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Technology Access and Digital Skills: Bridging the Gaps in Education and Employment Opportunities in the Age of Technology 4.0

Samsul Arifin, Didit Darmawan

Mayjen Sungkono University of Mojokerto, Indonesia

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A B S T R A C T

Limited access to technology has been a major challenge in preparing individuals for the increasingly digitized future job market. Unequal access to devices and the internet affects individuals' ability to develop essential digital skills. Those who cannot access modern technology risk falling behind in acquiring the skills needed in the world of work, which is increasingly reliant on technology and digital skills. These inequalities also exacerbate social and economic disparities, creating a chasm between those with access to technology and those without. This research identifies the importance of providing equitable access to technology to create equal opportunities for all individuals to develop the skills needed in the future job market. Inclusive policies that provide access to devices and the internet, as well as digital skills training programs, will help mitigate this gap and provide better career opportunities for all.

INTRODUCTION

Along with the rapid development of information and communication technology, society is now entering a digital era known as Technology 4.0. In the field of education, these advancements offer various conveniences and opportunities to expand access to information, learning resources and more efficient teaching methods. Online learning platforms, educational apps and other technological tools have made learning more flexible and accessible to more people, without being limited by geographical location. While technology has brought great benefits in improving the quality of education, there is a huge gap in access to such technology between individuals living in urban and rural areas, or between those with access to digital devices and those without. This exacerbates inequalities in education and creates a chasm between those who can utilize technology and those who cannot (Robinson et al., 2015).

The digital gap's role in education is increasingly evident in how students access adequate devices and internet connections (Lutz, 2019). In many regions, especially in developing countries, access to technological tools that support learning such as computers, tablets and stable internet connections is very limited. These limitations affect the quality of education received by students, creating inequalities between those who have full access to digital resources and those who do not. As many educational institutions attempt to implement digital education, many students struggle to keep up with the learning due to a lack of adequate facilities or technological capabilities. This creates a deeper gap in learning opportunities, which may affect the educational and career future of young people in this digital age (Warschauer, 2003).

A key issue related to the digital divide is the gap in access to technology among students, especially those living in remote or rural areas. While many governments and educational institutions are trying to facilitate access to technology, most students in these areas still struggle to obtain the necessary devices for online learning. In many places, the quality of internet connection is also a major issue that hinders effective learning. This exacerbates inequalities in learning opportunities so that students who do not have adequate access to technology risk falling behind in learning, while students in urban areas or those who are better off have a greater advantage. These difficulties are limited to hardware and internet connection issues, and include families' inability to afford the devices needed for online education (Selwyn, 2016).

* *Corresponding author, email address:* ***dr.diditdarmawan@gmail.com***

This digital gap has the potential to create a barrier in the development of important future skills, such as digital skills and technology literacy. Students who do not have access to modern technology tools are less likely to have equal opportunities to learn the skills needed to succeed in an increasingly technology-dependent world. Limited access to digital devices and fast internet also has the potential to affect students' intellectual development and creativity. As a result, these inequalities threaten basic education, and exacerbate inequalities in the skills development needed in an increasingly globally connected world of work (Van Dijk, 2017).

This issue needs further scrutiny because technology, while offering many benefits, can exacerbate existing inequalities in society. Discrepancies in access to technology in the education sector affect the quality of education received by students in different social strata. In the long run, this can lead to inequity in educational opportunities, which ultimately impacts the quality of human resources and economic development. By understanding the digital divide, we can formulate policies that bridge this gap and ensure that education is equally accessible to all (Ala-Mutka, 2011).

This research aims to analyze how gaps in access to technology affect the education opportunities for students, especially in areas with limited access to digital devices and internet connections. It will also explore the impact of such limited access on the development of students' digital skills, which in turn may affect their future employability. This research provides deeper insights into the digital gap in the education sector and to offer perspectives on the efforts needed to ensure equitable access to education in the age of Technology 4.0.

