



Does ICT Contribute Towards Sustainable Development in Education? An Overview

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ABSTRACT

Our society has become more globalised, with significant environmental issues, widespread poverty, a widening wealth-poverty divide, violence in many areas of the globe, and easy access to a plethora of knowledge. Technology advancements have recently had a significant impact on our society as well as other educational settings, such as education for sustainable development. The objective of this study is to examine further needs of educational sustainability and the contribution and challenges of ICT towards sustainable development in education. The data used in this study were secondary data that were descriptive in nature and analyzed according to the objectives and research questions of the study. Here, the researchers have collected the data from various journals, books, reports, magazines, internet sites, newspapers, etc. The present study revealed that online learning tools (like Collaborate) can allow students to interact with people from different cultures, enhancing their learning experience. On the other hand, when used in conjunction with local learning activities, these tools can open up opportunities for local-global connections. Moreover, incorporating online resources into the learning process, such as wikis and discussion boards, encourages student participation outside of the classroom and serves as a starting point for in-class conversations. On the other hand, the most widely employed solutions for achieving the SDGs are remote learning and mobile learning. ICTs may assist in promoting sustainability in a number of ways, but they also present a number of issues since they provide flexibility in the space-time nexus of the learning experience and access to a variety of data and knowledge.

Keywords: *sustainable development, ICT, education, future needs, challenges, contribution*

Introduction

Information and communication technologies (ICT) have significantly changed our lives and helped our civilization grow. These technologies have an impact on how we interact with one another, communicate, and do our jobs. They are also essential to the growth of sectors like health, the economy, and education (Annan-Diab & Molinari, 2017). ICTs thus have an impact on people's daily lives on an individual level, but on a global scale, these kinds of tools are meant to help build a more sustainable future by reducing poverty, and enhancing health, education, and the quality of life for many people. As stated in the goals for sustainable development, quality education is a human right and the primary means of reducing poverty, ensuring inclusive education, and fostering learning opportunities. As a result, ICTs have developed into crucial instruments for achieving this goal and addressing various social requirements through altering educational methods (Roy et al., 2023). As long as there is equality of opportunity, digital technologies help minimise social and economic inequities in society and promote inclusion. This is made possible by factors like their low cost or flexibility (Tjoa & Tjoa, 2017).

There is an increased concern for the environment and sustainable technology all around the globe, while it is unclear whether this is because of a rise in public knowledge, financial savings, or regulatory reforms. The use of ICTs in society's economic, political, and educational sectors as a tool for advancement and development must also be acknowledged (Donath et al., 2020). One of the most encouraging parts of today's society's changes and advancements is the growth and spread of technical instruments, which are having a fast impact on people's everyday lives, especially those of younger generations (Das & Barman, 2023). To change the teaching-learning processes of students, it is vital to evaluate how ICTs have been integrated into instructional practices (Carrión-Martínez et al., 2020).

ICTs in Education for Sustainable Development

Technology is spreading across society and influencing people's everyday lives. This is reflected in the changes that have occurred in the educational sector. These developments have made new educational practices that enhance students' teaching-learning processes possible. So, our educational procedures aim for equality and tolerance for individual variations. Without the incorporation of technology into education that encourages the creation of new instructional strategies and forms that lessen inequality and increase inclusivity, this would not be achievable. So, a more sustainable strategy requires not only the use of technology in the classroom but also the proposal of methodological improvements that improve people's quality of life. The

idea of sustainable development has recently sparked increased interest in education because the United Nations Organization established goals that aimed to address some of society's most pressing issues, such as ending poverty, ensuring a quality education, inclusion, or the reduction of inequalities (Acevedo-Duque et al., 2023). These objectives give the educational community a new chance to create effective teaching methods that educate students about sustainability. This suggests modifications to study plans, including steps like incorporating technology into them (Carrión-Martínez et al., 2020).

In order to solve societal issues and advance sustainable development, education is crucial. This growth can progress by using technology in education, which may provide a variety of learning possibilities. This study was conducted to better understand how ICT is being implemented in classrooms dedicated to more sustainable education.

Literature Review

In this study, the researcher reviewed and reported on the majority of relevant research on the contribution of ICT towards sustainable development in Education.

