

## Review of Research on Sustainable Education Influenced by the COVID-19 Pandemic

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The COVID-19 pandemic has a significant impact on human life from social, economic, and environmental aspects globally. The educational dimension has also been affected in schools' regular functioning, with the temporary closure of educational institutions and the disruption of face-to-face classes. Research that focuses on sustainable education during the COVID-19 pandemic is growing. There needs to be new knowledge and innovation to turn these challenging conditions into opportunities to reshape higher education. This study aims to review research in sustainable education during the COVID-19 pandemic, categorise the study, and identify the research trends and gaps. A systematic literature review is used as a methodology to attain the research objective. The results contribute to researchers providing potential topics that need to be further analysed. For practices, this study will help educators identify the opportunities and advance the implementation of sustainable education systems during the COVID-19 pandemic.

### 1. Introduction

Education can be considered as a process for facilitating learning or obtaining knowledge, skills, morals, beliefs, and customs. Education strategies include teaching and learning, training, storytelling, discussion, and directed research. It is usually done in formal or informal settings, and any event that forms a person's thinking, feeling, or actions can be deemed educational. Sustainable development is initiated by severe local and global environmental, social and economic concerns (Chofreh et al., 2016a). This notion covers government and corporate ambitions (Chofreh et al., 2017), as well as the worldwide mission of education and research programmes. The United Nations (UN) vision and 17 Sustainable Development Goals (SDGs) show 169 comparable goals adopted by UN member states to solve some of the most critical humanity concerns within 15 years (United Nations, 2020). Education ambitions are fundamentally reflected in SDG 4 of 2030, which seeks to "provide integrated and equitable quality education and to encourage lifelong learning opportunities for everyone" by 2030 (UNESCO, 2020). In this term, in conjunction with government, civil society, and private sector efforts, education plays an important role in the necessary transformation towards more environmentally sustainable communities (Chofreh et al., 2015).

The 2030 Agenda is a worldwide and collaborative commitment, although governments bear the main duty for guaranteeing the right to quality education. It requires political will, global and regional cooperation and involvement of all governments, civil society, the private sector, youth, the UN, and other multilateral institutions in addressing educational challenges and building systems for all-inclusive, equitable, and relevant students. The United Nations Children's Fund (UNICEF) (2021) stated that as the COVID-19 epidemic broke out in 2020, a majority of countries announced that schools and institutions would be closed temporarily, which has an influence on more than 91 % of students worldwide. Nearly 1.6 billion children and young people left school by

April 2020. The worldwide pandemic has far-reaching effects that can put harsh advances in global education at risk.

The United Nations Educational, Scientific and Cultural Organization (UNESCO) launched the Coalition for Global Education COVID-19 in March 2020, a partnership between the family of the UN, civil society organisations, media and information technology partners in the design and use of innovative solutions, as a means of safeguarding children's well-being and providing them with access to continuous learning (UNESCO, 2020). In this unexpected and unparalleled education interruption, together, they allow countries to address content and connectivity gaps and provide inclusive learning possibilities for children and youth. Many in the education sector saw digital learning as the solution to the COVID-19 issue. There is, however, a great risk of this leading to an even more significant society gap, especially among students, because the provision of digital learning depends on technical equipment and skills.

From an academic perspective, a study that explicitly discusses and examines the influence of COVID-19 on sustainable education is growing. New knowledge and innovation are needed to turn these challenging conditions into opportunities to reshape higher education. This study aims to systematically review research in sustainable education during the COVID-19 pandemic, categorise the study, and identify the research trends and gaps. A systematic literature review is used as a methodology to attain the research objective. The present study is focused on sustainable education as it is a necessary educational culture change that needs to be promoted in society towards more sustainable communities. This review aims to contribute to researchers providing potential topics that need to be further analysed and help educators identify the opportunities and advance the implementation of sustainable education systems during the COVID-19 pandemic.

