INCREASING EDUCATION GAP DUE TO DISPARITY IN ACCESS TO TECHNOLOGY

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Abstract
Disparities in access to technology and the gap to education are critical issues that span communities around the world, especially among low-income groups and in remote areas. The research method used was a literature review. The results show that limited access to technology in education results in low academic achievement and students' lack of readiness to face work demands in the digital era. Furthermore, students from low-income families and remote areas are most affected, with a greater likelihood of falling behind in digital literacy and independent learning skills.
Keywords: Inequality, Education, Technology Access Disparity.

Introduction

Education is one of the most promising future investments for every nation. With education, humans are taught to think critically, collaborate, and innovate to solve current and future challenges. Education not only develops intellectual knowledge, but also shapes human character for the better. As a vehicle to develop the potential of each individual, education also fosters a spirit of independence and social care in the community.

Education has a vital role in improving the welfare of mankind. In addition to empowering the potential of the nation's human resources, education is also able to encourage economic progress and social justice in a sustainable manner. (Sitopu et al., 2024); (Guna et al., 2024). Through education, people are equipped with skills to

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produce various innovations that can create new jobs and inclusive economic growth. Education also plays a role in fighting for the human rights of every citizen to achieve a more just and democratic society. (Hairiyanto et al., 2024); (Rozikin et al., 2024).

The development of the times has made education undergo many transformations, especially with the presence of the industrial revolution 4.0. Digital technology and big data now make it easier for people to learn anywhere and anytime. (Tubagus et al., 2023); (Aslan & Shiong, 2023). However, the utilization of technology in education also raises new challenges related to the gap in access to quality learning for all levels of society. Therefore, multi-sectoral cooperation is needed to realize inclusive education in the digital era.

Inequality in access to technology refers to significant differences in the ability to access and utilize technological information, influenced by factors such as geographic location, economic conditions, technological infrastructure, and digital literacy. These gaps often divide societies into large chasms in the quality of education students receive in different parts of the world, as well as between regions and cities within the same country. (CRESPO-RAMOS et al., 2020)..

In fact, urban students and middle to upper economic families have easier access to educational technology such as computers, fast internet, learning programs. In contrast, students in remote areas or underprivileged families are often limited to minimal educational facilities, with little or no access to the latest educational technology. This disparity creates real differences in the quality of learning and educational outcomes. (Han & Park, 2022).

During the COVID-19 pandemic, this problem became even more apparent when the world's schools switched to distance learning. Students without a computer or fast internet at home have difficulty participating in distance learning, potentially widening the education gap. This raises serious concerns about future equal educational opportunities. (Chen et al., 2022); (Nurdiana et al., 2023).

So it is important for education stakeholders including the government, educational institutions, industry partners to find solutions to minimize the gap. Steps that can be taken include providing adequate infrastructure in remote areas and establishing a program to help underprivileged families so that their children have access to devices and internet connections needed for digital studies. It is also important to improve the digital literacy of teachers and students at all levels of education. (García-Holgado & García-Peñalvo, 2022).. Training and capacity building of teachers on digital content, online classroom management, technology-based methods will help more effectively teach digital students. (Janatabadi et al., 2022)..

The integration of a curriculum designed to embed digital skills early on is essential to ensure that all students have an equal opportunity to develop these skills, preparing them for an increasingly technology-dependent future job market.

(Muharrom et al., 2023). While such efforts can help reduce the education gap, it is also important to constantly monitor and adjust these approaches to ensure that all students, regardless of background, have equal quality access to education. This is not only about closing the digital divide, but also ensuring that every child has the opportunity to succeed in an increasingly digitized world. (Smith, 2023).

Based on this problem, the researcher would like to further investigate the disparity in access to technology that increases the education gap and the impact of this gap on individuals and society.

Research Methods

The study in this research uses the literature research method, which is an approach to research that involves analyzing, interpreting, and synthesizing information published in written literature, such as books, journal articles, research reports, and online sources. This method is used to collect existing knowledge about a topic or research problem, with the aim of understanding trends and patterns, identifying research gaps, and forming a theoretical basis for further research. (Sukmadinata, 2009); (Assyakurrohim et al., 2022); (Moleong, 2019).

