
INNOVATIVE PEDAGOGIES -TRANSFORMATIVE LEARNING FOR SUSTAINABLE DEVELOPMENT

“Education can, and must, contribute to a new vision of sustainable global development”

(UNESCO, 2015)

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ABSTRACT –

Sustainability education in the form of Education for Sustainable Development (ESD) has gained popularity in light of the 2030 Agenda for Sustainable Development. ESD is also featured as one of the 17 sustainable development goals in 2030 agenda and is widely recognised that quality and sustainable education is a key enabler for all the SDGs. It is generally agreed that a paradigm shift from a transmissive to a transformative mode of learning for sustainable development is imperative which will empower the learners by enhancing their awareness and understanding for a sustainable future.

It has been felt that the growing recognition of the need for sustainability education now needs to be more concrete and action oriented, alongside various issues present in the education system to not only deliver sustainable education but also to achieve sustainable education. In this context my paper aims to discuss the significance of the core principles of ESD and the inclusion of the key innovative pedagogies in the education system, emphasizing on participatory and transformative learning methods for sustainable development (ESD) which will equip individual students with the knowledge, skills and values needed to create a sustainable future and help learners to become active agents of change for sustainability.

KEY WORDS– sustainability education, transformative pedagogies, participatory pedagogies, innovative pedagogical approaches. Interdisciplinary approaches.

INTRODUCTION – EDUCATION FOR SUSTAINABLE DEVELOPMENT

Sustainable development is the need of the hour. It is a higher order social goal that challenges the growth ethics and increasing inequity of modern life. (Kumar & Mohapatra, 2021). It has been discussed that the sustainable development should meet not only current needs but also the needs of the future generations. (Sohae & Farsad, 2025). Education is a fundamental human right and a key driver of sustainable development. (Gupta et al., 2021 as cited in Lunayach & Khichar, 2024). Education for sustainable development is one of the key topics of the 21st century. It sees education as the key to unlocking progress in all the global development goals. (UNESCO, 2017). The urgency of integrating sustainable development principles within educational frameworks has been underscored by global agendas, including the United Nations Sustainable Development Goals (SDGs), which place significant emphasis on quality education as a pillar for achieving sustainability. (UNESCO, 2020). UNESCO, the UN's leading agency on

Education for Sustainable Development (ESD) defined it as a 'key enabler of all other SDGs. (Huang, Pagano & Marengo, 2024).

Sustainability education in the form of Education for Sustainable Development (ESD) has gained traction in the light of the 2030 Agenda for Sustainable Development. ESD is also featured as one of the 17 Sustainable Development Goals (SDGs) in 2030 Agenda which covers the 5 key 'capitals' of sustainability (Economic, political, social, cultural and environmental). (Sandri & Holdsworth, 2021 as cited in Hui & Seow, 2022). Sustainable Development Goals (SDG -4) aims to ensure inclusive, equitable and quality education for all by addressing disparities in education access, quality and outcomes, and promote lifelong learning opportunities. (Gupta et al., 2021 as cited in Lunayach & Khichar, 2024).

ESD prepares learners to understand and respond to the changing world and is predominantly committed to enhancing students core competencies in transcultural understanding and cooperation, participatory skills, foresighted thinking and a capacity for compassion, empathy, solidarity, self-motivation and motivating others. (Martín-Garin, et al., 2021). It advocates for learning that is cognitive -improving how we think and understand information. Socio-emotional -Building social skills, empathy and emotional intelligence. Behavioural – encouraging positive actions and behaviours. (UNESCO, 2024). ESD enhances students' understanding and capacities for ensuring economic viability, social justice and environmental integrity. (Hallinger and Nguyen 2020 as cited in Hui & Seow, 2022).

Education for sustainability (EFS) aims to provide a pedagogical platform to support students' skills in designing innovative practices to implement in their entrepreneurship. (Sohae & Farsad, 2025). The Government of India (GOI) has initiated and integrated the principle of 'sustainability' in its various policies and developmental programmes. (Kumar & Mohapatra, 2021).