## 2. Sustainable education influenced by COVID-19

Sustainable education has several definitions in the literature. UNESCO (2021) defined it as a change of educational culture, which empowers learners with knowledge, skills, values, and attitudes to make informed decisions and responsible actions for environmental integrity, economic viability, and society. Unlike the non-sustainable education system that not delivers the learning process towards sustainable outcomes, sustainable education is a long-life learning process and an integral part of quality education that enhances the cognitive, social, emotional, and behavioural dimensions of learning. Nevin (2008) argued that sustainable education should have several criteria: be embedded in the curriculum in an interdisciplinary and holistic manner, share the values and principles that underpin sustainable development, promote critical thinking, problem-solving, and action in addressing the challenges to sustainable development, employ a variety of educational methods, allow learners to participate in decision-making, address local as well as global issues mainly related to sustainability issues, and look to the future ensuring that the content has a long-term perspective and uses medium and long-term planning.

The COVID-19 pandemic has had a tremendous influence on health, economy, and society (Zeinalnezhad et al., 2020). The UN stresses, especially in cases of closures and shutdowns, that quality education should be encouraged. For instance, the application of online/e-learning strategies for home learning, assigning teachers to follow their students daily or weekly, and the development of accelerated learning strategies are suggestions for improving online learning (World Health Organization, 2020). The COVID-19 catastrophe can signify the revival of society with the correct action to a situation where present and future generations are protected by an affordable education tied to SDGs (United Nations, 2020). In a century where society is judging its ability to change itself in response to pandemic problems, higher educations play a fundamental role (Leal Filho et al., 2018). To encourage sustainability initiatives, students, educators, scholars, and practitioners co-create knowledge and skills (Chofreh et al., 2016b). The development of learning activities is one of the major challenges for educators to effectively empower students to gain sustainable skills.

The COVID-19 epidemic is affecting sustainability initiatives in higher education by transforming teaching and learning methods towards e-learning. However, the results of this method are unclear as the teachers and students need to have internet access, appropriate software and hardware, and adequate technical skills. This crisis, similar to sustainability offers for education, is an opportunity to remind students of having several skills, such as decision-making and creative problem solving, which are needed in this unpredictable condition.

The rapid changes in every aspect of life, particularly in industry, caused by the spreading of COVID-19 has exposed the critical need to build resilience to face pressures, from epidemic virus, climate uncertainty to rapid technological transformation (Chofreh et al., 2020). Concerning sustainable education, online teaching related to the environmental, social, and economic dimensions of sustainability entails careful consideration of suitable content and pedagogical methods (Li and Zhou, 2018). E-learning can be an effective learning method in sustainable education (Azeiteiro et al., 2015). Lecturers who have switched to online classes should create teaching content relevant to the current crisis and ask students to reflect on the relationship that exists between COVID-19 and the problem being studied.

All the above discussions show that the COVID-19 has negative and positive influences on sustainable education. Scholars play a vital role in developing new knowledge and innovation to turn these challenging conditions into opportunities to reshape sustainable education. However, to date, there is a lack of study that systematically review how far the research in sustainable education and COVID-19 develops. Therefore, this study will address this limitation by categorising the literature and exposing the important research streams for future works.

### 3. Review method

The documents search is conducted in the Scopus database with the keywords “Sustainable” & “Education” & “COVID-19”, limited to the article, conference paper, and review in English. The search results show 174 documents within the period of 2020 to 2021. The current study focus is mainly focused on the review and empirical studies related to the influence of COVID-19 on sustainable education. Therefore, the documents screening and selection processes are in line with this objective. Figure 1 shows the detailed flow of the study.

