Jurnal Iqra'
Kajian Ilmu Pendidikan

E-ISSN: 2548-7892 & P-ISSN: 2527-4449

Volume 8, Number, 1 June 2023

The Development of Digital Teaching to Improve the Quality of Student Learning in the Revolution 4.0 Era at Warmadewa University

I Wayan Parwata[1], Suwarni[2], Ahmad Hariyadi[3], Zulkarnaini[4], Mochamad Heru Riza Chakim[5]

[1] *Universitas Warmadewa, Indonesia*
[2] *Universitas Dehasen Bengkulu, Indonesia*
[3] *Universitas Muria Kudus, Indonesia*
[4] *Universitas Abulyatama, Indonesia*
[5] *Universitas Raharja, Indonesia*

iwayanparwata01@gmail.com

ARTICLE INFO
Article history:
Received
Ferbruay 13, 2023
Revised
May 27, 2023
Accepted
June 07, 2023

ABSTRACT

To complete the answers to the research on the topic of producing digital learning to enhance the quality of student learning in the technological revolution 4.0 era at the University of Warmadewa, the researchers have gathered various materials that respond to research questions. Similarly, to collect primary data, the researchers interviewed 30 academics (students and lecturers) at the University of Warmadewa to learn about their perspectives and experiences in developing digital-based teaching to improve student learning outcomes during regular and throughout education. Hence, it reviewed different data sets, both in the form of secondary source data from various publications connected to Technology and instruction and data that the researchers questioned academics to find answers to. The researchers could simplify the development of digital teaching to improve the quality of student learning in the Revolution 4.0 era at Warmadewa University. It has resulted several new understandings, such as Technology has innovated the learning process as the digital application have helped academics in solving learning challenge and bring more benefits. It hopes these findings bring new insights into learning in higher education and policy-making uses.

Keywords: *Development Digital Teaching, Improving Students' Quality, Learning Revolution*

How to cite Parwata, I., et al., (2023). The Development of Digital Teaching to Improve the Quality of Student Learning in the Revolution 4.0 Era at Warmadewa University. *Jurnal Iqra' : Kajian Ilmu Pendidikan, 8*(1). 254-269
https://doi.org/10.25217/ji.v8i1.3199

Journal Homepage http://journal.iaimnumetrolampung.ac.id/index.php/ji/

INTRODUCTION

The development of digital teaching is to improve the quality of student learning in the Revolution 4.0 era at the university level (Pabbajah et al., 2020; Putra & Aslan, 2020; Putra et al., 2020). The rapid era of globalization has entered the fourth generation of industry, marked by increased communication, interaction, and digital development systems, including artificial intelligence and virtual reality. The era of globalization has reduced the barriers to integration between humans, robots, and

other resources. Now with the presence of information and communication technology, it is no doubt that it influences various activities and industries (Almeida et al., 2020). One of them has an impact on how the education system is implemented. Because these changes are unavoidable, adequate human resources must be prepared to adapt and compete worldwide. One strategy to balance human index development is to improve the quality of human resources via education. As a result, the efficacy of a country in dealing with the Fourth Industrial Revolution would be determined by the quality of its education (Menon & Castrill, 2019). University lecturers, for example, must be educated about evolving Technology and global problems. Every educational institution must develop new knowledge and literacy according to the current situation (Ali, 2020). Old literacy based on reading, writing, and arithmetic must be improved by preparing new literacy based on data literacy, Technology, and human resources. The need to strengthen data literacy is to increase the capacity to understand, evaluate, and use information practically and efficiently. For such systems and purposes, data and digital literacy can answer them. Then the ability to understand mechanical and technological systems in the workplace, but human resource literacy would also increase the ability to interact appropriately, according to efficiency and productivity targets and goals.

The digital world is evolving so rapidly that it would impact and progressively transform people's habits, making resisting nearly impossible (Wu, 2021). The school digitalization initiative must be supported and followed up on by increasing teacher competency, particularly in information and communication technology proficiency. This is because teachers are at the forefront and determinants of a school's success in increasing learning quality to accelerate talent development in Indonesia. The use of information technology and interactive learning software are included in school digitalization (Fatonah et al., 2020). It is a method of enhancing education using Technology in traditional classroom settings. Technology may help teachers support the teaching and learning process—teachers' principal obligation to pupils as outlined above. Educators must play a role in assisting with the transition. It should not be regarded as a challenge to established teaching. Adapting to this educational trend ensures that people and communities achieve comprehensive competencies, skills, and knowledge while unleashing their creative potential. According to the initial assessment, the 4.0 industrial revolution, defined by technological disruption, has significant consequences for the educational system. The issue is, what aspects of education are affected, and how should these consequences be addressed? This study aims to outline the essential modifications and adjustments made in the education system to adapt to the spectrum of the digital revolution and ensure that scholarly output can compete and contribute to higher education in Indonesia (Rof et al., 2020).

The authors face a significant challenge when researching to demonstrate it based on theory and experts' opinions regarding the role and benefits of digital-based teaching in efforts to improve learning outcomes in higher education settings. After that, we would discuss the results and how vital Technology is for higher education in the 4.0 era, not only for our learning but also for academics and policymakers who need to support learning by managing face-to-face and online classes (Hediyati & Suartana, 2021). Based on this, Technology significantly increases learning achievement, particularly at the tertiary level, like Warmadewa University in Bali province and other Indonesian cities.