INNOVATIVE PEDAGOGY – CONCEPT AND SIGNIFICANCE

The ideology of progress and growth deep rooted in Western culture, not only justify earth overexploitation in the name of continuous growth but also affect the creation and collective construction of visions and narratives of a different and sustainable future. (Lagnesjo, 2015 & Howlett et al., 2016 as cited in Fillo et al., 2018). The UN Decade of Education for Sustainable Development framework stresses the need for high quality education for SD, requiring a multi method approach through the use and combination of different pedagogical approaches. (Lozano et al., 2017). The necessary means and ways for Sustainable Development are recognized through education. (Kumar & Mohapatra, 2021). The incorporation of SD into curricula to achieve the sustainable goals and targets calls for pedagogical innovations that provide interactive, experiential, transformative and real-world learning. (Lozano et al, 2017).

There is no single meaning of the term pedagogy and it has different connotations across cultures. (Peterson, Dumont, Lafuente & Law, 2018). The term pedagogy finds its roots in the ancient Greek word 'pedagoge' and in ancient Greek a pedagogue was an individual responsible for educating children and the youth. This eventually gave rise to the word pedagogy. (Ayantunji, Olatoye & Ileuma, 2024). Pedagogy is a teaching method and it is adopted by a teacher, which

involves teaching styles, theory, assessment and feedback. (Nanjundaswamy, Baskaran & Leela, 2021). It can refer to all levels of teaching, from nursery and primary, all the way up to higher education. (Ayantunji, Olatoye & Ileuma, 2024). Pedagogy is defined as 'the art and science of teaching'. The choice of a pedagogical approach depends on the target and the specifics of the situation in which they will be used. (Lozano et al., 2017).

Innovative pedagogy has emerged as a cornerstone of modern education aiming to foster critical thinking, creativity and problem solving among learners. (Muniandy & Abdullah, 2023; Valle, 2024 as cited in Awang et al., 2025). It encompasses a range of teaching strategies that transcend traditional boundaries including experiential learning, project-based approaches, collaborative endeavours and technology-oriented learning. (CV, Ajayan, Ruskin & George, 2024). Constructivism serves as a foundational theory supporting innovative pedagogy emphasizing active engagement, construction of knowledge through personal experiences, prioritising hands-on learning, collaborative projects, and problem-solving activities. (Diddi & Nirappel, 2023). Innovative pedagogies are not merely supplemental enhancements but fundamental elements of effective teaching and learning practices in modern educational settings which empower educators to actively engage students in the learning process by accommodating varying learning styles, and cultivate inclusive and empowering learning environments. (CV, Ajayan, Ruskin & George, 2024).

Mezirow's transformational learning theory explains that the value of connecting education for sustainability and transformative learning is that community engagement and the ability to deal with complexity and uncertainty are pursued. (Fillo et al., 2018). These innovative pedagogies characterised by their focus on critical thinking, collaboration, technology integration and real-world application, not only enhance academic achievement but also cultivate a deeper sense of sustainability and global citizenship among learners. (Ayantunji, Olatoye & Ileuma, 2024). Education is continuously evolving to adopt innovative pedagogy shifting from traditional lecture-based instruction to learner-based instruction to learner centred, competency based and technology integrated approaches. (Muniandy & Abdullah, 2023; Valle, 2024 as cited in Awang et al., 2025). Higher education sector is an important player/instrument in introducing innovative approaches to achieve sustainable development. (Kumar & Mohapatra, 2021).

The innovative pedagogies encompass the following characteristics. (Diddi & Nirappel, 2023).

