

Green Technology in Education and Sustainable Development

Dr. Sukumar R

Department of Electronics and Communication Engineering, Faculty of Engineering and Technology, Jain (Deemed-to-be University), Bengaluru, India

Email Id- r.sukumar@jainuniversity.ac.in

ABSTRACT: *Technology has affected the society in various aspects whether in a positive or in a negative way. It helped in the expansion of advanced economy just like current global economy. From year 2005 to 2014 many nations have emphasized on sustainable growth of education sector. Here the aim of the whole process is to build a connection between research universities and their surrounding communities. This is only feasible when there is a transformation of technology towards renewable technology with green component and as a result of this environmental pollution might be prevented, which is a huge problem at current moment. Green technology is a best way to provide future generations a healthier, cleaner, and purer world. Understanding of monetary, environmental, and social sustainability, along with proposed pathway to training, teaching, and appraisal, are the focus of current evaluations of educational programs. Furthermore, it is suggested to educate the subsequent generations, with the assistance of green awareness campaign in this regard, also students should play an effective role in making policies and decisions of their universities and institutes. Thus it can be implemented by resolutions of universities. For the development and promising opportunities for the next generations, a bridge between the society and educational institutions can be built.*

KEYWORDS: *Education, Environmental, Green, Sustainable, Technologies.*

INTRODUCTION

Technology is a field that focuses on applying empirical understanding of art and technology to the real world issues. Technology is a process of assembling, modifying, utilizing, introducing with different tools, systems management, and machines management to solve the issues associated outcomes. Technology has a profound impact on humans and other creatures' abilities to control and adapt to their natural environment. On the other hand, technology has the ability to create modern economies that make human life simpler and more convenient. Technological machineries produce pollution that is both needless and futile, resulting in toxic waste and a reduction in natural resources, as well as disruption to the Earth's environment. To advance every current social structure, it is common practice to compare those structures with "ideal systems," which should be ideal under all possible circumstances.

The zero green gas secretion to the atmosphere and preservation is a function of these ideal resources and these technologies are environmentally friendly. For structure, restoration, and growth, today's smart landscapes need long-term technologies. Green roofs, zero-energy homes, natural ventilation systems, and stormwater drainage. Infrastructures such as sustainable metropolitan drainage networks, green energy sources such as biogas extracted from manure and sewage, and low-irrigation landscaping are examples of sustainable infrastructures. City buses and trains that operate on alternative energies, improved access to public transportation, integrated motorbike paths and walkways, charged or unpaid tolls for personal car use, electricity generation, rainwater harvesting, roof and urban planting methods, farmscrapers, cultivator market places are all examples of sustainable transportation systems.

Green Technology is evolving as a therapeutic technology for the world in the current state of technology and connectivity, minimizing environmental reparation while making human existence more pleasant. Green innovations, on the whole, prevent any sort of environmental damage. This is in the course of making a greater contribution and making the lives of the people easier and safer. Green Technology is said to boost farm production and profitability while reducing environmental destruction and safeguarding natural resources. Green technologies can be used to complete leading-edge research in current fields such as automobiles, the internet, atomic and nuclear energy, computers, aircraft production, nanotechnology, telecommunication technology, and space. This sustainable technology has the potential to become a replacement for possible human needs.

Every nation's backbone is quality education, and it's a part of the Sustainable Development Goal, which seeks to ensure inclusive and quality education and encourage educational opportunities to everyone. Education is critical to the potential living standards of the people and the world's long-term viability. In general, emerging digital developments are transforming education in both learning and educational contexts. The following facets of each of these main developments and how they are transforming schooling can be summarized: our educational goals and objectives, educational ecologies and contexts of learning, learning processes, teaching processes, and educational governance and regulation (Figure 1).



Figure 1: Five Drifts of Education and Technology in Sustainable Growth.