Zelenika & Pearce, (2012) conducted research on ICTs as catalysts and instruments for sustainable development to study the ways in which the internet and other ICTs might address severe weaknesses in sustainable development initiatives. The study found that using OSAT, the internet, and other cutting-edge ICTs are employed as platforms for fostering global cooperation. A research on the use and effect of ICT in education for sustainable development was undertaken by Kędzierska et al., (2013) to explain the idea of ICT capabilities that students should acquire in ESD-related learning. The study shows that digital media, particularly Web 2.0 technologies, are significant levers for supporting ESD and enhancing participant learning outcomes. Adu et al., (2014) looked at the contribution of higher education and information and communication technology (ICT) to sustainable development in Nigeria. The study discovered that all ICT tool indicators were necessary for sustainable development. Tjoa & Tjoa, (2017) highlighted on ICT's potential for advancing the Sustainable Development Goals. This study found that there are two ways that ICT affects sustainability, ICT is unquestionably a key facilitator for more effective resource utilisation, education, and corporate operations, which is a crucial success

element for attaining the SDGs. On the one hand, sustainability may have negative consequences, such as the development of electronic trash. In another investigation by Hilty & Huber, (2017) on how to get students interested in ICT-related study programmes and sustainable development, many students find certain connections between sustainable development and ICT to be thought-provoking and have the potential to inspire them to get involved with sustainability.

Need for the Study

The components of sustainable development include socioeconomic, cultural, and political changes. Recently, there has been an urgent need to investigate ICT as one of the components due to the introduction of current and advanced technology. There is a need to introduce certain independent variables since studies have demonstrated the effectiveness of education in supporting sustainable development on a global scale. Therefore, the study concentrates on the features and future demands of education for sustainability and the contribution of ICT to sustainable development in education.

Research Questions

The following questions were raised to provide answers to the problem the study set out to address:

- RQ¹. What are the characteristics and further needs of education for sustainability?
- RQ². What is the contribution of ICT towards sustainable development in education?
- RQ³. What are the potential and challenges towards sustainable development in education?

Research Objectives

To conduct the study, the researcher has framed the following objectives:

- O¹. To study the characteristics and further needs of education for sustainability.
- O². To study the contribution of ICT towards sustainable development in education.
- O³. To study the potential and challenges towards sustainable development in education.

Research Methodology

In the current study, the researchers used secondary data that were descriptive in nature and analyzed according to the objectives and research questions of the study. The study only used theoretical information, therefore content analysis of the accessible materials was performed. As a result, the researchers have collected the data from various journals, books, reports, magazines, internet sites, newspapers etc.

Discussion and Analysis

A) Characteristics and Further Needs of Education for Sustainability

EFS's primary goal is to get people ready to work for sustainable education. EFS has implemented several pedagogies in terms of objectives and techniques. In contrast to conventional pedagogy, EFS has a goal: to transform social practices and individual behaviours via the development of critical thinking, group-working abilities, and skills for successful social action. EFS combines knowledge (education on the environment), sentiment and emotional engagement, and a purpose (Grosbeck et al., 2019).

The EFS has emphasised the need for:

- Experiential learning is learning that draws on students' prior experiences as well as current and shared ones;
- Connection with local realities and problems;
- Development of the participants' problem-proposing and skill in problem-solving;
- Development of the participants' capacity to establish local to global linkages and connect personal difficulties with societal problems (Abera, 2023).

Although EFS has successfully raised public awareness of environmental issues and sustainable development, it has yet to be nearly as successful in promoting alternative worldviews and modes of existence (behaviours). It has fallen victim to "progressivism," as the term is used by Steinberg and Kincheloe, (2012) to denote an adverse reaction to conventional teaching methods, limited to didactics, and has frequently failed to offer a practical alternative pedagogy (i.e. an act of transmission of values and ways of knowing). The need of the hour to use projects for increasing student engagement in learning, the expectation that students actively participate in data collection and analysis, the frequent student-centered organisation of classes, and the regular use of problem-solving are all examples of EFS practices that are generally effective in promoting active learning in the classroom. They haven't always stood out as practical illustrations of empowering and transformative education, which changes the way that students think and behave (Hajdukiewicz & Pera, 2020).

