan dalam penelitian ini. Pengumpulan data dilakukan dengan memilah artikel jurnal dengan kata kunci pandemi dan pembelajaran online 2020-2021 dari database makalah penelitian yaitu MDPI dan menghasilkan 5 jurnal dari berbagai negara untuk direview. Kajian ini menunjukkan bahwa pandemi mempercepat proses transformasi digital dalam pendidikan meskipun ada tantangan yang harus dihadapi dari segi infrastruktur (jaringan internet, perangkat digital) dan proses (modul pembelajaran online dan evaluasi pelaksanaan)

INTRODUCTION

In March 2020, the first case of the corona virus was detected in Indonesia and in April 2020 schools began to be closed so that learning activities had to be carried out online. The educational process between teachers and students began to have communication technology as mediator to support distance education. In this uncertain situation, international organizations are starting to look for ways to guide and ensure the education process runs smoothly. One of them is UNESCO which publishes a document that analyzes the impact of the Covid-19 pandemic on the learning process and provides recommendations to schools and the

government when schools return to normal (Jesús et al., 2021).

The Covid-19 pandemic has changed people's activities, habits, and behavior in daily life in various aspects, especially in the field of education. The Indonesian government is trying to stop the spread of the corona virus by implementing social distancing policies and temporarily closing schools. Chryсна (2020) in his news article revealed that the Minister of Education and Culture of Indonesia, Nadiem Makarim had issued Circular Letter SE 4/2020 regarding the Implementation of Educational Policies in the Emergency Period for the Spread of Covid-19 which regulates the learning process from home which was followed by SE

Secretary General of the Ministry of Education and Culture 15 /2020 concerning Guidelines for Organizing Learning from Home During the Emergency Period for the Spread of Covid-19 which can be downloaded on the website portal of the Task Force for the Acceleration of Handling Covid-19.

One of the major changes caused by the Covid-19 pandemic is digital transformation in the field of education. Digital transformation is a process that can trigger significant changes through a combination of aspects of technology, information, computing, communication, and connectivity experienced by everyone from children to adults (Vial, 2019: 118). Research conducted by Plummer et al., (2021: 2) confirms that the pandemic accelerates the process of transitioning face-to-face learning to online learning by utilizing ICT. This change had been experienced by all levels of education around the world due to the implementation of social distancing restrictions. This transformation can lead to disruption of the learning process which triggers educational organizations to adapt quickly and overcome the negative and positive impacts of this process. However, interventions in the field of education are needed to drive the learning process so that it continues to develop (Hannon and Peterson, 2017).

One of the things that influence a person to utilize ICT is expressed by Spoel et al., (2020: 623) as a result of previous experience in using digital technology to obtain education can influence a more positive perception of distance learning. However, in some places, e-learning is still considered a new thing so that teachers, parents and students still find it difficult to adapt using ICT for learning activities. In line with research conducted by Schuck & Lambert (2020) which explains various challenges such as media literacy that parents have as supervisors, unstable internet networks, electronic devices, and evaluation of ongoing e-learning activities to minimize deficiencies and maximize positive results.

This study aims to deepen knowledge about the extent of the use of ICT and the challenges faced in the process of learning and teaching activities during the covid-19 pandemic, find out the results of related research and those that have been done before by collecting articles related to the topic of the

problem being studied from publishers. the international journal MDPI, understands the development of ICT and learning techniques used during e-learning activities, as well as clarifying the research problem, namely how the impact of the pandemic in accelerating digital transformation in education. The inclusion criteria in this study were articles published between 2020-2021 in education science journals that discussed e-learning activities during the covid-19 pandemic with a qualitative approach, while on the exclusive criteria, journal articles that used quantitative research methods and were not focused. The change in the situation from the face-to-face to online learning system caused by the COVID-19 pandemic was not part of this study.

CONCEPT & METHODOLOGY

Innovation Adoption Theory

The 2019 EDUCAUSE Horizon report outlines the challenges that could hinder technology adoption, namely “increasing digital proficiency”, “increasing interest in digital learning and instructional design skills”, “developing the role of educational institutions with communication technology use strategies”, “advancing digital equity”, and “reviewing the teaching practices used”. The first two points described above are most likely to be addressed immediately (Alexander et al., 2019: pages 13-19). Peimani & Kamalipour (2021: 3) argue that this report should not be the end of the discussion on the use of technology to improve student learning experiences. So, the question that arises next is what the results of this discovery in the distance learning process during the covid-19 pandemic are.