Technological progress has resulted in unintended fatal and lethal consequences that are harmful to the environment. The main thing now is the preservation and protection of ecosystem. Education is the best way to become conscious of expanding human resource. Environmental education is the process of instilling and fostering environmental values, expertise, and awareness. There is a need of creative technologies in the manufacturing of cars and heavy vehicles to make transportation safer and more convenient. Academicians have the critical importance in this respect for developing and molding students for this format. New technologies will aid in the dissemination of green consciousness and make it more practical and available for everybody. The reliance on traditional energy-generation methods must be phased out. Green aspects must be included in any field, such as design, engineering, and product innovation. Green philosophy must be applied in order to grow and nurture world. Nature's wrath can be seen in the form of tsunamis, hurricanes, ozone loss, and other natural disasters. Academicians and students can overcome the problem with their material, abilities, and experience by taking concrete steps toward this campaign. Green education fosters philanthropic ideals and generates enthusiasm among students.

Climate change, resource depletion, food and conflict problems, water issues, ecology, poverty-caused emissions, and infections are all common threats that the current and future generations face. Academic universities and colleges are leading major initiatives to help students develop expertise, awareness, and behaviors that can help them combat these issues. Academicians' position and duty in implementing, exchanging, and conveying knowledge and intelligence to their students are often critical. Students are taught

about the realistic side of development, and knowledge of future stability. Agribusiness, organic farming, the environment and air, ecological hospitality, green medicinal governments, and green transportation are all examples of unique and realistic topics. Green nanotechnology is having an effect on renewable technologies right now. It offers an alternative method for reducing and reusing waste materials without damaging the environment. It is based on the three R's: Reduce, Reuse, and Recycle. Developed educational systems have a critical role to play in implementing green thinking and green innovation since they are the hubs for disseminating information and actualizing ideas. To make the land possible and safe, instructors, leaders, administrators, and learners should shake hands with each other and strive to improve the use of electricity and more use of e-material rather than printed materials to reduce carbon emissions[1].

1. Green Education Programs:

The best way to grow or build knowledge in the minds of future generations is via a Green Education programme. This recognition can be accomplished by Green Technology education and promotion. Educational sustainable development has been described in the United States for the years 2005–2014. From primary school to higher education, a sense of values and a hope for the future world must be implanted. The United Nations Educational, Scientific, and Cultural Organization (UNESCO) has identified crucial points where education and literacy are at their highest levels. Higher education and academia play a critical role in ensuring sustainability and environmental conservation. Green technologies and the green economy, when used creatively, have the potential to become a strong correlation between society and its environmental issues. In order for students to engage with society, public universities must teach them the ideals and culture of that social system. Student has the potential to become reflective practitioners of social problems, presenting better alternative solutions to society. Teachers, staff, and students will start making small commitments to sustainability by applying the green education program's principles. Such a small benefit will result in a significant improvement in energy-efficient and environmentally friendly administrative processes, as well as a reduction in waste production and carbon emissions. Students are included in new policy decisions and declarations because they are an important indication in the coming generations[2].

In today's world, social media is gaining momentum as a visual platform for higher education to raise environmental awareness among academics and students. It has the ability to raise public consciousness about academic universities' and organizations' efforts to green society. In the age of social media, only a small amount of research has been done about how to use social media platforms like Twitter or Facebook to raise awareness about environmental sustainability among academics, students, and higher education administrators. It seems to be a waste of potential, since social media can be seen as the most effective and successful means of communicating the importance of environmental sustainability consciousness. As a result, this research field has a lot of promises in terms of how it can be used to benefit environmental protection.

Green training provides the dealing with ecological demands of time necessitating use of alternative development processes and providing a commitment to and awareness of the environment. Examples include population growth, erosion, and climate change. Although the value of a green education is undeniable, when it comes to the future of sustainable education, there are some concerning developments. As per a survey, there seems to be an increase in interest in such an experience, along with prospects for students pursuing ecological awareness. However, there is fear that a more common climate change denial becomes, the less progressive the ideas for how to address present suffering relationship with world. The FDA-owned term "clean" does not always imply that products were manufactured in a sustainable manner. Furthermore, these items are becoming increasingly costly, making them less accessible to the public. Most people seem to agree that the potential of green learning looks promising because of the availability of innovative opportunities at colleges, new careers oriented toward addressing environmental issues, and growing popular exposure to environmental issues. However, it appears that the alternatives to ecological challenges are becoming less progressive, offset by market pressures and some regulatory intervention. Green education students, perhaps, inspired to not only defend the funds for these services, but also to mobilize against the policies that threaten climate and deny that anything radical needs to improve[3].