The relationship between individual behaviours and social realities and issues and the need for personal and collective action to change social institutions and culture still need to be better understood in EFS practices. Additionally, it translates awareness into differences in social practices, institutions, structures, and individual and collective lifestyle choices. On the other hand, it assists students and participants in gaining socio-political knowledge. Acquiring such abilities and a more excellent grasp of how the socio-political system operates may lead to a feeling of empowerment and improved opportunities for social reforms. Moreover, a more effective relationship between the study of local issues and global concerns about sustainability (Mauricio et al., 2021).

B) Contribution of ICT towards sustainable development in education

Rapid ICT breakthroughs are fundamentally altering how we communicate and engage with one another on a personal, local, and global scale, as well as how we see our position in the world. ICT is altering how and what we study in addition to how we communicate, work, and travel. The landscape of education is changing as a result of ICT-driven changes in many facets of everyday life, and this has enormous potential to advance the ambitious goal of universal education, particularly in poor nations. ICT in education may be utilised to create international networks and support creative peer learning. Students may be inspired and motivated by the dynamic, multifaceted educational experience that ICT makes possible by giving them the chance to study, explore ideas, and express themselves via the use of tools and platforms that best fit their specific learning preferences. ICT is already changing how classrooms are thought of by bringing learning online, providing new alternatives for information delivery, and developing new strategies for in-service teacher support and training (Ramaswamy et al., 2021).

ICT is a powerful instrument for social change and is supporting a larger amount of economic development across various industrial sectors. In an increasingly digitised world, students will be well-equipped to drive innovation and make significant contributions to economic and social development if they can apply the ICT skills they learn in school to social and professional settings. Sustainable development goal 4 promotes the use of ICT to advance the ideas of expanding access to inclusive and equitable education, delivering high-quality education that satisfies both student and labor-market demands, and guaranteeing that people have access to opportunities for lifelong learning. Understanding that ICT solutions must support, rather than influence, the definition of and criteria for providing context-specific inclusive and excellent education is essential to achieving the goals of SDG4 (Gidadawa & Dogondaji, 2014).

B) Educational Sustainability: Opportunities and Challenges

In particular, information and communication technologies (ICTs) have already been incorporated into education and the EFS. According to Cai & Wolff (2023), ICTs have been demonstrated to increase connectivity between students and instructors and among students. They have also been demonstrated to improve the exploitation of shared resources in learning repositories. Zhang et al., (2020) also argued that social presence enhances learning performance in academic contexts. Online programmes (like Collaborate) can allow students to interact with people from different cultures, enriching the learning process. Additionally, when used in conjunction with local learning activities, these programmes open up opportunities for local-global connections. Moreover, incorporating online resources into the learning process, such as wikis and discussion boards, encourages student participation outside the classroom and serves as a starting point for in-class conversations (García et al., 2020).

On the other hand, Others have voiced doubts about the ICTs' ability to help build a more civilised and sustainable society. According to Marouli et al., (2016) "Information and communication technology can either benefit or hurt regional economies and communities. The drawback stems from the ability of ICT products and services to displace communities that haven't been able to close the digital divide in terms of governance, service provision, and commerce" (p. 27). As a result, the results of using ICTs are influenced by current social inequalities. The potential advantages of ICTs for sustainable societies are distorted by students and the community's unequal access to ICTs. According to Kostoska & Kocarev, (2019), what is necessary is "innovation with a purpose"; technological innovations (like ICTs) should be viewed as a means to an end, so there is a need to consider our goals carefully.

Conclusion

ICTs may assist in promoting sustainability in several ways, but they also present a number of issues since they provide flexibility in the space-time nexus of the learning experience and access to a plethora of information and knowledge (Hallinger & Nguyen, 2020). Technology is a helpful tool, but how effectively we use it depends on our decisions and the goals for which we use it. The use of ICT can enable a more comprehensive strategy in which "the concept of the local to the global community [can] be reflected within the content and learning process" (Anyolo et al., 2018). ICT can link people geographically apart, providing substantial personal benefits (e.g., access to large bodies of information, services, and resources) (González-Zamar et al., 2020). Additionally, ICT may encourage sophisticated human interaction situations that support individualised micro-learning environments tailored to specific learning demands and prevent social exclusion (Kostoska & Kocarev, 2019).