Social distancing restrictions to minimize the spread of the corona virus have encouraged students, teachers, and parents to adapt to changing situations from face-to-face learning to online learning. The use of technology in the field of education can be studied by using the innovation adoption process as a multidimensional approach. Innovation can be defined as the creation or adoption of new ideas, products, services, programs, technologies, policies, structures or new administrative systems (Amabile 1988; Damanpour and Wischnevsky 2006; Walker

2008; Zaltman, Duncan, and Holbek 1973). The adoption of innovations results in the assimilation of products, services, processes and practices that are new to the organization (Damanpour and Wischnevsky 2006; Kimberly and Evanisko 1981; Walker 2008).

The adoption and innovation process has three main stages, namely: (1) the initiation stage, (2) the adoption decision stage, and (3) the implementation stage (Pichlak, 2015: 478). The first stage is initiation (pre-adoption), this stage reflects activities related to needs analysis, finding problem solutions, gathering information and knowledge from various sources and what innovations will be adopted (Patwardhan & Patwardhan, 2012). The second stage is the decision to adopt, this stage includes the decision to approve the idea or ideas given and start developing solutions from various perspectives (Damanpour & Schneider, 2006). The third stage is implementation (post-adoption) which relates to activities to conduct trials and confirm acceptance of the adopted innovation (Rogers, 1995; Hamid, Counseling, & Swift, 2012).

Online Learning

Online learning used in the current education system requires good mastery of digital literacy from both teachers and students. Research conducted by Gordy et al., 2020 revealed that teachers experience a greater workload than before and find it difficult to balance online teaching activities and their personal lives. Psychological study by Besser et al., 2020 explained that online learning induced negative emotions including anxiety, boredom, frustration, decreased motivation, and social disconnection.

However, the pandemic provides an opportunity for teachers to adopt technology in teaching and shows the importance of using technology to prepare for the unexpected in the future. Online teaching and learning activities can be carried out synchronously or asynchronously. Hrastinski (2008) explains that asynchronous learning occurs when students can choose their own time to participate in learning through digital media such as the Stream column in Google Classroom or use websites where students can login to communicate and

complete activities at the specified time and at their speed. In contrast, asynchronous learning activities occur in virtual spaces using live video audio conferencing with live feedback.

The hope of implementing e-learning during the covid-19 pandemic is that it can provide new learning experiences for students. Synchronous learning activities succeed in presenting a real classroom with direct feedback. The use of online learning applications from universities as well as those available for free such as Google Classroom have helped implement asynchronous learning to open discussion forums, submit lecture materials and record online classes that have been carried out. However, the weakness of the online learning system is the low level of student involvement during the learning process. Educational institutions must ensure distance learning (PJJ) can take place well by reviewing the results of online learning carried out.

Information and Communication Technology (ICT)

The exchange of information in online learning requires ICT devices such as cell phones, wireless networks, the internet, and other communication media (Ratheeswari, 2018: 45). The use of ICT for online learning systems is currently following the development of the industrial revolution 4.0 which is closely related to Cyber Physical Systems, Internet of Things (IoT), and Networks. The industrial revolution 4.0 described by Davis, 2020 as "the emergence of cyber-physical systems that require new capabilities from users and the machines used". Technology in today's industrial era is a blend that blurs physical, digital, and biological boundaries that affect every aspect of our daily lives.

ICT has made dynamic changes in all aspects of people's lives, especially during the COVID-19 pandemic, which has increased the impact on the education field. ICT provides more opportunities for students and teachers to adapt learning activities according to individual needs. However, the inequality of access to the internet and technology causes a digital divide in society that needs further attention (Plummer et al., (2021: 8). This problem must be resolved

first before applying audio-visual technology to online learning during the covid-19 pandemic.