Results and Discussion
Education Theory and Technology

Education plays an important role in developing individuals and society as a whole. Through the learning process, individuals not only gain the knowledge, skills and values needed to actively participate in society, but also develop critical thinking, creativity and social competence. (Warin, 2024). As such, education serves as a tool that empowers people to advance their quality of life and open up new opportunities. In addition, education helps shape character, supports individual development, and prepares people for future challenges (Forhad, 2022). (Forhad, 2022).

On the other hand, education plays an important role in a country's economic and social development. Quality education can increase productivity and innovation, promote economic growth, and strengthen the foundations of democracy and social justice. The function of education in producing experts is essential to respond to the changing needs of the labor market, while lifelong learning accommodates technological developments and globalization. (Biltawi et al., 2021).. Education also plays a role in reducing inequality, as it provides opportunities for all people, regardless of their background, to reach their full potential. By empowering individuals and communities, education ensures sustainable development and collective well-being for current and future generations (Liu et al., 2023). (Liu et al., 2023).

Technology has brought about a revolution in the methods and quality of education, allowing for wider access and a more personalized approach to teaching

and learning. With the advent of the internet and various online learning platforms, students from all over the world can now access countless resources, take courses from reputable universities, and participate in virtual classes without geographical or physical constraints. (Schield, 2022). Technologies such as interactive whiteboards, learning apps and simulators are changing the way teachers teach and students learn, making them more engaging and interactive. This not only increases student engagement but also enables education that is tailored to each individual's learning pace and style, which was previously difficult to achieve in conventional classroom settings. (Wang & Yan, 2020).

Technology is playing an increasingly important role in the transformation of education systems and methods today. Big data is able to record the way students learn and then analyze the details needed to develop new materials and approaches that suit individual interests. Fast feedback thanks to technology helps teachers and students identify points that need to be highlighted together. This is expected to promote learning outcomes and student-centered education. (Das & Mondal, 2021). Although challenges such as gaps in access and training for educators are still faced, the positive benefits of technology for education are undoubted. Technology has brought education into an interactive digital age that is open to all. Data analysis from technology provides new insights to develop learning processes and materials according to individual needs. (Nurhayati et al., 2023).. While challenges such as access gaps and teacher training remain, the application of technology in education promises continuous improvement and efficiency needed to meet the future (Sarmila et al., 2023). (Sarmila et al., 2023)..

Technology Access Disparity

Inequality in access to technology refers to significant differences in the ability of individuals or groups to access and use information and communication technology (ICT), including the internet, computer devices, and other digital technologies. This phenomenon often occurs because economic, geographical, and social factors affect the ownership, accessibility, and ability to utilize technology. (Das & Mondal, 2021). This inequality of access creates a "digital divide" between those with full access to cutting-edge technologies and those with limited or no access. This is an important global issue because ICTs are essential to many aspects of modern life, such as education, employment, and socio-political participation, so inequality of access has the potential to deepen socio-economic inequalities (Kanagavel & Thanikais, 2021). (Kanagavel & Thanikaiselvan, 2024).

Technology access inequality indicators may include aspects such as availability of regional wide network infrastructure, percentage of households owning a computer or internet-connected device, affordable internet service rates, and digital literacy of the population. These indicators help identify gaps in

technology access and use between demographic groups, including urban and rural comparisons, low and high income groups, and generational differences. (Rinzin, 2020). Measuring and understanding these inequalities is important for shaping policies and interventions that close the digital divide and ensure that all individuals, regardless of background, can utilize the full potential of ICT developments. (Asare et al., 2022)..

The inequality in access to technology in the regions is due to a number of interrelated factors. The main factor is uneven technology infrastructure, where urban areas often have faster and more reliable wide internet networks than rural or remote areas. Economic factors also play a role; technology investment tends to be higher in high-income regions. (Istrate, 2021). As a result, the ability to access, maintain and update technology equipment is an unaffordable luxury for many poor communities. In addition, internet subscription fees are still a significant burden for low-income households, adding to the financial barriers to technology utilization. (Daka et al., 2023)..