ESD is an innovative education that will solve present and future global problems by fostering a more inclusive and prosperous community. ESD is an example of high-quality schooling that is responsible for environmental integrity, financial impact, and societal shaping of coming generations. ESD also urges all to develop the requisite expertise, talents, behaviors, and ideals to secure a long-term future. The development of the Ministry of Energy, Green Technology, and Water has accelerated Malaysia's green technology transition, which had been moving at a snail's speed. In order to achieve the economic paradigm, change toward Project 2020, the Ministry also plays an important role in supporting green technologies in all modes of growth. As a result, the government has taken the lead by participating in the survey of green tech education in pre-school, elementary, and high education. One example of how renewable technology is used in real life is that people want to follow green activities as much as possible by starting with the simplest thing. For example, rather than purchasing a new bottle of drinking water, practice by taking one from home. Furthermore, instead of using Styrofoam or non-environmentally safe plastic containers to transport food, people are encouraged to bring their own food.

It is critical to effectively inspire people to live a green lifestyle. As a result, the 'going green' philosophy will be implemented using technology like combustion and manure, which can help to minimize pollution while still minimizing its consumption, recycle possibly recyclable goods, and compost kitchen waste to nurture the land. One of the changes toward the green paradigm is weather change, resource scarcity, and globalization's influence. As a result, TVET (Technical and Vocational Education and Training) responds to the challenges by applying sustainable capabilities that can meet business demands while also ensuring the long-term viability of social reforms. In TVET, emerging green skills are used to build new competencies by using new green approaches. Environmental education is primarily concerned with developing awareness of nature and natural environments through scientific programmes, as well as forming an understanding of the issues, environmental principles, and dynamic relationships between natural and human components. As a result, educational institutions such as schools are appropriate for educating and shaping environmental behaviors among pupils, resulting in more valuable human resources in the future who are more serious with environmental protection and restoration. This template is used to develop an appreciation for nature and natural resources. Furthermore, conventional learning techniques is changed in order to improve student's environmental awareness by enabling them to recycle and reuse materials in an attempt to incorporate green technology components.

In terms of working for renewable and energy-saving solutions, educational programmes are the cornerstone. As a result, teaching methods takes the lead in this direction, as they are empowering other sectors to go green. In order to provide instruction contents, academic institutions use a lot of energy-consuming technologies and facilities. As a result, school systems or programme contents have a correlation with energy. The term "green" is now commonly used to describe emerging technologies and goods that help to ensure the natural environment's long-term viability. An examination of the current IS literature reveals that IS researchers employ a variety of terms when combining the terms "green" and "IS." Green Information Technology is a new field, and the implications for industry, society, and the world in the twenty-first century are becoming more pressing. The nearly widespread use of Information and Communication Technologies (ICT) has a large carbon footprint.

Going green helps the environment by increasing energy consumption, reducing greenhouse gas emissions, using fewer toxic materials, and fostering reuse and recycling. Quantifying the environmental impact of communication and information technologies is an essential step toward reducing its impact. A range of priority areas and events are included in environmentally friendly IT (Figure 2).



Figure 2: Green Information Technology Activities and Areas of Focus [4].

As people become more reliant on electronic records, data centres are rapidly expanding in scale and number. The rapid adoption of Internet communications and media, the computerization of business processes and software, and disaster recovery have all contributed to this development. In addition, several federal, state, and local government departments have implemented e-government policies that include use of the Internet for public records, news, purchases, homeland security, and science computing. Many of the current focus of the green tech revolution is on data centres, which consume a lot of energy. Green IT creativity will pave the way to ICT sustainability by using the following implementations in computer technology shown in Figure 3[4].