Audio Visual Technology

The use of audio-visual media as a means of communication in the field of education aims to increase the effectiveness of the teaching and learning process. Audio Visual is a product that combines sound (audio) and images (visual). The use of audio visual usually involves a variety of hardware (hardware) such as cameras, projector screens, computers, televisions and others (Barman, 1984: 344). The benefits of using audio-visual media in the field of education are increasing students' attention, making students more active because they use more than one sense organ, giving students freedom to process messages, reducing the use of meaningless words, facilitating understanding of a material, stimulating students to ask questions. more, directing them to conduct further investigations and facilitate the teaching and learning process (Reddy, 2008: 27-28).

Online learning that utilizes technology can facilitate a new mode of answering some written or verbal questions posed by students to get direct responses from teachers. Platforms like Microsoft Teams make presentations easier by sharing screens in real time as part of synchronous learning. The use of similar platforms can allow teachers to share visual content during learning activities as well as create new ways to interact with students to increase the effectiveness of learning activities (Norton et al., 2013: 20).

Platforms with audio-visual technology can provide opportunities for students who are less active in face-to-face learning activities. The different learning abilities of each student can improve during discussions and interactions with teachers and peers in the comment column. Quieter students seemed more comfortable to communicate using text than verbally. Audio-visual technology enables more inclusive access to lecture sessions and discussion materials of learning materials. In addition, students can play back learning recordings along with chat history for critical and deep reflection especially for those who live in different time zones (Peimani & Kamalipour, 2021: 11).

For this research regarding the impact of the Covid-19 pandemic in accelerating digital transformation in education the method was qualitative to obtain in-depth results (Daymon & Holloway, 2011: 7). This type of research used content analysis to provide a comprehensive overview of previous research related to the topic studied (Denney & Tewksbury, 2012: 1). Researchers used a literature review type of research to summarize previous research and provide updates on the topics studied regarding the E-Learning system used during the Covid-19 pandemic. Related news articles and journals on the topic under study are secondary data in this study. In line with previous research conducted by Mhlanga & Moloji, 2020 which discussed digital transformation due to the COVID-19 pandemic in Africa by utilizing secondary data in the form of newspaper articles, magazines, peer-reviewed journals, recently published journal articles, and policy reports from national and international organizations. Research conducted by Shuck & Lambert, 2020 regarding the experience of online teaching teachers during the COVID-19 pandemic also used a literature review to strengthen the results of the survey conducted.

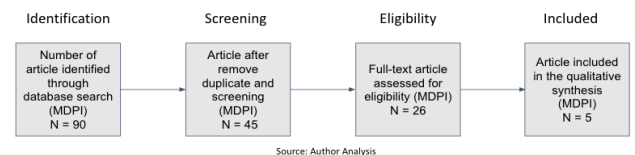


Figure 1. Data Collection

The data collection technique was carried out using secondary data from the international journal Education Science published by MDPI with a rating of 0.453 according to the Scimago Journal Rank (SJR). The keywords used in the search for journal articles are Pandemic and Online Learning, resulting in 90 journal articles, this study limits journals published for 2020-2021 as the Covid-19 pandemic develops, until the results are 45 journal articles. Inclusion criteria were determined by research that discussed the context of Online Learning during the Covid-19 Pandemic. As an exclusion criterion, journal articles using quantitative research methods were not used and 26 journal articles were obtained. Furthermore, the entire contents of the journal articles are read thoroughly and research

that does not focus on the use of communication technology in education is not used, resulting in 5 journal articles that will be reviewed.

Table 1. Article Journal Review

Article Journal	Research Place	Summary
Mhlanga & Moloji, 2020	South Africa	The digital transformation in education is fully supported by the local government by creating various programs through the media of TV, Radio, Mobile Applications, Websites and Social Media
Plummer et al., 2021	Brazil, USA	Teaching in the field of physiotherapy health through online methods with the video conference platform Zoom encourages the creation of telehealth to help students and patients understand the material
Gordy et al., 2021	USA	Teaching staff who have participated in the program using the flipped learning method are more confident and skilled in teaching students boldly
Peimani & Kamalipour, 2021	England	Teaching staff who have attended courses using the flipped learning method are more confident and skilled in teaching students online
Schuck & Lambert, 2020	USA	Online learning helps the education of students with disabilities continue, but the challenges they face are very diverse and cause anxiety for teachers