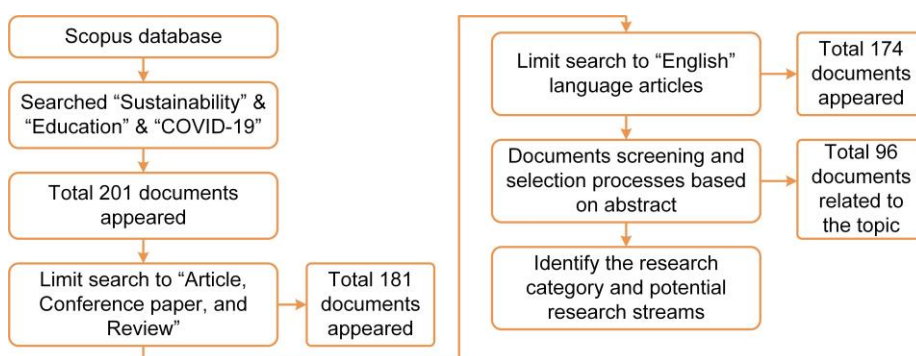


Figure 1: Research flow

### 4. Results and discussion

The literature search shows 174 documents appeared in the Scopus database. However, not all publications can be considered as some of them are not related to the topic. After the research analysis process, only 96 scientific papers are closely related to sustainable education and COVID-19. These papers are published from 2020-2021 in various academic journals and conferences, among others are the Journal of Cleaner Production, Sustainability, Higher Education, International Journal of Environmental Research and Public Health, and Journal of Management Education. Table 1 provides an overview of research trend in sustainable education and COVID-19. Current research in sustainable education and COVID-19 can be classified into four groups: the impact of COVID-19 on the education system, learning methods, education programme, and public education. The explanation of each group is provided below.

- The impact of COVID-19 on the education system

The studies are available in this group focus on the impact of the COVID-19 pandemic on education. The COVID-19 crisis has brought many inequalities in the education system ranging from access to broadband and computers required for online education, the enabling environment needed to focus on learning, to inequality between resources and education necessities. Donnelly et al. (2021) stated that the pandemic had brought significant disruptions to the education system across Europe, such as school closures and emergency remote learning that causes a lack of personal interaction between teachers and students. In another report, Di Pietro et al. (2020) observed that physical school closure and remote learning caused by the crisis poses other problems, including less time spent in learning, stress symptoms, a change in the way students interact, and a lack of learning motivation.

Nine research sub-categories have been identified from the literature analysis, including quality of education, exploring students satisfaction, development of future education strategy, personality behaviour, the response of educational institutions, the financial impact on educational institutions, issues and challenges, new education policy, and support from stakeholders. In this category, research concerning the effect of the crisis on the quality of education and the response of educational institutions in facing the pandemic got the highest amount of publications, followed by research related to personality behaviour. In contrast, a study exploring new education policy and support from stakeholders is still narrow. Therefore, these two research sub-categories can be potential research streams to be investigated by scholars. The COVID-19 pandemic also influences how education institutions do their business, starting from the students' recruitment process, teaching and learning

processes, until students' graduation process. Research scrutinising a new business model is needed to identify the components of the education value chain that should be improved or changed. Perhaps more importantly, the academics might analyse the value offered by education institutions during the crisis.

*Table 1: Trend of research in sustainable education and COVID-19*

Category	Sub-category	Amount of study	Research scope
The impact of COVID-19 on the education system	Quality	5	Regional National
	Students satisfaction	2	Higher education
	Future education strategy	2	Lower education
	Personality behaviour	4	Early childhood care
	The response of educational institutions	5	General scope
	The financial impact on the institutions	2	
	Issues and challenges	2	
	New policy	1	
	Support from stakeholders	1	
	Learning methods	Dissemination of digital technologies	10
Flipped classroom		1	
Learning management systems		1	
Online learning		25	
Teachers and students experience		1	
Virtual and social networks		8	
ICT skills		3	
Integrative teaching		1	
Open education development		1	
Educational programme	Sustainability integration into courses	2	
	Teaching development	2	
	The connection between education and SDGs	2	
Public education	Professional development	2	
	Public participation	1	
	Social fair and pressure	1	
	Specific sustainable education	1	

- Learning methods

The COVID-19 pandemic forces change in learning methods from offline to online learning, whereby teaching is undertaken remotely and on digital platforms. This method is quite challenging as it requires teachers to create innovative e-learning methods and students ready to adapt and show high interest in learning. Both educators and students are among those who felt the heavy impact of those changes as they need to adapt to new social, health, and economic conditions. Prasetyo et al. (2021) mentioned that the COVID-19 crisis can be seen as an opportunity to expand the use of technology in education, in line with the fifth industrial revolution notion in which there is expected to be a massive shift in the interaction between people and machines. People will grow accustomed to the current e-learning method, and it will become the new learning culture in education. This adaptation is viewed positively as readiness for change is required to find effective problem-solving strategies. Therefore, readiness for change at the individual and organisational levels play a vital role in responding to uncertainties and evolving environmental changes.