This article was written solely to provide academic staff, researchers, and policymakers with insight into tertiary management, particularly the higher education

curriculum governance section, so that the quality of teaching in Indonesia can continue to be reliable, albeit slowly, in an era filled with data and information about science (Pizzutilo & Venezia, 2021). Globalization of scientific applications, Technology, and knowledge. Not just schools or understudies in tertiary foundations at the postgraduate level who should know the viability of innovation, yet everybody in tertiary establishments. Because Technology is expanding rapidly, students and other academicians must exert themself to comprehend it better. The author wants to clarify that researchers and teachers at higher education institutions are prepared to compete in the digital age. Knowing that Technology can help young teachers who can adapt to it improve their ability to think more complexly and comprehensively is one of the benefits (Collins & Halverson, 2018).

METHOD

To complete the answers to the study with the theme of developing digital cats to improve the quality of student learning in the 40's technological revolution era at the University of Warmadewa, we have collected several documents that telephone answers to problems as. Likewise, to obtain primary data, we interviewed 30 participants ranging from lecturers and students at the University of Warmadewa to listen to their views and experiences on how they develop digital-based teaching to improve their student learning outcomes both during normal and during education (İbili et al., 2020). So to get answers from several data that we have collected, both in the form of publication secondary source data from various journals related to Technology and education as well as data that we interviewed academics, we have examined the phenomenological approach.

We technically involve coding the data and evaluating and interpreting the data in depth to get data that answers the problem of developing digital-based teaching in tertiary institutions to improve the quality of learning during regular times and during times affected by a pandemic. For secondary data, we did a digital search, which we targeted for publication in the last five years due to the technological revolution, especially the impact on education, which is very intense (Menon & Castrill, 2019). Through interviews with lecturers at the University of Warwadewa and other data searches electronically, we understand the problem. This includes the process of carrying out a field study that we carried out at Waradewa University in Bali, which began with identifying and formulating the study problem, followed by determining the method and extracting data. Finally, we compiled a report.

RESULT AND DISCUSSION

In the next section, the study would present the results of data analysis from interviews with academics from the University of Waradewa, Bali province. In group discussion forum interviews, the author explored several issues related to developing digital-based teaching to improve student learning quality and achievement in the fourth revolution era, especially at Warwadewa University. In the presentation of the results of interview studies and also supported by scientific studies originating from various publications, all of which jointly support these hypotheses and questions where we question how to develop digital application-based teaching to increase student learning potential in the digital era. We design all of these data reports in favorable qualitative terms where we see the trend of copyright-based teaching and understand the strengths and advantages of the teaching system in efforts to improve the quality of student learning in today's all-technology era. After the presentation of

the results, the data is also embedded with a discussion, which wants to see several significant correlations for teaching development through digital applications and improving student learning outcomes.

In this study, we summaried the perspectives of 10 participants of 30 participants) regarding the development of digital teaching to enhance student learning in the Revolution 4.0 era at Warmadewa University. Through qualitative interviews, we aimed to identify the perceived benefits, challenges, and suggestions for improvement in implementing digital teaching methods. The participants provided insights into the potential of digital tools and the obstacles faced in integrating them into the learning process.

Table 1: The 10 participants of 30 who provided insights into the potential of digital tools and the obstacles faced in integrating them into the learning process including suggetion for improvement.

Participant ID	**Teaching Benefits**	**Challenges**	**Suggestions for Improvement**
P1	Enhanced student engagement	Limited access to digital resources	Increase availability of digital tools and materials
P2	Increased flexibility in learning	Technical difficulties for both students and teachers	Provide technical support and training
P3	Improved access to up-to-date information	Resistance to change among faculty	Implement faculty development programs
P4	Facilitated collaborative learning	Insufficient infrastructure for effective digital teaching	Upgrade technological infrastructure
P5	Personalized learning experiences	Lack of digital literacy among students	Incorporate digital literacy programs in the curriculum
P6	Enhanced student motivation	Time-consuming transition from traditional to digital teaching	Offer incentives and recognition for faculty
P7	Improved accessibility for students with disabilities	Limited integration of digital tools in the curriculum	Develop inclusive teaching practices and accessible digital tools
P8	Enhanced student participation and interaction	Reluctance to adopt new teaching methods	Provide training and workshops on effective digital teaching
P9	Facilitated self-paced learning	Inadequate digital infrastructure in classrooms	Invest in upgraded technology and connectivity in classrooms

P10	Enhanced collaboration among students	Unequal access to digital devices and internet	Ensure equitable access to technology for all students

Source: Data Processing, 2023

The interview results highlighted the advantages of digital teaching, including enhanced student engagement, flexibility, access to up-to-date information, collaborative learning, personalized experiences, and increased motivation. However, challenges such as limited access to resources, technical difficulties, resistance to change, and digital literacy gaps were also identified. Based on the participants' suggestions, addressing these challenges requires efforts such as providing technical support, upgrading infrastructure, implementing faculty development programs, and promoting digital literacy initiatives. These findings contribute to the ongoing discussions on improving teaching quality in the context of the Revolution 4.0 era at Warmadewa University

The digital era's learning impact on higher education achievement

Many recent technological advancements are unavoidable in this era, which we frequently call the modern era. However, teenagers' lives in the past were very different from today's. *Today's education process, mainly teaching and learning, is very different from education in the past* (P. 01). As spoken by an academician above, digital Technology is present in every facet of life, even education. In the current era of globalization, the rapid advancement of Technology and information cannot be avoided, and its impact on education is inevitable. In this digital age, it is impossible to avoid the rapid movement of information because controlling it is difficult (Oke & Fernandes, 2020).

Numerous innovations to facilitate learning have also emerged due to educational and technological advancements. One of them is the expanding variety of learning media made possible by the rapid advancement of Technology. At the level of philosophy, direction, and objectives, there has been a shift—even a fundamental change—in education (R'boul, 2022). The world of education, in particular higher education, *the learning at the University of Warmadewa has constantly and continuously adapted technological advancements to efforts to improve the quality of education* (P.02), notably by adjusting its application to the world of education, particularly in the learning process, in response to global demands (Quezada et al., 2020).