Source: Author's Analysis

RESULT & DISCUSSION

The Effect of the Covid-19 Pandemic on Digital Transformation

Researchers assume that the pandemic has been a driving factor for digital transformation in education during the pandemic. Maximizing the use of audio-visual communication technology is the main solution to stabilize the current education sector (Mhlanga and Moloji, 2020: 4). According to Dhawan (in Plummer et al., 2021: 2) online learning is the future but the pandemic has accelerated the process. The teaching staff reported that the skills of using audio-visual communication technology in the era of the industrial revolution 4.0 during the Covid-19 pandemic had improved with the implementation of online learning.

The era of the industrial revolution 4.0 is the emergence of cyber-physical systems that involve new capabilities for humans and machines where technology becomes embedded in society and even within us. This revolution is affecting the way individuals use technology. Some people think that educational organizations are not ready for this change, but the emergence of the Covid-19 pandemic has forced them to close and completely switch to digital learning (Mhlangan & Moloji, 2020: 2). Synchronous and asynchronous learning methods can utilize various media and communication technologies that have not been

widely used before to combat the direct impact of Covid-19 on the education sector (Kim, 2020: 150).

Although children and adolescents are now accustomed to using communication technology, parental assistance during the teaching and learning process needs to be done to supervise teaching and learning activities so that they can run effectively. Proper and adequate planning can create effective online classroom situations such as traditional learning carried out in a face-to-face environment. However, the Covid-19 pandemic has accelerated the transition and left little time to prepare for online learning. These changes must be made quickly and effectively (Gordy, 2020: 2). Prensky (in Peimani and Kamalipour, 2021: 2) said that "currently students are no longer objects formed through the education system, but they are digital natives and incompetent educators are digital immigrants. Students not only have skills in using up-to-date information. technology but also has developed new learning styles. The challenge that needs to be overcome is no longer the problem of replacing face-to-face online classes, but whether technology will encourage and redesign teaching and learning systems. One of the focuses of education is how new technologies can be used to support teaching and learning activities regardless of the medium of delivery.

Online Learning During the Covid-19 Pandemic

The year 2020 marks the beginning of drastic changes to the education system across the country. The coronavirus, which was first identified in the Chinese city of Wuhan, has spread across the country and has become a global pandemic bringing frustration and anxiety from uncertainty about what and how to deal with circumstances that educators or students have never experienced before. Many universities in different countries have experienced unprecedented transitions from face-to-face to various forms of online education and distance learning amid the COVID-19 outbreak such as in China, India, Bulgaria, Pakistan and Germany (Peimani and Kamalipour, 2020:1).

Online learning focuses on a blended learning approach that typically includes online

lectures, discussions, forums, and interactive software with the capacity to connect students with synchronized student learning activities. A study conducted by ECAR in 2019 revealed that around 70% of students favor some or all of the face-to-face learning environment. This strong preference can be used in mixed learning environments where classroom learning can be an opportunity to interact with teachers, classmates, the material being taught and technology as a means for such engagement. Increased flexibility, sophisticated multimedia integration, and access are the advantages provided (Peimani and Kamalipour, 2020: 2).

However, both online learning and direct learning, educators are required to find appropriate and efficient ways to help develop students' skills in teaching and learning activities. Communication technology with audio visual is very important to encourage student participation. Available video conferencing platforms can create real-time space and time with conversations similar to face-to-face classes, although they still don't provide the exact same social experience as face-to-face interactions with peers. However, the introduction of digital classrooms could motivate the authorities to digitize the education sector. An important aspect that must be considered is maintaining the communication technology that has been used today and analyzing extensively the performance of the use of distance learning systems that have been carried out.