In addition to economics and infrastructure, there are issues of digital literacy and lack of education or training in the use of technology. Even if available, lacking the necessary skills to use it can minimize the benefits of access. With the ever-changing technological developments, continuous education and training is needed to keep individuals skilled and labor market relevant. (Husain et al., 2024). Inequalities in the education system between regions-where poorer or remote schools often have fewer resources to provide adequate technology education-highly hinder efforts to improve digital literacy and form an ongoing cycle of skills shortages. This lack of digital literacy leaves parts of the population isolated from the socio-economic development that modern technology facilitates. (Kalra, 2021).

Effect of disparity in access to technology on the education gap

Inequality in access to technology has a direct impact on the education gap. In today's digital age, access to technology such as computers and the internet plays an important role in the learning process. Students in areas with good technology facilities benefit from accessing information, digital resources and interactive tools that enrich their learning experience. (Mahdavi et al., 2023).. In contrast, students in areas with limited access are often left behind, as they do not have the same resources to supplement school teaching, which can limit their understanding and mastery of educational concepts (Choi et al., 2023). (Choi et al., 2023)..

Limited access to technology in underprivileged schools often results in a curriculum that does not match the attainment standards set in better-facilitated areas. Students in these schools are rarely taught technology-based lessons and assignments, which hinders the development of essential skills such as digital literacy, online research and critical thinking needed in many aspects of professional and

academic life. (Widjaja & Aslan, 2022). These inequalities can create a cycle where students from less developed regions struggle to compete for admission to colleges or job opportunities that require advanced and cutting-edge technological skills (Najam, 2024). (Najam, 2024).

In addition, the COVID-19 pandemic has highlighted and widened the education gap due to differences in access to technology. With the urgent need for distance learning, students without proper equipment or stable internet connection are at a great disadvantage. (Alhussein et al., 2023).. While some students can continue their studies with little disruption by attending virtual classes and accessing study materials online, others may be completely shut out of the learning process due to lack of the required equipment or connection. This creates a learning gap that could potentially have a long-term impact on their academic success (Chu, 2020).

In addition, the lack of access to technology often makes it difficult for teachers to improve their professional competencies and stay up-to-date with the latest teaching methods. Educators in disadvantaged areas may find it difficult to integrate technological tools into their curriculum or adopt innovative learning methods that improve student learning outcomes. (Wu, 2023). Without adequate resources for professional development, these teachers risk falling behind best educational practices, widening the gap in education quality between digitally-rich and less-advantaged schools. This overall gap contributes to differences in educational achievement and affects students' long-term socioeconomic opportunities (Gao et al., 2020).

Gaps in access to technology also imply unequal opportunities for students to develop essential 21st century skills. In many modern industries, mastery of information technology and adaptability to technical change are highly valued qualities. Learners who do not have the opportunity to hone these skills during the early stages of their education will struggle to keep up with the pace of change in the world of work (Ray, 2022). (Ray, 2022). Furthermore, the jobs of the future increasingly rely on expertise in digital technologies, widening the income and opportunity gap between those with digital skills and those without. Therefore, unequal access to technology limits not only current academic achievement but also the future economic potential of the individual (Ocholla et al., 2022). (Ocholla et al., 2022)..

Tackling the problem of disparity in access to technology and its impact on educational inequality requires synergized efforts from various stakeholders. The government should play a role in providing infrastructure and resources for schools in underprivileged areas. Private initiatives and public-private partnerships can also help provide access to technology and teacher training. In addition, educational institutions and non-profit organizations can contribute by providing enrichment

programs and extra support for learners affected by access inequalities. (Vavekanand & Dayanand, 2024).

The conclusion that can be drawn from the problem is that differences in access to technology lead to widening educational disparities and potentially have multiple impacts on students' future social and economic opportunities. This is not only an education issue, but also a social justice issue that requires strategic and comprehensive measures. Investing in widespread access to technology needs to be seen as a top priority to ensure that every student, regardless of their background or geographic location, has the opportunity to realize their full academic and professional potential. If not properly addressed, the disparities arising from discrepancies in access to technology will continue and further widen the gap in society.

Solutions and Policies to Tackle Technological Disparities in Education

To resolve the technology gap in education, several concrete solutions and policies can be implemented. First, the government can increase investment in technology infrastructure in rural areas and less developed regions. (Hubbard, 2022). This includes constructing adequate broadband internet facilities as well as providing technological pedagogical tools to schools that need them. This policy aims to ensure that every student, regardless of geographical location, has access to digital learning resources (Fralinger, 2023). (Fralinger, 2023).