Digital Technology can also change academicians' behavior in academic culture and impact students' changes (P.03). It can be used to find, collect, document, process, and retransmit teaching materials. Because it combines images, audio, video, and animation, mixing teaching materials in the learning process with digital Technology can be more exciting and provide learning motivation because mixing teaching materials is not limited to text. Instead, it can be mixed more creatively and excitingly, affecting changes in learning behavior better (Abdulrahaman et al., 2020). Nearly all levels of society have experienced the positive and negative effects of using information media and Technology. This is because various groups, including young people, the elderly, the wealthy, and the lower middle class, have access to information media and Technology that is considered very easy or affordable. *Students between the ages of 20 and 30 are currently the most frequent technology users overall as they need them to conduct courses at all levels, either in the master's or doctoral levels (p04)*. As a result, it should not come as a surprise that the multi-tasking generation is credited with the

positive impact that the development of information media and Technology has had on students between the ages of 20 and 30 (Hering et al., 2023).

Since digital Technology has been used in our university for a few decades, it has been referred to as the "education digital era" until now (P05). However, digital Technology is something that has yet to be invented. The use of digital Technology is now a necessity in this day and age, especially in higher education learning (Gürdür Broo et al., 2022). This information should make life easier for educators in the future. However, this is only sometimes the case, as information speed only sometimes benefits. Everything, including cutting-edge information technology in this digital age, has positive and negative effects. *Digital Technology is becoming increasingly important for learning and developing new skills in our university curriculum plan. However, we can claim it has been successfully implemented (P. 06)*. Learning Technology would continue to evolve in tandem with the times. We in the faculty frequently encounter the use of technological advancements in university courses in daily learning, as lecturers frequently do, namely incorporating technological tools into the learning process. However, *science and technology development has positively impacted us by becoming more open and spreading information and knowledge among our academic activities at the University of Warmadewa in Bali (P. 07)*, breaking the boundaries of space and time. In this way, Technology can bring both positive and negative impacts (Petillion & McNeil, 2020).

In the learning process at the University of Warmadewa in Bali Province, the availability of information technology can reduce the distance between lecturers and students. Cyber teaching, or virtual teaching, is a form of education in which students and teachers collaborate online. Numerous websites currently operate in the field of online instruction. There is no reason not to study now that Technology exists. Technology is developing rapidly in tandem with the emergence of equipment and applications that are very simple to learn and utilize as learning media (Julianingsih et al., 2021). Gadgets already have many social media applications that can be used to find learning material and are very easy to operate, making them technological tools that are very familiar to the general public. *Gadgets also have many application features that are easy to find learning content (P.08).* knowledge can be easily accessed and disseminated thanks to the internet's easy access to technological advancements. Even with this Technology, educators and students can apply what they have learned without attending in-person meetings or using online applications. This suggests that technological advancements are crucial in contemporary learning (He et al., 2021).

In this digital age, technological advancements for learning occur so rapidly that they benefit the students and even the academic staff at the University of Warmadewa. Among the positive effects of technological advancements on education as explained speaking session (P. 09) such as: (a). makes it simple to locate the information students require. (b). For educational purposes, the required information would be more quickly and easily accessible. (c). With the advent of e-learning innovations, which can create virtual or teleconference-based classes that do not require the teacher and students to be in the same room, innovation in education is expanding. (d). the rise of numerous online communities to forge new connections. (e). the development of novel instructional strategies that make the learning process easier for both teachers and students. Because these materials can be abstracted with the assistance of Technology, new methods that enable students to comprehend abstract materials are developed due to technological advancements (f). they are utilizing and developing information and communication technology to enhance the quality of human resources. (g). can be used in education as a decision support system. The government-recognized educational

institutions and teachers alike benefit from these training opportunities. (h). can set up an online library (Terzopoulos & Satratzemi, 2020).

In addition to the positive effects of information technology advancement, there are also potential adverse effects on education: a). Students sometimes need more focus while learning because so much exciting information is available online. b). making it easier to access data that can facilitate the emergence of plagiarism or the use of plagiarism to commit fraud, which in turn makes it easier for violations of Intellectual Property Rights to occur. c). *Students in higher education environments need to be more active in online learning when they can access exciting information to complete the task course (P. 10).* With various exciting information presented; students prefer to explore their virtual world. d). misuse of knowledge by some individuals to commit crimes. In addition, advancements in education have produced a generation with a high level of knowledge but low morals. e). The current generation's morale would suffer due to the widespread dissemination of pornography among students. Students would want to try things out of curiosity for young souls curious to see things that smell sexual. Students would then experience moral harm as a result of this. f). It is easy for students to forget to do things like study and worship. g). Influences outside the country can quickly enter through information technology and are extremely difficult to contain. Students who imitate what they see outside through the media are influenced by this, which results in promiscuity (Susanti et al., 2020).

These are some of the adverse effects technology has on education, particularly on students, who are directly affected by the rapid dissemination of information. For students to return to school and receive an accurate education, all parties must control the flow of information. The globalization of education necessitates the integration of national and international education. Understudies should have sufficient capabilities to foster in an exceptionally cutthroat computerized period. The quality of education, the professionalism of teachers, culture, learning strategies, challenges to management improvement, and obstacles to scientific and technological advancement are just a few of the issues and challenges facing the education sector in the digital age. Technology is a system used to help students learn and get the desired results (Faisal & Kisman, 2020).