Reflecting on early distance learning experiences in managing conditions of uncertainty and emergencies can pave the way for developing more nuanced approaches to learning, teaching and assessment, and for increasing the resilience of the higher education sector in the face of public health crises. Several studies have highlighted the benefits associated with distance learning for students with disabilities. For example, the advantage of providing open access to courses can be to facilitate repetitive learning, such as watching demonstration videos multiple times (Serianni et al., 2014). Two studies have found that students who are autistic or who score highly on autism assessments are more likely to prefer video reviews and blogs over interacting with peers and instructors (Nieminen et al, 2020.,

Satterfield & Kelle, 2016). In another study, adult students with learning disabilities experienced flexibility and self-management in online classes because they did not have to worry about feeling "inferior" to other students (Murders, 2017). The potential benefit associated with distance learning is that parents can have the opportunity to be more involved in their child's learning (Sorensen, 2019).

Distance learning has different strategies especially for children and students with disabilities. Teachers in special schools explain the three main stages of teaching from home, firstly by making initial contact with families and preparing the necessary device, secondly establishing routines at home for students and focusing on the socio-emotional well-being of children, third is direct involvement with students. The learning process begins by lending an iPad to each student to facilitate interactive educational and teaching activities with games, storytelling, singing, and morning attendance (Schuck & Lambert, 2020: 5).

Utilization of ICT for Online Learning during the Covid-19 Pandemic

The method of combining online and face-to-face schools (blended learning) has begun to be applied in the UK to prevent the spread of the Covid-19 virus in the school environment, asynchronous learning is carried out using the Learning Central (LC) Cardiff University website when synchronized using Microsoft Teams as the main platform. Microsoft Teams is considered quite effective in facilitating synchronized online lectures and discussion sessions and makes it possible to gather various students from different geographic locations and time zones, facilitate individual and group discussions, and send and save documents. Students can present their work and receive immediate feedback. Then LC becomes an asynchronous platform that can provide subject descriptions, presentation schedules, seminar and tutorial structures, study materials, reading lists, assessment summaries, group allocations, teaching lecturers, research themes and all presentation materials that have been collected (Peimani & Kamalipour, 2021: 6).

Meanwhile in America, especially the Mississippi area, the flipped learning method has been applied in training programs for medical educators such as The Science Teaching Excites Medical Interest (STEMI). This type of reverse learning focuses on audience interaction and an active learning model by bringing learning activities that were originally outside the classroom to inside the classroom. In this system, students are invited to watch videos from online classes, interact in online discussions, or conduct research at home while engaging in the materials and concepts taught in class with the guidance of a mentor. The STEMI program provides access for teachers to share about communication technologies that can be used in the classroom, how to obtain information and how to present this information to students (Gordy et. al., 2020).

Research conducted by Mhlanga and Moloi (2020) illustrates how the South African government supports the use of information and communication technology in education during the pandemic. Mass media such as television and radio are also being used in South Africa to provide virtual classes during the lockdown by offering lessons exclusively to students from home. The departments of communication & digital technology and basic education in South Africa have joined forces to ensure virtual learning runs effectively by providing TV channels dedicated entirely to education, broadcasting virtual classroom studios to deliver live learning to students, and providing broadcast lessons on stations. community radio across the country. The South African government has successfully utilized technology to help overcome educational disruptions caused by the Covid-19 pandemic. When the Covid-19 health crisis that limited educational activities hit South Africa, their Ministry of Basic Education (DPP) launched a free digital school through an AI-based education platform, namely Ms Zora.

The program has more than 34 teachers working in public and private schools who deliver teaching via live streaming on African Teen Geeks social media pages, Ms Zora's Facebook and Twitter and the official DPP website. The program is free, and each session is recorded and posted on the DPP website so

students can access it at any time. Institutions in South Africa are starting to intensify their efforts to provide online learning using YouTube, Microsoft Teams, Skype, WhatsApp. The South African government is also partnering with private network providers to offer educational apps and websites. This collaboration with various providers is beneficial for students because it will not eat up their data packages when accessing the website. Apps and websites like 2Enable are created to make it easier for students in South Africa to access and read study materials for free. Not only that, but the South African government will also make a storybook on the application. Research conducted by Mhlanga and Moloi in 2020 showed that Covid-19 had a major influence on the use of various communication and information technology devices in the era of the industrial revolution 4.0 in the field of education.