1. Changing Nature of Knowledge
2. Technological Advancements
3. Diversity in Learning Styles
4. Globalisation and Interconnectedness
5. 21st century skills
6. Student engagement and motivation
7. Lifelong learning
8. Preparations for unpredictable futures

21ST CENTURY INNOVATIVE PEDAGOGICAL APPROACHES – TRANSFORMATIVE LEARNING FOR SUSTAINABLE DEVELOPMENT

Teaching is an art that is constantly evolving and varies from teacher to teacher, classroom to classroom, school to school, platform to platform. (Chetry, Prakash & Sharma, 2023). The 21st century classrooms are being characterized as being student centred, skill based, (critical thinking, problem solving, entrepreneurialism, curiosity, imagination) and digitally networked. (Ayantunji, Olatoye & Ileuma, 2024). Therefore, to prepare young learners for the future world, it is essential to adopt and integrate innovative pedagogical approaches into today's education system. (Chetry, Prakash & Sharma, 2023) with a growing emphasis of equipping students with the necessary skills and knowledge needed to thrive in an interconnected world and to ensure sustainable learning outcomes for learners (Ayantunji, Olatoye & Ileuma, 2024).

Sustainability education should not only strive for pedagogical excellence but also the formulation of transformative pedagogies. (Hui & Seow, 2022). These pedagogies include problem-based learning, flipped classrooms and experiential learning and incorporate and integrate blended learning models, digital tools to enhance learning flexibility and personalized instruction. (Muniandy & Abdullah, 2023; Valle, 2024 as cited in Awang et al., 2025). The variation in pedagogical approaches offered is also important given the diversity of students, e.g. gender or cultural background and these diversity of approaches allows students to employ and develop different learning processes, making them grow as learners and enhancing their skills and capacities to learn and think. (Lozano et al., 2017).

Higher Education in India has undergone a significant change in the recent past with the access to Information Communication Technology (ICT), social mobility of community, increasing significance of research and diversification of the education system, have acted as accelerators of transformation. (Kumar & Mohapatra, 2021).

Participatory pedagogies are the essence of transformative learning as it promotes critical self-reflection- content reflection, process reflection and premise reflection that leads to transformed habits of the mind. (Mezirow, 1997 as cited in Fillo et al., 2018).

- 1. Experiential learning initiatives** – Experiential learning as introduced by David Kolb, emphasizes learning through experience and reflection. This approach is particularly effective in entrepreneurship education, where real world application is crucial. (Myue, 2024). This strategy immerses students in hands – on, real world experiences to deepen understanding, build practical skills and foster reflection. (Singh et al., 2024). The activities include internships, field studies, simulations, service learning projects and other immersive learning experiences. (Didi & Nirappel, 2023). NEP 2020 recommended that “experiential learning will be adopted, including hands-on learning, arts-integrated and sports-integrated education, storytelling-based pedagogy, among others, as standard pedagogy within each subject, and with explorations of relations among different subjects” (Lone & Kour, 2024).
- 2. Project Based Learning** – This approach encourages students to learn by working on real world problems and project that requires critical thinking, collaboration and creativity. (Ayantunji, Olatoye & Ileuma, 2024). PBL involves students working on extended, interdisciplinary projects that address real-world challenges or issues. This

approach promotes student autonomy, creativity, and the application of knowledge to authentic problems. (Singh et al., 2024).