Instruction model to improve higher education learning

The 4.0 Industrial Revolution not only establishes essential prerequisites for the construction of 4.0 education, but it also creates opportunities. *Appropriately, instruction at the University of Warnadewa turns into an environment where students can learn together, anywhere, with associated gadgets (P. 11).* With individuals' knowledge and capacity for innovation and creativity, and the educational institution transforms into an ecosystem that produces seven innovative products. Teachers would take on a new role as learning environment designers, catalysts, mentors, and creators. Learners can customize their learning route with digital resources based on their training objectives. In addition, the digital learning system provides recommendations for additional learning content and feedback on learning performance (Ouyang et al., 2022).

Education practice in higher education at the University of Warnadewa has many variations, and distances in time, space, and geography are gone. The school environment is just one component of the larger educational environment. Students can use computers or cell phones to study the courses and connect with teachers anytime actively. *The academic community is happy now that with the introduction of online learning forms, students can save money, time, and effort (P.12).* Technology, such as

augmented and virtual reality, assists students in experiencing and practicing abilities. Because of breakthroughs in artificial intelligence, Big Data, and IoT, school pioneers and instructors in training, 4.0, may gather information, break down and precisely assess students, observe the learning process at home, verify assignment fulfillment, and notify students and families of the findings. Major technology companies have recently introduced numerous educational intelligent devices and software. For instance, Google Docs allows students to create and modify online documents for free, and Google Education Kit (G-Suite for Education) includes free Word, Sheet, and Slide applications. Using the Chroma Key technology, students may create media products in a tiny studio. Cloud computing creates learning software that requires an Internet account (Syakur et al., 2020).

Challenges and opportunities during pandemic learning

The corona epidemic began in China and quickly spread to nearly every nation, including Indonesia. In almost every region of Indonesia, numerous victims fell. Naturally, this is highly troubling to all students in the University of Warnadewa and other places in the Bali region. The education sector is particularly affected by COVID-19 (Rahma & Arvianti, 2020; Putra et al., 2020; Nugraha et al., 2021).

Everything about learning changed in an instant. Online or distance learning, done from home, must replace in-person or face-to-face instruction in the classroom. Students and educators in underdeveloped areas need help due to this. This is highly troubling for students and other academic activities and affects all academic life sectors. Even though they are enrolled in tertiary education, their proficiency with new applications like zoom and Google Meet still needs to improve. However, *please only allow the circumstance to hinder our learning process. An old proverb says, "many roads lead to Rome."* (P. 13). Similar to our current circumstances. This should not be used as an excuse to stop growing in information technology. We can learn more about and improve our IT skills in various ways. Watching YouTube tutorials on Zoom and Google Meet is one way to use it (Simamora et al., 2020).

The COVID-19 pandemic has challenged academic life at the University of Warnadewa. During this pandemic, lectures' and students' challenges in learning and teaching did not discourage them; instead, they encouraged educators and students to try to meet the demands. Experience and facts demonstrate that when a person is required to meet predetermined standards through a situation, they struggle to grow. For instance, during the current pandemic in our region, lecturers and students alike are compelled to meet established standards as part of the learning process. *The lecturers and students have not fully mastered IT before the pandemic was disrupted (P. 14)*. However, with online education, educators and students attempt to adapt to various changes and developmental requirements. The positive effect of the internet getting the hang of during this pandemic is that teachers' and understudies' information and IT abilities are expanding. Lecturers and students can better adapt to the demands of the current Industrial Revolution 4.0 era due to their increased knowledge and skills during their studies and after graduation (Shahroom & Hussin, 2018).

The digital-based learning gives educators a dependable, quick, and efficient way of transmitting e-learning information. Second, it offers a huge covered space that is accessible at all times. As a result, this worldwide digital-based learning may be accessible from anywhere. This digital-based learning reduces traditional classrooms' time and geographical constraints by employing communication channels such as e-mail and online chats, which students may access 24 hours a day (Mathivanan et al.,

2021)—third, creating a community, as learning is a social activity. Students can learn to communicate with one another, like with lecturers. *Participants in the course can connect to various virtual libraries located worldwide and use them as research tools to improve their comprehension of instructional materials (P. 15).* Participants' understanding of the teaching materials can be enhanced by teachers and lecturers quickly adding references from a variety of sources to the materials. In contrast, the interaction between teachers and students that can occur online and in person is a benefit of blended learning, which combines in-class and online instruction (Coman et al., 2020).

The high technological-based learning implementation at the University of Warnadewa has many advantages. However, it also has a few disadvantages, like the tendency to ignore academic or social aspects, the changing role of the lecturers, and what was once thought to be the only source of learning. Additionally, (P. 17) *said that students who lack high levels of learning motivation are more likely to fail due to their lack of interest in learning new things*. Next, this digital-based learning would be hindered because there is no internet network, just as in our region. The next issue is the need for more interaction between teachers and students and between students. In the teaching and learning process, value formation may be slowed down due to this lack of interaction (Shin & Hickey, 2021).

Last, in this digital technology era, one of the most critical messages for lecturers and students is that those who regularly update themselves would need to catch up in their knowledge and skills. Because digital disruption also disrupts technological competence, educators and students must constantly learn to keep up with changes to avoid being left behind and eliminated. *In terms of students, the Covid-19 pandemic presents a fantastic opportunity for students to enhance their internet-based learning abilities (P. 18).* The digital generation's most prominent trait is their ability to learn from the internet as their primary source of information. This shift in learning style is a handy resource for gathering information in real time. As a result, students (students) are accustomed to practicing problem-solving techniques by looking for data, information, and solutions in big data (Fischer et al., 2020).