RESEARCH METHOD

The literature review approach is an effective method for understanding the digital divide and educational accessibility in the era of Technology 4.0 as it provides an opportunity to explore existing research, theories and data related to this topic. In this research, the literature analysis will focus on studies that address inequalities in technology access in the education sector, as well as the impacts of such inequalities on education quality and digital skills development. This method allows us to identify common patterns that emerge across studies, both globally and locally, and to examine the findings from a broader perspective. The literature review will also include research assessing government policies, educational institutions' efforts and community initiatives in addressing the digital divide (Burchinal et al., 2019). Thus, this approach provides an understanding of the root causes of the digital divide in education and its impact on students.

Through this approach, the analysis will involve a review of different types of literature that include academic articles, policy reports and relevant statistical data to assess the distribution of technology across different social and geographical strata. One important aspect of this literature study is to examine educational technology policies that have been implemented in different countries and how they affect the accessibility of education for students from different backgrounds (Warschauer, 2003). By evaluating the existing literature, this study aims to compile a comprehensive picture of the digital gap, as well as offer insights for more inclusive policy measures in addressing educational access issues in the digital age. This method also allows researchers to analyze the relationship between the technological gap and broader social inequalities in society.

RESULT AND DISCUSSION

Education Opportunity and the Digital Gap

The gap in access to technology during the Technology 4.0 era significantly impacts educational opportunities for students globally. This era, characterized by digital devices, the internet, and cloud-based applications, has transformed education delivery, particularly through online learning. However, not all students have equal access to essential technology and internet connections. In many countries, especially in rural or developing regions, access to adequate technology is severely limited, exacerbating educational inequalities. This disparity hinders student participation in digital education and risks widening existing social gaps (Van Deursen & Van Dijk, 2014).

This gap is also seen in terms of the difference between families who can afford digital devices and good internet connections, and those who cannot. Students who do not have access to these technologies tend to fall behind in keeping up with learning materials, especially when teaching methods rely on digital technology such as online learning. Without devices or a good connection, such students may not be able to access learning videos, online assignments, or even attend classes virtually. This greatly affects the quality of education they receive, exacerbating existing inequalities and preventing them from acquiring knowledge on par with students in more developed areas (Beaunoyer, Dupéré, & Guitton, 2020).

Limited access to technology also affects students' ability to develop digital skills that are critical in the future workforce (Robinson et al., 2015). Students who

cannot optimally utilize technology risk not acquiring the basic digital skills needed to enter a job market that increasingly prioritizes technology-based skills. This creates a gap in students' readiness to compete in an increasingly digitally connected professional world (Ala-Mutka, 2011). These skills, including the ability to use software, collaborate online and access information efficiently, are becoming increasingly important in a variety of employment sectors (Mossberger, Tolbert, & Stansbury, 2003).

In many developing countries, despite efforts to introduce technology into schools, inadequate infrastructure is often a major barrier. Schools in remote or less developed areas often do not have the facilities to support technology-based education. Hardware such as computers, tablets and even stable internet connections are hardly available in such schools. In many cases, schools rely solely on traditional teaching methods that do not utilize technology at all and limit students' ability to compete in an educational environment that is increasingly dependent on technological advancements. This shows the importance of building adequate infrastructure as the basis for equalizing education opportunities in the digital era.

The digital gap is limited to physical access to devices and internet connections, and relates to digital literacy (Lutz, 2019). Most students living in more developed areas have adequate devices and have the skills to make good use of these technologies. In contrast, students from lower economic backgrounds often do not get the opportunity to learn to use technology, either at home or at school. Without these skills, they will struggle to adapt to the demands of a world of work and education that increasingly relies on the use of technology. Digital literacy is crucial in ensuring that every student has an equal opportunity to access knowledge and participate in the rapidly evolving digital economy (Helsper, 2012).