Networks and the internet are the main factors in the 4.0 industrial revolution, especially in the era of education during the pandemic. Various audio-visual platforms for video conferencing with internet access can provide feedback similar to direct interaction. Applications and websites that are often used in synchronous distance learning activities include Zoom Meeting (Kim, 2020)., (Peimani and Kamalipour, 2021)., (Mhlanga and Moloi, 2020)., (Gordy, 2020)., (Schuck, & Lambert, 2020) (Plummer et al., 2021), Google Hangout (Gordy, 2020), Blackboard Collaborate (Kim, 2020), Microsoft Teams (Kim, 2020)., (Peimani and Kamalipour, 2021)., (Mhlanga and Moloi, 2020) and WebEx (Gordy, 2020). As for asynchronous learning, platforms that can be used include Google Docs, Blackboard (Kim, 2020), and Learning Center (Peimani and Kamalipour, 2021). Camtasia and Screencastify are also used by teachers as screen recording software, while Edpuzzle is used to create interactive videos and Canvas is used as a website to organize learning materials (Gordy, 2020). The selection of communication and information technology used in teaching and learning activities can be adapted to the needs of students in the classroom.

Table 2. ICT Tools for E-Learning during Pandemic Covid-19

E-Learning Methods	ICT Tools	Description	Literature
Synchronous	Video Conference Platforms	Teachers deliver Lectures and Seminars to students with a digital interface and formative feedback	(Mhlanga dan Moloi, 2020), (Gordy et al., 2020), (Peimani dan Kamalipour, 2021) (Schunk & Lambert, 2020) (Plummer et al., 2021)
	Social Media	Teachers hold live streaming of teaching in public and private schools	(Mhlanga dan Moloi, 2020)
Asynchronous	Television, Radio	The teacher delivers the subject matter on TV & Radio	(Mhlanga dan Moloi, 2020)
	Mobile Platforms and Applications	Learners access school materials from educational and information websites	(Mhlanga dan Moloi, 2020)

Source: Authors Analysis

Advantages and Disadvantages of Audio-Visual Communication Technology in Online Learning during the Covid-19 Pandemic

According to optimistic academics, the shift from face-to-face to online learning that was initially forced in light of the coronavirus crisis has created long-overdue forms of change. In addition, proponents of technological progress echo how online migration has contributed to the professionalism of teaching the staff and academics (Peimani and Kamalipour, 2021: 2). Distance learning is quite efficient because it does not have time and place restrictions.

Research conducted by Fedynich 2014, and Yilmaz 2009 revealed that synchronous or asynchronous online learning has several advantages, for example: it does not have to be in the same physical location, saves on travel costs and other costs needed to attend face-to-face classes and provide learning opportunities. for adult students who have to work part time or full time. Students can control their own learning pace on online learning. Other positive aspects of online classes are the ability to re-watch recorded learning materials, optimal time management regarding classwork, a comfortable learning environment for shy and introverted students, and being a valuable experience for mastering skills using audio-visual communication technology. online form (Gordy, 2020: 4). Young children may not have the necessary technology skills for online learning, such as typing responses into chat screens or sharing files with written information. However, the distinct functions and tools of different video communication platforms can benefit children's learning when

teachers use them appropriately. For example, the “screen share” function allows participants to present pictures or video clips from a computer, as well as use an online whiteboard to draw or write.

However, there are various constraints or limitations on online schools that vary depending on the ability of students and teachers to access online sites and use computers. The transition from face-to-face schools to online schools is particularly challenging for those in areas without adequate distance learning infrastructure and Internet access. The situation was reported in the US and countries around the world such as Canada, Italy, Spain, Egypt, South Africa, Nigeria, Pakistan, Israel, Singapore, and Indonesia (Gordy, 2020: 6).

This difficulty is more pronounced in young children or students of primary and early school age who may have never accessed the internet or have limited experience with online learning tools such as computers (Fedynich 2014; Wedenoja 2020). Additional issues to consider are access to online sites and the use of computers by children which require adult supervision and, therefore, adult involvement is urgently needed (Schroeder and Kelly 2010; Youn et al 2012). In line with (Schuch & Lambert, 2020: 8) that the weakness of the online learning system for students with disabilities is the lack of involvement of parents who have to work and do not have much time to accompany their children to study online. In addition, online learning may not be sufficient or suitable for use by young children who need more interaction and hands-on experience in order to focus on learning compared to adult learners (Kim, 2020: 148). The problem of poverty, broadband access and/or network capacity (Mhlangan & Moloi, 2020) is an obstacle for students and teaching staff in several countries in implementing online schools. Technical problems are also common. When teachers share their computer screens, teach learning materials, answer questions from students, and try to monitor student engagement, teachers also help students with technology challenges in education in a virtual environment.