On the other hand, ICTs nowadays are far more varied than before regarding tools and applications (Kioupi & Voulvoulis, 2019). ICTs' position in EFS is facing new difficulties due to the emergence of sophisticated social networking platforms such as cloud computing systems and cognitive applications (Mochizuki, 2016). Therefore, the refinement of learner physical presence and physical engagement, as well as the additional value of technologically assisted learning environments, is a major adjustment that we must make for the use of ICTs in EFS (Wahyudin & Malik, 2019).

Limitations and Future Work

During this work, several limitations have been discovered since few examples of ICT are used for long-term growth in education. This restriction could be caused by the review's scope being restricted to looking for existing articles and research papers in the databases. Moreover, more studies should be done in this area since certain studies show that ICT integration in society is crucial and that there is a direct correlation between technological advancement and quality-of-life enhancement. Individuals in areas devoted to sustainable development are happier when they have access to digital resources.

However, including sustainability as a new dimension monitored by all policymakers, stakeholders, academicians, and the associated organisational entities will be a crucial necessity in the near future for ICT in education and sustainable development. For this purpose, a further empirical study can be carried out on education for sustainability and how it will fulfill the SDG goals 2030 of the country. To achieve these SDG goals, best practices for sustainability and performance indicators are necessary.

References

- Abera, H. G. (2023). The Role of Education in Achieving the Sustainable Development Goals (SDGs): A Global Evidence Based Research Article. *International Journal of Social Science and Education Research Studies*, 03(01), 67–81. <https://doi.org/10.55677/ijssers/v03i1y2023-09>
- Acevedo-Duque, Á., Jiménez-Bucarey, C., Prado-Sabido, T., Fernández-Mantilla, M. M., Merino-Flores, I., Izquierdo-Marín, S. S., & Valle-Palomino, N. (2023). Education for Sustainable Development: Challenges for Postgraduate Programmes. *International Journal of Environmental Research and Public Health*, 20(3), 1759. <https://doi.org/10.3390/ijerph20031759>
- Adu, E. O., Emunemu, B. O., & Oshati, T. (2014). The role of information and communication technology (ICT) and higher education in sustainable development. *J Communication*, 5(2), 181–190. <https://doi.org/10.1080/0976691X.2014.11884837>
- Annan-Diab, F., & Molinari, C. (2017). Interdisciplinarity: Practical approach to advancing education for sustainability and for the Sustainable Development Goals. *International Journal of Management Education*, 15(2), 73–83. <https://doi.org/10.1016/j.ijme.2017.03.006>
- Anyolo, E. O., Kärkkäinen, S., & Keinonen, T. (2018). Implementing Education for Sustainable Development in Namibia: School Teachers' Perceptions and Teaching Practices. *Journal of Teacher Education for Sustainability*, 20(1), 64–81. <https://doi.org/10.2478/jtes-2018-0004>
- Cai, Y., & Wolff, L.-A. (2023). Education and Sustainable Development Goals. *Sustainability*, 15, 1–5. <https://doi.org/10.3390/su15010643>
- Carrión-Martínez, J. J., Luque-de la Rosa, A., Fernández-Cerero, J., & Montenegro-Rueda, M. (2020). Information and Communications Technologies (ICTs) in Education for Sustainable Development: A Bibliographic Review. *Sustainability (Switzerland)*, 12, 2–12. <https://doi.org/10.3390/su12083288>
- Das, P., & Barman, P. (2023). E-Learning: Emerging trends in present education system. In P. K. Paul, D. Gurrapu, & E. R. K. (Eds.), *Digital Education: Foundation & Emergence with challenges, cases* (pp. 71–86). New Delhi Publishers. <https://www.researchgate.net/publication/371755100>