Addressing this gap requires more inclusive and equitable policies for distributing technology and educational resources. Some countries have begun implementing programs to provide students in remote or less developed areas with access to devices and the internet, but challenges remain in terms of sustainability and equitable distribution. Governments and educational institutions need to collaborate to create infrastructure that supports online learning that is accessible to all, regardless of their social or economic background. Programs such as internet subsidies or distribution of devices to low-income families can help mitigate this gap.

The gap in access to technology in the age of Technology 4.0 has a significant impact on education opportunities for students. Inequalities in device access, internet connection and digital literacy are creating a widening gap in the quality of education students receive. These gaps affect educational opportunities, and affect the development of digital skills needed to compete in an increasingly technology-dependent world of work (Ala-Mutka, 2011). To ensure that every student has equal opportunities, policies and efforts are needed to reduce this gap and ensure equitable access to technology across society.

Impact of Limited Access to Technology on Digital Skills

Limited access to technology has a major impact on individuals' digital skills, which in turn affects their future career opportunities. In an increasingly technology-dependent world, digital skills have become essential to compete in the job market. Individuals who do not have access to adequate technological tools, such as computers or a stable internet connection, risk not developing the basic digital skills needed. Without these skills, they may struggle to access information, collaborate online or use productivity tools that are standard in many industries (Bauer & Mäder, 2018). The digital gap refers to access to hardware, and to the ability to utilize technology effectively in daily life and work.

One of the biggest impacts of limited access to technology is the inability of individuals to develop the digital skills required in the world of work (Robinson et al., 2015). Skills such as mastery of productivity software, the ability to work with data, and the ability to communicate and collaborate in a digital environment, have become key requirements in many job sectors. Without adequate access, students and young workers will not have the opportunity to learn to use the tools and applications that are essential to their career development.

For example, students who are unfamiliar with the use of software such as Microsoft Office, Google Workspace, or collaborative applications such as Slack, may fall behind their peers who have become familiar with these technologies early on (Anderson & Rainie, 2018).

Furthermore, limited access to technology can exacerbate social and economic inequalities, as those in lower social strata or in remote areas are more likely to lack access to modern technology. This creates a larger gap in terms of skills development and future employment opportunities. Students or young workers who do not have access to technology miss out on opportunities to acquire digital skills, and are hindered in accessing higher education or technology-

based professional training. As such, they are more likely to be trapped in low-paying jobs and limited career opportunities, which can exacerbate existing social inequalities (Van Dijk, 2017).

In many industries, technology has changed the way work is done, creating a need for new and more complex skills. For example, the manufacturing and information technology industries require skills in coding, data analysis and digital project management. Individuals who lack the necessary digital skills will struggle to adapt to these changes, which hinders their ability to get better employment or progress in their careers. Even in sectors not directly related to technology, efficient mastery of digital tools is increasingly becoming a basic requirement. The gap in access to technology is increasingly worrying, as those who are left behind struggle to find work, and risk missing out on opportunities to participate in the growing digital economy (Brynjolfsson & McAfee, 2014).

Limited access to technology also limits opportunities to develop non-technical skills that are increasingly important in the workplace, such as remote communication and collaboration skills. In many modern jobs, collaboration between teams connected via the internet or digital communication tools is essential. These skills are important for workers who work from home, and for those who work in global companies with colleagues from different countries. Without adequate access to practice and interaction in digital spaces, individuals marginalized by the digital divide will miss the opportunity to adapt to ways of working that increasingly rely on technology and online communication (Lutz, 2019).

There are also positive impacts that can be gained with equitable access to technology. When individuals have full access to technology, they can access digital training and online courses that open up opportunities to develop skills that are highly valued by employers. Platforms such as Coursera, edX, or Udemy allow individuals to obtain skill certificates in a variety of fields, from data analysis to graphic design. Access to technology can increase social and economic mobility for individuals who may have previously struggled to access formal education. However, without equal access, this gap will continue to grow and exacerbate inequities that exist (Helsper, 2012).