This is certainly stressful because at any time Zoom can experience interruptions,

students are disconnected from the network and leave Zoom, and they will be stressed because they feel they have missed important material. So, Teachers must accept student participation to return to Zoom, read text fields in Zoom, while teaching material at the same time. There are so many parts moving at the same time that it is very stressful and exhausting.

The nature of the industrial revolution 4.0 with a combination of technology in the physical, digital and biological world is still difficult to do because of a number of challenges related to connectivity, poor internet, and general infrastructure conditions. The unexpected shift from face-to-face to distance learning undoubtedly poses tremendous challenges for teachers, students and the distance learning infrastructure. The distance learning challenges experienced by teachers are a lack of discipline from students, loss of nonverbal cues in communication, lack of social interaction, and the potential for increased stress because students lose opportunities to study with peers.

Teaching requires immediate feedback or reaction from students to assess understanding and inform the teaching process. Making eye contact is an integral part of face-to-face teaching and learning. This difficulty was encountered when students turned off their cameras. Teachers describe the struggles of creating a social presence when students attend class sessions from home, sometimes uncomfortable with opening their cameras and with the state of their home environment. While teachers value and respect students' privacy needs, they are overcoming the challenges of dealing with students who choose not to use cameras. Mood and tone, traditional indicators of presence and engagement are undervalued in a virtual environment (Plummer, 2021: 9).

For the discussion, Gordy (2020:5) in his research posed a question to one of the teachers who had to teach remotely: *"I can say that it (distance learning) helped me to grow... I mean, the longer you do it, the more exposed you are to it. , the greater your ability in that area and the more comfortable you will feel"*.

In line with Kim's research (2020: 148) which got an answer from one of the teachers: *"When teaching online, I try to use various*

tools: a whiteboard to draw, share a screen to present material using a software program that I have on my computer. The use of the online tools I use gives students the opportunity to reflect on what is efficient and what to consider by observing the way I teach."

One teacher in a health education class said that she had never imagined using an online learning system for physiotherapy before (Plummer, 2021:10): *"I didn't think this method would be suitable for physiotherapy education. I think online education might be appropriate for some courses in other departments, but not for physiotherapy. But for now, with the support of resources provided by our university, I believe this method can also be used for some courses in our profession. Now we are doing "hybrid" education... We are getting very positive feedback from the students."*

In addition, Gordy also highlighted the teacher's point of view in involving parents in the child's learning process. One teacher explained that all stakeholders need to be involved for the success of the online education system during the Covid-19 pandemic: *"I think parents need to be involved if they can afford it... I think this pandemic might remind us more that everyone needs to get involved to help. I don't think you can rely on just one group."*

CONCLUSION

In this study, secondary data analysis was conducted to determine the effect of Covid-19 in accelerating digital transformation in the education sector. This research examines how the education sector adopts communication technology devices during the Covid-19 pandemic. The results show that several universities have taken advantage of new virtual platforms and designed new teaching methods and active assessments, interactive learning with quizzes, case studies, and group discussions. Without the technological tools that enable distance learning, education will be significantly disrupted in the face of a pandemic. However, the rapid adoption of information and communication technology will lead to increased stress, use of time, and feelings of insecurity. The transition from face-to-face to online learning was considered unprepared from the teaching staff's perspective, the process described as rushed and haphazard with

inadequate technology and internet access in many locations.

An in-depth analysis of the strengths and weaknesses of the learning systems and technologies used during the pandemic should be carried out. The benefits of new online learning would be impactful with careful planning through appropriate and adequate distance teaching strategies so that online learning can be as effective as traditional face-to-face learning. Future research is expected to be able to examine and compare how the use of communication and information technology in online learning occurs at the elementary school to university level. The use of quantitative methods in future research can provide a more general picture of digital transformation in education.

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