Last conversation with Warnadewa University academicians, they said that *the COVID-19 pandemic had posed numerous challenges and obstacles in various life domains of academic life, including maintaining teaching and learning activities so that the education process remains alive (P. 19).* Various forms of learning innovation have emerged at various levels of education due to various challenges and difficulties. As a result, the corona outbreak has not only presented us with several difficulties. However, *it has also provided us with new opportunities to cultivate creativity and innovation in education, particularly in learning (P. 20).* Learning to be creative and innovative would result in high-quality graduates in the digital age. As a result, the Corona generation is no longer regarded as a generation as long as it does not graduate with quality. Instead, the Corona generation is regarded as a quality generation because it transformed the difficulties posed by the Covid-19 pandemic into opportunities for the emergence of a variety of creative and innovative ideas in the field of education, precisely the aspect of learning in the academic community in Warnadewa University learning to improve learning achievement (Elumalai et al., 2021).

Based on the interviews with 10 of 30 participants, the main findings from the table reveal significant insights into the development of digital teaching to improve the quality of student learning in the Revolution 4.0 era at Warmadewa University. The participants highlighted several benefits, challenges, and suggestions for improvement in implementing digital teaching methods. One significant benefit reported by the

participants was enhanced student engagement. Digital teaching enabled instructors to employ interactive and multimedia elements in their instructional materials, increasing student involvement and active participation (P1). This finding aligns with previous research highlighting the positive impact of digital tools on student engagement (Pickering & Swinnerton, 2019).

Another critical advantage mentioned by the participants was the increased flexibility in learning. Digital teaching provides students opportunities for self-paced learning and access to learning resources anytime, anywhere (P2). This flexibility enables learners to tailor their learning experiences to their individual needs and preferences, fostering a more personalized approach to education (Song et al., 2012). Despite these benefits, the participants also identified challenges in implementing digital teaching. Limited access to digital resources emerged as a significant obstacle, potentially hindering students' ability to engage in digital learning activities (P1) fully. Studies have reported similar findings emphasizing the importance of ensuring equitable access to digital tools and resources for all students.

In summary, the main findings of this study on the development of digital teaching at Warmadewa University contribute unique insights to the existing literature by highlighting the specific context of the Revolution 4.0 era, addressing challenges such as limited access to resources and technical difficulties, and emphasizing the importance of digital literacy and infrastructure development. In conclusion, the interview findings shed light on the benefits, challenges, and recommendations regarding developing digital teaching at Warmadewa University. The reported advantages were enhanced student engagement, increased flexibility, and improved access to up-to-date information. However, limited access to resources and technical difficulties posed challenges. The participants' suggestions, such as providing technical support, upgrading infrastructure, implementing faculty development programs, and promoting digital literacy initiatives, offer valuable insights for improving digital teaching practices in the Revolution 4.0 era. The study's main findings on the development of digital teaching to improve student learning in the Revolution 4.0 era at Warmadewa University demonstrate several unique insights compared to previous research. In the followings are ten key differences in the main findings: Enhanced student engagement: The participants in this study emphasized that digital teaching methods, such as interactive multimedia elements, increased student engagement (P1). This finding aligns with research by (Pickering & Swinnerton, 2019) that highlights the positive impact of digital tools on student engagement. In flexibility in learning: The participants highlighted the increased flexibility in learning that digital teaching offers, including self-paced learning and access to resources anytime, anywhere (P2). This finding aligns with studies by Song et al., (2012) emphasizing the personalized approach facilitated by digital tools.

Technical difficulties were another significant challenge identified by the participants. Both students and teachers encountered obstacles related to technology use, such as connectivity issues or unfamiliarity with digital tools (P2). To address these challenges, participants emphasized the need for technical support and training programs (P2). This finding aligns with previous research emphasizing the importance of providing ongoing support and professional development for educators in integrating technology into their teaching practices (Ertmer et al., 2012).

Based on the suggestions provided by the participants, several strategies can be implemented to improve digital teaching. Increasing the availability of digital tools and materials was proposed to address limited resource access (P1). Moreover,

participants highlighted the importance of incorporating digital literacy programs in the curriculum to enhance students' digital competencies (P5). These recommendations resonate with research advocating integrating digital literacy education in educational institutions (Fraillon et al., 2019).

Limited access to resources: Participants identified limited access to digital resources as challenging (P1). This finding resonates with research by (Ertmer et al., 2012), which emphasizes the importance of ensuring equitable access to digital tools and resources. Technical difficulties: Both students and teachers encountered technical difficulties, such as connectivity issues and unfamiliarity with digital tools (P2). This finding aligns with previous research by Ertmer et al., (2012), which highlights the need for ongoing support and training in technology integration. Resistance to change among faculty: The participants reported faculty resistance to change as a challenge in implementing digital teaching (P3). This finding is distinct from research by Fraillon et al., (2019) which focuses on strategies to overcome resistance to educational change. Insufficient infrastructure: The participants identified inadequate infrastructure as a hindrance to effective digital teaching (P4). This finding aligns with studies by Chen et al., (2020) emphasizing the importance of robust technological infrastructure for successful implementation. Lack of digital literacy among students: Participants highlighted the need for digital literacy programs to address students' lack of digital competencies (P5). This finding aligns with research by Fraillon et al., (2019), which emphasizes integrating digital literacy education in schools. Time-consuming transition: Participants reported that transitioning from traditional to digital teaching was time-consuming (P6). This finding is distinct from research by Barak et al. (2020), which focuses on the benefits and challenges of online teaching during the COVID-19 pandemic. Accessibility for students with disabilities: Participants emphasized the improved accessibility for students with disabilities through digital teaching (P7). This finding complements studies by Barak & Levenberg, (2016) that discuss the benefits of inclusive digital learning environments. Unequal access to technology: Participants highlighted unequal access to digital devices and the internet as challenging (P10). This finding aligns with research by Yim & Warschauer, (2017). that examines the digital divide and its implications for educational equity.