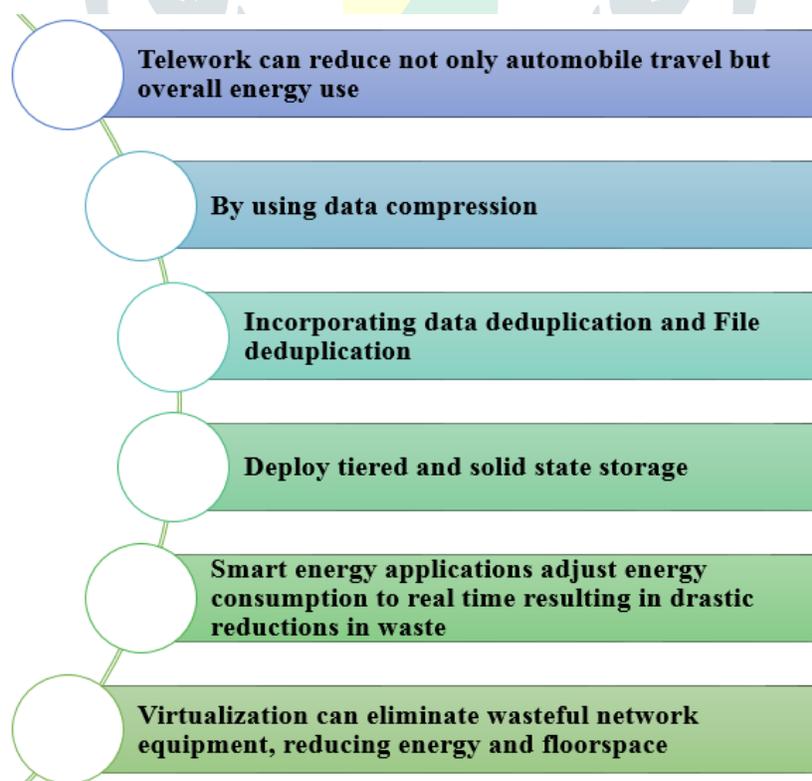


Figure 3: Applications of Information Technology as Green IT Innovation[4].

LITERATURE REVIEW

Marmelo V. Abante et al. discussed the needs to build up the TVET Schools student with Green Information Technology information over orthodox education and directed with Green Information Technology Teaching prospectus in Philippines. Global warming is a phenomena caused by a proportion of carbon dioxide (CO₂) levels in the atmosphere. Information Technology is one of the areas that has contributed at least 3% of CO₂ emissions, and the percentage is increasing on a daily basis as Information Technology has become one of the most important aspects of human life. Green Information Technology was adopted in order to save the environment. However, it has been noted that Green Information Technology in the Philippines is still moving slowly and is considered to be in a worrying state. TVET Colleges are a form of Technical and Vocational Education and Training institution that was created with the goal of producing thousands of practitioners. These prospective experts are trained in Green Technologies in order to ensure the global environment long-term viability.

Alexandra Klimova et al. have shown appearance of green information & communication technology and ICT for greening particularly in teaching. The study also looked at various frameworks for incorporating environmental sustainability into ICT curriculum content, as well as emerging trends and future directions in the improvement of teaching initiatives in the region. For several countries, environmental sustainability and energy production have been primary concerns. Knowledge and communication systems are one of the areas that relate to the transition to a sustainable society. As a result, green ICT has gotten a lot of interest from businesses in the face of quickly evolving technology patterns. Despite the high demand for trained professionals with considerable experience in green ICT, it is recently being accepted in ICT curricula. The article have been written for academics and researchers working in the fields of environmental growth and green technology, with the aim of developing educational programmes to meet the social need for sustainability[5].

Kavita suryawanshi in her study has shown that Green ICT rehearses and consciousness is less amongst the scholars of the designated learning institutes in Pune India. The author has proposed strategies to boost Green ICT understanding in higher education institutions based on the results review in order to address some of the more difficult problems relating to future sustainability. Despite its importance in the education sector, information and communication technology (ICT) have a harmful consequence if not used properly. The Earth's incredible weather change in recent years is a sign that it is ill. As part of their growth agenda, India has accepted the concept of sustainable growth. Any person working in the field of ICT is expected to be a trend - setter in the field of ICT conservation, which is rapidly becoming such a field of research. The aim of this paper is to suggest Green ICT approaches for higher education institutions to use. The findings revealed that students at the selected education institutions in India are less aware of green ICT practices, and suggested strategies to raise awareness of GICT (green information and communication technology) practices within educational institutes.