- Donath, L., Mircea, G., & Rozman, T. (2020). E-learning platforms as leverage for education for sustainable development. *European Journal of Sustainable Development*, 9(2), 1–19. <https://doi.org/10.14207/ejsd.2020.v9n2p1>
- García, E. G., Magaña, E. C., & Ariza, A. C. (2020). Quality education as a sustainable development goal in the context of 2030 agenda: Bibliometric approach. *Sustainability*, 12(15), 1–18. <https://doi.org/10.3390/SU12155884>
- Gidadawa, Z. S., & Dogondaji, M. B. (2014). Application of ICT in Nigerian educational system for achieving sustainable development. *International Letters of Social and Humanistic Sciences*, 32, 62–71. <https://doi.org/10.18052/www.scipress.com/ILSHS.32.62>
- González-Zamar, M.-D., Gómez-Galán, J., Abad-Segura, E., & López-Meneses, E. (2020). Managing ICT for Sustainable Education : Research Analysis in the Context of Higher Education. *Sustainability*, 12, 1–25. <https://doi.org/10.3390/su12198254>
- Grosseck, G., Tîru, L. G., & Bran, R. A. (2019). Education for sustainable development: Evolution and perspectives: A bibliometric review of research, 1992–2018. *Sustainability*, 11, 2–35. <https://doi.org/10.3390/su11216136>
- Hajdukiewicz, A., & Pera, B. (2020). Education for Sustainable Development — The Case of Massive Open Online Courses. *Sustainability*, 12, 2–20. <https://doi.org/10.3390/su12208542>
- Hallinger, P., & Nguyen, V. T. (2020). Mapping the landscape and structure of research on education for sustainable development: A bibliometric review. *Sustainability*, 12(5), 1–16. <https://doi.org/10.3390/su12051947>
- Hilty, L. M., & Huber, P. (2017). Motivating students on ICT-related study programs to engage with the subject of sustainable development. *International Journal of Sustainability in Higher Education*, 19(3), 642–656. <https://doi.org/10.1108/IJSHE-02-2017-0027>
- Kędzierska, B., Magenheimer, J., Kędzierska, A., & Fischbach, R. (2013). The application and impact of ICT in education for sustainable development. *World Conference on Computers in Education*, 152–161.
- Steinberg, S., & Kincheloe, J. L. (2012). *Unauthorized Methods: Strategies for Critical Teaching*. Routledge.
- Kioupi, V., & Voulvoulis, N. (2019). Education for sustainable development: A systemic framework for connecting the SDGs to educational outcomes. *Sustainability*, 11, 1–18. <https://doi.org/10.3390/su11216104>
- Kostoska, O., & Kocarev, L. (2019). A novel ICT framework for sustainable development goals. *Sustainability*, 11, 1–31. <https://doi.org/10.3390/su11071961>
- Marouli, C., Misseyanni, A., Papadopoulou, P., & Lytras, M. (2016). ICT in Education for Sustainability : Contributions and Challenges. *International Conference- The Future Education*. <https://www.researchgate.net/publication/318851415>
- Mauricio, P., Castellanos, A., Queiruga-dios, A., & Álvarez, L. G. (2021). Inclusion of Education for Sustainable Development in Environmental Engineering . A Systematic Review. *Sustainability*, 13, 1–11. <https://doi.org/10.3390/su131810180>
- Mochizuki, Y. (2016). Educating for Transforming Our World: Revisiting International Debates Surrounding Education for Sustainable Development. *Current Issues in Comparative Education*, 19(1), 109–125. <https://eric.ed.gov/?id=EJ1128155>
- Ramaswamy, M., Marciniuk, D. D., Csonka, V., Colò, L., & Saso, L. (2021). Reimagining Internationalization in higher education through the United Nations Sustainable Development Goals for the betterment of society. *Journal of Studies in International Education*, 25(4), 388–406. <https://doi.org/10.1177/10283153211031046>
- Roy, L., Das, P., & Barman, P. (2023). Pattern of using social media and its impact on psychological well- being of school going adolescents: An empirical study. *ANVESAK*, 53(1), 74–88. <https://www.researchgate.net/publication/369550178>
- Tjoa, A. M., & Tjoa, S. (2017). *The role of ICT to achieve the UN sustainable development goals (SDG)*. Springer International Publishing Switzerland, 2, 3–13. https://doi.org/10.1007/978-3-319-44447-5_1
- Wahyudin, D., & Malik, R. S. (2019). Teaching Environmental Education for Sustainable Development: Strategies and Challenges. *Journal of Sustainable Development Education and Research*, 3(1), 51–70. <https://doi.org/10.17509/jsder.v3i1.17172>
- Zelenika, I., & Pearce, J. M. (2012). The internet and other ICTs as tools and catalysts for sustainable development: innovation for 21st century. *Information Development*, 1–16. <https://doi.org/10.1177/0266666912465742>
- Zhang, T., Shaikh, Z. A., Yumashev, A. V., & Chlăd, M. (2020). Applied model of E-learning in the framework of education for sustainable development. *Sustainability*, 12, 1–15. <https://doi.org/10.3390/SU12166420>