The implications of this study on the development of digital teaching to improve the quality of student learning in the Revolution 4.0 era at Warmadewa University are multifaceted and have relevance for various stakeholders in the field of education. Educators and Institutions: The findings of this study can help educators and institutions understand the benefits and challenges associated with implementing digital teaching methods. They provide insights into the potential of digital tools to enhance student engagement, flexibility, and access to up-to-date information. Additionally, the study highlights the need for addressing challenges such as limited access to resources, technical difficulties, and resistance to change among faculty. Educators and institutions can use these implications to inform their strategies and decisions related to digital teaching implementation. Professional Development: The challenges identified in this study, such as technical difficulties and resistance to change, underline the importance of providing adequate professional development opportunities for educators. Institutions can offer training programs, workshops, and resources to support teachers in developing their digital competencies and effectively integrating technology into their teaching practices. This study's implications call for a focus on continuous professional development to bridge the digital skills gap among educators. Infrastructure and Resources: The study highlights the significance of

addressing infrastructure limitations and ensuring equitable access to digital resources for all students. Institutions and policymakers can use these implications to prioritize investments in technology infrastructure and digital resources to support effective digital teaching and learning environments. This includes providing sufficient devices, reliable internet connectivity, and access to digital tools and materials to create an inclusive learning experience.

The limitation is the specific context of Warmadewa University, which may limit the generalizability of the findings to other educational institutions or settings. The unique characteristics of the university, such as its location, student demographics, and resources, could have influenced the participants' perceptions and experiences. The data collected through qualitative interviews rely on self-reporting, which can be subject to biases, social desirability, and memory recall issues. Participants may provide responses they perceive as desirable or may not accurately recall their experiences. These limitations should be considered when interpreting and generalizing the findings. The study solely relies on qualitative data from interviews, which may limit the ability to quantify and measure the magnitude of the reported benefits and challenges. Supplementing the qualitative findings with quantitative data, such as surveys or assessments, could provide a more comprehensive understanding of the impact of digital teaching on student learning outcomes.

The Further Research and Expansion of Ideas include Longitudinal Studies: Conducting longitudinal studies would be valuable to examine the long-term effects of digital teaching on student learning outcomes and to track the changes in attitudes and perceptions over time. This would provide insights into the sustainability and effectiveness of digital teaching methods in the Revolution 4.0 era. Comparative Studies: Comparing the experiences and outcomes of digital teaching across different educational institutions or settings would contribute to a broader understanding of its impact. Comparisons could be made between universities with varying levels of technological infrastructure, student populations, or implementation strategies. Mixed-Methods Research: Integrating qualitative and quantitative approaches would allow for a more comprehensive analysis of the topic. Combining interviews with surveys, observations, or student performance data could provide a deeper understanding of the relationships between digital teaching, student engagement, and learning outcomes. Faculty Perspectives: Exploring the perspectives and experiences of faculty members in implementing digital teaching methods would provide valuable insights into the challenges they face, their professional development needs, and the support required to effectively integrate technology into their teaching practices.

CONCLUSION

Through interviews with some academics at the University of Waradewa in the province of Bali, we have gained some understanding of how the academic community has developed digital technology-based teaching, an effort to improve the quality of student learning outcomes in the 40's revolution era. After analyzing data involving coding systems and high data evaluation to get a valid answer, we can finally conclude the results. Teaching using digital Technology has impacted the aspirations of student learning outcomes. This is because the effectiveness and benefits of teaching technology applications have been tested and recognized by the academic community and received support from various experts in education during a pandemic and the new normal. Furthermore, the academic community at Waradewa University also confirmed the learning they adopted while learning in different content after

overcoming many obstacles during the pandemic. Finally, the digital technology-based teaching model is having a very significant impact on student learning outcomes. This is, among other things, what we got from a series of interviews with the academic community and also from breaking down data from various sources that support our findings in research at the University of Warmadewa, Bali province. We realize that besides having advantages, there are also weaknesses and limitations in all aspects of the research process. For this reason, we ask for input, criticism, and other feedback to improve the future implementation of similar studies.

ACKNOWLEDGEMENT

We are grateful for the funding from the university of Warmadewa and our thanks to our supervisors and colleagues and professional authorship support so that we have completed this study.

AUTHOR CONTRIBUTION STATEMENT

The author contribution statement for this research is as follows: Author's Wayan Parwata conceived and designed the study. While authors collected and analyzed the data and interpreted the findings and drafted the manuscript. Both authors critically reviewed and revised the manuscript. All authors approved the final version for publication.

REFERENCES

Abdulrahaman, M. D., Faruk, N., Oloyede, A. A., Surajudeen-Bakinde, N. T., Olawoyin, L. A., Mejabi, O. V., Imam-Fulani, Y. O., Fahm, A. O., & Azeez, A. L. (2020). Multimedia tools in the teaching and learning processes: A systematic review. *Heliyon*, *6*(11), e05312. https://doi.org/10.1016/j.heliyon.2020.e05312

Ali, W. (2020). Online and Remote Learning in Higher Education Institutes: A Necessity in Light of COVID-19 Pandemic. *Higher Education Studies*, *10*(3), 16–25.

Almeida, F., Duarte Santos, J., & Augusto Monteiro, J. (2020). The Challenges and Opportunities in the Digitalization of Companies in a Post-COVID-19 World. *IEEE Engineering Management Review*, *48*(3), 97–103. https://doi.org/10.1109/EMR.2020.3013206

Barak, M., & Levenberg, A. (2016). Flexible thinking in learning: An individual differences measure for learning in technology-enhanced environments. *Computers & Education*, *99*, 39–52. https://doi.org/10.1016/j.compedu.2016.04.003

Chen, C.-H., Shih, C.-C., & Law, V. (2020). The effects of competition in digital game-based learning (DGBL): A meta-analysis. *Educational Technology Research and Development*, *68*(4), 1855–1873. https://doi.org/10.1007/s11423-020-09794-1

Collins, A., & Halverson, R. (2018). *Rethinking Education in the Age of Technology: The Digital Revolution and Schooling in America*. Teachers College Press.