Secondly, the development of training and professional development programs for teachers in using educational technology is an important aspect. In this way, teachers will not only be equipped with the ability to use technology in teaching but can also utilize it to improve student learning outcomes. This program could be coordinated by the education department with support from higher education organizations and the technology industry to ensure relevant and up-to-date materials. (Mahmudiono & Laksono, 2021)..

Third, encourage and facilitate public-private partnerships in support of technology education. Technology companies can contribute through device donations, access to education cloud services, or STEM (Science, Technology, Engineering, and Mathematics) education programs. Such partnerships not only reduce the financial burden on governments and educational institutions but also ensure that students have access to the latest technology and learning tools. (Gui & Alam, 2024).

Finally, the implementation of inclusive education policies that recognize the needs of different groups of students, including those from underprivileged backgrounds. This could include providing subsidies or financial assistance for students who need technological devices for home learning, as well as academic support programs to help students improve their digital skills. Such policies affirm a

commitment to the principle of equity in education and are an important step towards eliminating the technology disparity gap. (Haddar et al., 2023); (Tuhuteru et al., 2023).

By implementing the policies and solutions mentioned above, we can move towards a more equitable education system where every student has an equal chance to succeed in this digital era. Comprehensive and synergized solutions between various stakeholders are key in overcoming the technological disparities affecting education today.

Impact of the technology disparity gap in education

The gap in mastery of educational technology results in a range of significant negative impacts on the learning journey of learners and overall educational equity. First, there is an inequality of learning opportunities between students who have full access to technological resources and those who do not (Gui & Alam, 2024). (Gui & Alam, 2024). Students in regions with limited access to technology are hampered in advancing critical digital competencies, which are now foundational skills in the modern world of work. This gap forms a 'digital divide' that further widens the divide between children from diverse economic backgrounds. (Vin & Kawasaki, 2024).

In addition, the technology gap also affects students' motivation and engagement in the teaching-learning process. Without interactive and engaging technology tools, students may lose interest in the subject matter. This has the potential to reduce academic achievement and enthusiasm for learning, as conventional learning without supporting technology is often insufficient to meet the needs of students who are accustomed to technology in their daily lives. (Salem et al., 2020).

The third impact is on the difficulty of adapting graduating students into the job market. Today's world of work is increasingly dependent on technology, and students who are not trained in digital skills may face difficulties in competing in a global market that requires mastery of technology. This gap may limit the employment prospects for students in the long run and affect their ability to contribute economically in society. (Amin et al., 2023).

Finally, technology gaps can reinforce cycles of poverty and social inequality. Students from underprivileged families often do not have the resources to provide educational technology at home, so they are less prepared for lessons and more likely to fall behind. This limits their career potential and reduces their likelihood of escaping poverty (Rosinger et al., 2021). (Rosinger et al., 2021). Through these effects, the technology disparity gap is not only an educational issue, but also a broader social issue that requires serious attention from all sectors of society.

Conclusion

Survey findings on disparities in access to technology and educational disparities highlight that differential access to technology has a significant impact on the quality and effectiveness of education received by students. Research shows that students from low-income and less developed communities often do not have the same devices and internet connectivity as students from more affluent backgrounds. As a result, there is a disparity in the learning experience, with disadvantaged students having limited opportunities to access digital materials, online learning tools and interactive educational resources that can enrich their learning.

Limited access to technology not only affects daily learning experiences, but also students' ability to develop digital literacy, which is a critical requirement in today's knowledge economy. Research findings show that a lack of digital skills makes it harder for students to pursue higher education and competitive careers, widening the socioeconomic gap. This inequality is exacerbated by the COVID-19 pandemic, which has forced a transition to online learning methods and exposed lack of access to technology as a major obstacle to continuing education.

In response to these findings, the researchers emphasized the importance of investing in education technology infrastructure, especially in underserved areas. They suggest increasing access to devices and high-speed internet, training teachers and students in educational technology, and developing universally accessible educational content. By doing so, these interventions are expected to close the technology gap, giving all students an equal chance to succeed in an increasingly technology-dependent education system.

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