Research in the learning methods has been focusing on nine sub-categories: dissemination of digital technologies, flipped classroom, learning management systems, online learning, investigating students and teachers experience, virtual and social networks as a media for teaching and learning, ICT skills, integrative teaching, and open education development. The literature review indicates that online learning got the highest amount of study compared with other sub-categories, followed by research concerning the dissemination of digital technologies for teaching and learning processes. In this regard, the remain seven sub-categories are potential research streams that can be explored by academia. New potential research streams will be focusing on issues, challenges, and opportunities from the available learning methods that can be avoided or reaped by students and teachers. Another topic that can be potential research is focusing on verification and evaluation of knowledge. Verification and evaluation are among the main components in the learning process, which aimed to identify the achievability level of learning goals. Scholars may assess the achievability level of e-learning goals and the effectiveness e-learning process during the pandemic.

- Educational programme

The COVID-19 crisis also impacts sustainable educational programmes globally. The educational programme needs to adapt to the current condition. In this case, the educational institutions need to define some actions to address the challenges faced. The existing study in the educational programme category concentrates on three research streams: sustainability integration and pandemic consideration into specific courses, teaching development, and analysis of the linkage between education, pandemic, and SDGs. Based on the literature analysis, research in this category is considered limited. There is a need for a further study focusing on identifying actions to implement the new educational programmes, such as the establishment of an integrated school platform for distance learning, blended learning for students from several levels, the application of “just in time” student assessment to measure the extent of learning losses and identify the students who have fallen behind and may need additional targeted support. All these new educational programmes would help the educational institutions to mitigate the challenges while also building a more resilient system that can withstand the future crisis. In addition, a study investigating the issues and challenges of implementing the new educational programme would be beneficial for academics and practitioners from education institutions.

- Public education

Education for society is also a part of sustainable education that has been impacted by the crisis. COVID-19 threatens the cohesiveness of human relationships: lockdowns create a fractured world of isolated individuals experiencing fewer opportunities to congregate than ever before. The consequences could be dramatic, exacerbating the type of atomised society. Therefore, international and local governments need to support society through, among others, personal investment, state subsidies, and private sponsorship, to see civil society continue to be united by common values and shared experiences.

Research in the public education category is closely related to human resource development as human resource is a highly essential factor in sustainable development. It is due to a country's development requires not only the natural, materials, and financial resources, but also the human resources who have the capability to utilise the resources. Research in this category has been focusing on four sub-categories consisting of professional development, public participation, social fair and pressure, and specific sustainable education. However, research in this category is still rare, which needs further research development. The main area of study in public education might be focusing on sociological factors such as social responsibility and health safety influencing public education during the pandemic.

The scope of the existing research in sustainable education and COVID-19 is in the boundary of regional, national, higher education, lower education, and general content. This research scope is valuable for academics and practitioners to explore some issues in a particular area. However, there is also a need to observe several emerging issues in a global scope. Research covering the impact of COVID-19 on sustainable education in the global scope would be advantageous to give an overall perspective of the issues under investigation and explore more complex problems caused by the pandemic.

## 5. Conclusions

The key objective of this study is to review the recent research development in the influence of the COVID-19 pandemic on sustainable education. To achieve this objective, this study conducted a systematic review of selected articles from the Scopus database. The key findings revealed the identification of future studies that are potential for further research development in the field of sustainable education influenced by the COVID-19 pandemic. Research in the impact of COVID-19 on the education system can be concentrated on new education policy, support from stakeholders, a new business model to identify the components of the education value chain that should be improved or changed, and the value offered by education institutions during the crisis. In the learning methods category, scholars can observe issues, challenges, and opportunities from the available learning methods, and the assessment of the achievability level of e-learning goals and the effectiveness e-learning process during the pandemic. Research in educational programmes can be focused on the identification of actions to implement the new educational programmes. In the public education category, scholars can investigate sociological factors such as social responsibility and health safety influencing public education during the pandemic. A variety of new research in these four research categories can generate new strategies and innovations for education systems, which can help educators identify opportunities and advance the implementation of sustainable education systems during the pandemic.

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