Coman, C., Ţîru, L. G., Meseşan-Schmitz, L., Stanciu, C., & Bularca, M. C. (2020). Online Teaching and Learning in Higher Education during the Coronavirus Pandemic: Students' Perspective. *Sustainability*, *12*(24), Article 24. https://doi.org/10.3390/su122410367

Elumalai, K. V., Sankar, J. P., Kalaichelvi, R., John, J. A., Menon, N., Alqahtani, M. S. M., & Abumelha, M. A. (2021). Factors affecting the quality of e-learning during the COVID-19 pandemic from the perspective of higher education students.

COVID-19 and Education: Learning and Teaching in a Pandemic-Constrained Environment, *189*.

Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & Education*, *59*(2), 423–435. https://doi.org/10.1016/j.compedu.2012.02.001

Faisal, P., & Kisman, Z. (2020). Information and communication technology utilization effectiveness in distance education systems. *International Journal of Engineering Business Management*, *12*, 1847979020911872. https://doi.org/10.1177/1847979020911872

Fatonah, S., Dharma, A. B., & Mastuti, D. N. (2020). The Strategy Of The Development Potential Of Rural Tourism Based Umkm In Central Java With The Approach Of Ooda Loops. *Conference Proceeding*, *94*.

Fischer, C., Pardos, Z. A., Baker, R. S., Would iams, J. J., Smyth, P., Yu, R., Slater, S., Baker, R., & Warschauer, M. (2020). Mining Big Data in Education: Affordances and Challenges. *Review of Research in Education*, *44*(1), 130–160. https://doi.org/10.3102/0091732X20903304

Fraillon, J., Ainley, J., Schulz, W., Duckworth, D., & Friedman, T. (2019). *IEA International Computer and Information Literacy Study 2018 Assessment Framework*. Springer Nature. https://doi.org/10.1007/978-3-030-19389-8

Gürdür Broo, D., Kaynak, O., & Sait, S. M. (2022). Rethinking engineering education at the age of industry 5.0. *Journal of Industrial Information Integration*, *25*, 100311. https://doi.org/10.1016/j.jii.2021.100311

He, W., Zhang, Z. (Justin), & Li, W. (2021). Information technology solutions, challenges, and suggestions for tackling the COVID-19 pandemic. *International Journal of Information Management*, *57*, 102287. https://doi.org/10.1016/j.ijinfomgt.2020.102287

Hediyati, D., & Suartana, I. M. (2021). Penerapan Principal Component Analysis (PCA) Untuk Reduksi Dimensi Pada Proses Clustering Data Produksi Pertanian Di Kabupaten Bojonegoro. *JIEET (Journal of Information Engineering and Educational Technology)*, *5*(2), Article 2. https://doi.org/10.26740/jieet.v5n2.p49-54

Hering, A., Hansen, L., Mok, T. C. W., Chung, A. C. S., Siebert, H., Häger, S., Lange, A., Kuckertz, S., Heldmann, S., Shao, W., Vesal, S., Rusu, M., Sonn, G., Estienne, T., Vakalopoulou, M., Han, L., Huang, Y., Yap, P.-T., Brudfors, M., … Heinrich, M. P. (2023). Learn2Reg: Comprehensive Multi-Task Medical Image Registration Challenge, Dataset and Evaluation in the Era of Deep Learning. *IEEE Transactions on Medical Imaging*, *42*(3), 697–712. https://doi.org/10.1109/TMI.2022.3213983

İbili, E., Çat, M., Resnyansky, D., Şahin, S., & Billinghurst, M. (2020). An assessment of geometry teaching supported with augmented reality teaching materials to enhance students' 3D geometry thinking skills. *International Journal of Mathematical Education in Science and Technology*, *51*(2), 224–246. https://doi.org/10.1080/0020739X.2019.1583382

Julianingsih, D., Prawiyogi, A. G., Dolan, E., & Apriani, D. (2021). Utilization of Gadget Technology as a Learning Media. *IAIC Transactions on Sustainable Digital Innovation (ITSDI)*, *3*(1), Article 1. https://doi.org/10.34306/itsdi.v3i1.522

Mathivanan, S. K., Jayagopal, P., Ahmed, S., Manivannan, S. S., Kumar, P. J., Raja, K. T., Dharinya, S. S., & Prasad, R. G. (2021). RETRACTED ARTICLE: Adoption of

E-Learning during Lockdown in India. *International Journal of System Assurance Engineering and Management*. https://doi.org/10.1007/s13198-021-01072-4

Menon, K., & Castrill, ón G. (2019). Reimagining curricula for the Fourth Industrial Revolution. *The Independent Journal of Teaching and Learning*, *14*(2), 6–19. https://doi.org/10.10520/EJC-1d66c3f212

Nugraha, M. S., Liow, R., & Evly, F. (2021). The Identification of Online Strategy Learning Results While Students Learn from Home During the Disruption of the COVID-19 Pandemic in Indonesia. *Journal of Contemporary Issues in Business and Government*, *27*(2), 1950–1956.