Vânia G. Zuin et al. presented the newest viewpoint for learning and capability building on green chemistry and towards sustainable chemistry representing their vital role to transmute human resources, established and infrastructural sites in all subdivisions on a great scale, to create operative cutting-edge information that can be materialized in greener and more maintainable goods and procedures in a stimulating realm. Green chemistry education (GCE) and sustainable chemistry education (SCE) have gotten a lot of coverage in recent times in this sense. Conversely, there are still holes in knowledge of the historical origins of green chemistry (GC) and sustainable chemistry (SC), their discrepancies and parallels, and the ramifications of incorporating this clearer sense into teaching methods. Based on current efforts, additional work is required on the part to incorporate GCE and SCE into chemistry and other learning curriculum content and training, including gathering additional best practices and forging new and expanded relationships at the national, regional, and global levels.

Etika Ariyani et al. focused on literature review by extracting the information on green growth, expertise, learning, and mining. The aim of this research is to better understand economic development and improve the synergy between the climate, education, culture, and innovation. Sustainable engineering education, from concepts to architecture, in the twenty-first century requires “greening” the engineering program. Sustainable economy has viewed as a prominent tool for developed countries to pursue long-term sustainability. It entails promoting sustainable growth and sustainability while guaranteeing that intangible resources continues to

provide all the energy and environmental amenities that human depends on for their survival. According to the findings, sustainable economic development can be accomplished by using renewable environmental solutions to protect and restore environmental sustainability and ecosystem stability while fulfilling people's needs with the least amount of environmental damage possible.

DISCUSSION

Green information technology-related undergraduates course and programmes are also in their infancy. It is hoped that with time, this will expand in terms of the amount of programs, projects, sustainable computing technologies, and simulated applications that can be used to measure the carbon footprint in the design of sustainable technology. The five strands of science and training in economic development, the importance of education in green tech, the various projects applied for green education and their sustainability, and the uses of information technology as green, and its advancement are all covered in this report. Educational programmes are the key, according to the study, when it comes to promoting towards renewable and energy-saving measures. As a result, educational approaches takes the lead in this path, as they are leading other industries to go green. Green environmental innovations are concerned with sustainability that leads to less ecological degradation. Through the use of renewable energy would have a significant positive effect on the health and safety efficiency as well as its ecological consequences.

CONCLUSION

It's a known fact that the global development and human well-being is positively impacted by education. There is a need of revamped educational environment to lead each one into a stable and productive future if everyone wants to end unhealthy thought and practices. According to the findings of this report, environmental curriculum-related models are ideally suited to students in line with sustainable development education as well as the incorporation of green technology elements to address environmental problems. Although many people agree that the future of green education is bright because of the availability of innovative opportunities at colleges, new careers oriented toward addressing environmental challenges, and growing public awareness of environmental issues, it also seems that alternatives to environmental challenges are becoming less progressive, offset by market pressures and some regulatory intervention. Green education students, perhaps, will be inspired to not only maintain support for these services, but also to mobilize against activities that affect the climate and deny that anything radical needs to improve.

REFERENCES

- [1] "The status quo of green-building education in South Africa : review article," *Acta Structilia*, 2015.
- [2] A. Sbardella, F. Perruchas, L. Napolitano, N. Barbieri, and D. Consoli, "Green technology fitness," *Entropy*, 2018, doi: 10.3390/e20100776.
- [3] Jeremy, "What the Future of Green Education means for Green Jobs," *US green Technol.*, 2013.
- [4] A. Mishra, A. Yazici, and D. Mishra, "Green information technology/information system education: Curriculum views," *Tech. Technol. Educ. Manag.*, 2012.
- [5] A. Klimova and E. Rondeau, "Education for cleaner production in Information and Communication Technologies curriculum," *IFAC-PapersOnLine*, 2017, doi: 10.1016/j.ifacol.2017.08.1792.