Limited access to digital technology is one of the biggest challenges faced by many individuals in the modern world. Today's workforce increasingly relies on digital skills to carry out everyday tasks, from communication to complex data analysis. For those without adequate access, this limitation can hinder their ability to keep up with the times, creating a widening gap of inequality in society. Those marginalized by an inability to access technology will find it difficult to develop the skills needed to compete in a job market that increasingly relies on digital innovation.

This phenomenon has a profound impact on individuals' career opportunities. Without adequate digital skills, individuals will struggle to access better, higher-quality and more rewarding jobs in the ever-evolving global labor market. This creates inequality, where only those with access to digital tools and training can take advantage of the opportunities available. This inequality harms not only the individual, but also society as a whole, as those who do not have the opportunity to thrive cannot make optimal contributions to the economy and social innovation.

Unequal access to technology also exacerbates existing social and economic problems. In many areas, especially in rural areas or developing countries, limited infrastructure and resources to provide the required technology further exacerbate the gap between those who have the opportunity and those who do not. Thus, those who are hindered by these access limitations will be further left behind in terms of education, job skills, and access to greater economic opportunities. This creates a vicious cycle that is difficult to break, where technological inequality exacerbates social and economic inequality.

It is important to understand that access to technology is not just about having a device or a fast internet connection, but also about how it is used to empower individuals to develop their skills and potential. Therefore, to address this issue, more inclusive and empowerment-focused policies are needed. Governments and organizations should work together to create infrastructure that can reach more people, as well as provide relevant training so that individuals can utilize technology in productive and innovative ways.

Creating more inclusive policies in terms of technology access means providing more equitable opportunities for everyone to develop the skills needed in the world of work (Berger & Frey 2016). This involves providing affordable devices, wider internet access, and quality digital skills training. Only in this way can we reduce existing disparities and give every individual an equal chance to succeed, regardless of their social or economic background (Ras et al., 2017).

Going forward, we need to strengthen collaboration between the public and private sectors to provide better and wider access to technology. In this case, the private sector can play a role in providing affordable technology solutions, while the public sector can ensure policies that support more equitable access. Together, they can create an ecosystem that allows every individual, from all walks of life, to thrive in an increasingly digitally connected world.

As such, the future world of work will clearly depend heavily on an individual's ability to utilize digital technology. The rapid advancement of technology has changed almost all aspects of life, especially in the economic and employment sectors. Digital skills are now an integral element of success in the world of work, be it in technology, communications or business. Therefore, providing equal access to every individual to develop digital skills is crucial. Without adequate access, some groups will be left behind and struggle to compete in a job market that increasingly emphasizes technology-based skills.

For this reason, creating inclusive policies and infrastructure that support wider access to technology is crucial. The government and the private sector must work together to provide the necessary tools and training, ensuring that technology does not only belong to those who are already in an advantageous position. With supportive policies and adequate infrastructure in place, we can pave the way for every individual to actively participate in an increasingly digital and connected world of work. This will not only create more equal opportunities for everyone, but also ensure that no one is left behind in this fast-paced development.

CONCLUSION

Limited access to technology has a significant impact on digital skills development and future career opportunities. Students and individuals who do not have access to adequate technological devices, as well as a stable internet connection, are at risk of not acquiring much-needed skills in an increasingly technology-dependent workforce. Without adequate digital skills, individuals are likely to fall behind in their career development and struggle to compete in an increasingly technology-first job market. Moreover, this inequality of access further exacerbates social and economic inequalities, widening the gap between those with access to technology and those without, resulting in limited economic opportunities for the disadvantaged.

For this reason, it is important for various parties, including the government, private sector, and education institutions, to create more inclusive policies in providing access to technology. This includes providing adequate devices and stable internet access, as well as strengthening digital literacy programs at all levels of education. Training is needed to develop digital skills, both for students, young workers, and individuals who need new skills in the face of technological changes in the world of work. Thus, every individual will have a fairer chance to thrive and participate in the increasingly advanced digital economy.

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