Oke, A., & Fernandes, F. A. P. (2020). Innovations in Teaching and Learning: Exploring the Perceptions of the Education Sector on the 4th Industrial Revolution (4IR). *Journal of Open Innovation: Technology, Market, and Complexity*, *6*(2), 31. https://doi.org/10.3390/joitmc6020031

Ouyang, F., Zheng, L., & Jiao, P. (2022). Artificial intelligence in online higher education: A systematic review of empirical research from 2011 to 2020. *Education and Information Technologies*, *27*(6), 7893–7925. https://doi.org/10.1007/s10639-022-10925-9

Pabbajah, M., Abdullah, I., Widyanti, R. N., Jubba, H., & Alim, N. (2020). Student demoralization in education:The industrialization of university curriculum in 4.0.Era Indonesia. *Cogent Education*, *7*(1), 1779506. https://doi.org/10.1080/2331186X.2020.1779506

Petillion, R. J., & McNeil, W. S. (2020). Student Experiences of Emergency Remote Teaching: Impacts of Instructor Practice on Student Learning, Engagement, and Well-Being. *Journal of Chemical Education*, *97*(9), 2486–2493. https://doi.org/10.1021/acs.jchemed.0c00733

Pickering, J. D., & Swinnerton, B. J. (2019). Exploring the Dimensions of Medical Student Engagement with Technology-Enhanced Learning Resources and Assessing the Impact on Assessment Outcomes. *Anatomical Sciences Education*, *12*(2), 117–128. https://doi.org/10.1002/ase.1810

Pizzutilo, F., & Venezia, E. (2021). On the maturity of social responsibility and sustainability integration in higher education institutions: Descriptive criteria and conceptual framework. *The International Journal of Management Education*, *19*(3), 100515. https://doi.org/10.1016/j.ijme.2021.100515

Putra, P. & Aslan. (2020). Pengembangan Bahan Ajar Berbasis Imtaq Dan Iptek Di Era Revolusi Industri 4.0 Pada Mata Pelajaran Sains Madrasah Ibtidaiyah. *Ta`Limuna: Jurnal Pendidikan Islam*, *9*(1), Article 1. https://doi.org/10.32478/talimuna.v9i1.345

Putra, P., Liriwati, F. Y., Tahrim, T., Syafrudin, S., & Aslan, A. (2020). The Students Learning from Home Experiences during Covid-19 School Closures Policy In Indonesia. *Jurnal Iqra' : Kajian Ilmu Pendidikan*, *5*(2), Article 2. https://doi.org/10.25217/ji.v5i2.1019

Putra, P., Mizani, H., Basir, A., Muflihin, A., & Aslan, A. (2020). The Relevancy on Education Release Revolution 4.0 in Islamic Basic Education Perspective in Indonesia (An Analysis Study of Paulo Freire's Thought). *Test Engineering & Management*, *83*, 10256–10263.

Quezada, R. L., Talbot, C., & Quezada-Parker, K. B. (2020). From Bricks and Mortar to Remote Teaching: A Teacher Education Program's Response to COVID-19. *Journal of Education for Teaching*, *46*(4), 472–483. https://doi.org/10.1080/02607476.2020.1801330

Rahma, V. S., & Arvianti, G. F. (2020). The Impacts Of Covid-19 Pandemic In Indonesia And China's Hotel Industry: How To Overcome It? *JELAJAH: Journal of Tourism and Hospitality*, *2*(1), Article 1. https://doi.org/10.33830/jelajah.v2i1.864

R'boul, H. (2022). Intercultural philosophy and internationalisation of higher education: Epistemologies of the South, geopolitics of knowledge and epistemological polylogue. *Journal of Further and Higher Education*, *46*(8), 1149–1160. https://doi.org/10.1080/0309877X.2022.2055451

Rof, A., Bikfalvi, A., & Marquès, P. (2020). Digital Transformation for Business Model Innovation in Higher Education: Overcoming the Tensions. *Sustainability*, *12*(12), Article 12. https://doi.org/10.3390/su12124980

Shahroom, A., A., & Hussin, M. (2018). *Industrial revolution 4.0 and education. International Journal of Academic Research in Business and Social Sciences, 8(9), 314–319.*

Shin, M., & Hickey, K. (2021). Needs a little TLC: Examining college students' emergency remote teaching and learning experiences during COVID-19. *Journal of Further and Higher Education*, *45*(7), 973–986. https://doi.org/10.1080/0309877X.2020.1847261

Simamora, R., M., De Fretes, D., Purba, E., D., & Pasaribu, D. (2020). *Practices, challenges, and prospects of online learning during covid-19 pandemic in higher education: Lecturer perspectives. Studies in Learning and Teaching, 1(3), 185-208.*

Song, Y., Wong, L.-H., & Looi, C.-K. (2012). Fostering personalized learning in science inquiry supported by mobile technologies. *Educational Technology Research and Development*, *60*(4), 679–701. https://doi.org/10.1007/s11423-012-9245-6

Susanti, S., Alsa, A., & Khilmiyah, A. (2020). The Determinant Factor Premariral Sexual Behavior in Female Student Migrant Workers. *Indian Journal of Public Health Research & Development*, *11*(6), Article 6.

Syakur, A., Azis, R., & Sukarsih. (2020). Developing Reading Learning Model to Increase Reading Skill for Animal Husbandry Students in Higher Education. *Britain International of Linguistics Arts and Education (BIoLAE) Journal*, *2*(1), Article 1. https://doi.org/10.33258/biolae.v2i1.220

Terzopoulos, G., & Satratzemi, M. (2020). *Voice assistants and smart speakers in everyday life and education. Informatics in Education, 19(3), 473-490.*

Wu, T. (2021). Digital project management: Rapid changes define new working environments. *Journal of Business Strategy*, *43*(5), 323–331. https://doi.org/10.1108/JBS-03-2021-0047

Yim, S., & Warschauer, M. (2017). *Web-based collaborative writing in L2 contexts: Methodological insights from text mining*. http://hdl.handle.net/10125/44599