3. **Problem Based Learning (PBL)** – This approach is used to help students to apply skills or knowledge to a situation with the intention of promoting meaning making and skill transfer. (Peterson, A, 2018). PBL presents students with authentic, open-ended problems or scenarios to solve collaboratively. This approach encourages critical thinking, creativity, and innovation while addressing complex issues. (Singh et al., 2024).
4. **Digital Pedagogy** – Digital technologies are revolutionizing the way education is delivered and experienced. (Krupakar & Suneela, 2024). The rapid advancement of technology has transformed the educational landscape, influencing how teachers are trained to meet the needs of diverse learners. (Rathore, K, 2024) The transformation in education through the development of ICT is overwhelming in the continuation of revolutionary support of the internet and utilization of network linked devices. (Nanjundaswamy, Baskaran & Leela, 2021). The infusion of technology in education, encompassing blended learning and the flipped classroom model, revolutionizes traditional instructional methods. (Diddi & Nirappel, 2023). The technology-oriented learning uses technology to support and enhance learning and flipped classrooms. (Ayantunji, Olatoye & Ileuma, 2024). Through the application of electronic bases unique instructional and educational modalities have emerged including the Massive Open Online Courses (MOOCs) platform, which utilizes ICT on e-materials, e-books, videos and e-transcript facilitating learning, LMSs (Learning Management System), like Moodle or Google Classroom, Simulations and Virtual Classrooms like Teach Live or virtual reality (VR) simulations, Collaboration Tools which includes platforms like Zoom, Microsoft Teams, and Slack, Websites like OER Commons or Creative Commons provide free and adaptable teaching materials. (Rathore, K, 2024). The other innovative technologies include, Digital classrooms, Blended learning model, adoptive learning system, Gamification Game Based learning, 'Web Based Presentation Tools' and 'Online Mind Mapping Tools', social media, Collaboration Tools and Mobile Apps, Digital Storytelling, Virtual Reality and Augmented Reality and digital assessments and feedback. (Nanjundaswamy, Baskaran & Leela, 2021, Krupakar & Suneela, 2024).
5. **Personalized Learning** –Personalized learning is a learner centred approach that aims to prepare instruction and learning experiences to meet individual student needs, preferences, interests, and abilities. (Singh et al., 2024). The principles and practices of personalized learning consist of Learner Profiles, Flexible Learning Pathways, Individualized instruction, Student agency and ownership, Mastery Based Progression, Collaborative Learning Communities and continuous improvements– (Krupakar & Suneela, 2024).
6. **Flipped Classroom** -This approach reverses the traditional lecture = homework format, where students learn the basics at home and work on activities and projects in the classroom. (Ayantunji, Olatoye & Ileuma, 2024). This approach is used so that the

learners can self-pace when meeting new content with the aim of promoting metacognition and self - management. (Peterson, A, 2018). In a flipped classroom model, students learn new content outside of class through prerecorded lectures or readings, allowing class time to be dedicated to interactive activities, discussions and hands-on learning experiences. (Singh et al., 2024).

7. **Collaborative learning** – It emphasises group work and peer interactions, which are also essential for entrepreneurial success. (Myue, 2024). This approach encourages students to work together to achieve a common goal, promoting teamwork, communication, problem-solving skills. leadership and negotiation skills. (Ayantunji, Olatoye & Ileuma, 2024). E.g. Interdisciplinary teams, networking opportunities, Think Pair Share, Group discussion. (Myue, 2024).
8. **Green Education-** Green education for sustainable development is a crucial element in shaping a future where environmental preservation and human well -being go hand in hand. (Lunayach & Khichar, 2024). It is an instructional approach focussed on educating individuals about environmental issues, ecological principles and sustainable practices and it plays a critical role in cultivating environmentally literate and responsible citizens capable to actively participate in environmental conservation and sustainable practices. (Akinsemolu & Onyeaka, 2025). India has been proactive in integrating green education as part of its national curriculum recognising that sustainability is not just an environmental issue but also a social, cultural and economic one. (Lunayach & Khichar, 2024). The Government of India (GOI) in order to promote the concept of sustainability made Environment education (EE) compulsory in formal education, ranging from primary schools to higher education institutions following the landmark judgement passed by the Supreme Court of India in 2003 regarding environmental education. (Kumar & Mohapatra, 2021) India's national initiatives such as the National Green Corps and the Green School Programme have played a pivotal role in embedding sustainability into the educational framework and inspiring students to become environmental advocates and change agents in their communities. (Ministry of Environment & Forest and Climate Change, 2020 as cited in Lunayach & Khichar, 2024). Environmental education has been further categorized into 'Eco -justice and Community' and 'Place -Based environmental education'. (Lozano et al., 2017).
9. **Value Based Learning** – The role of values has been identified as crucial for creating transformative shift towards sustainability and sustainable development. It presents a crucial shift for education and future generation as a whole. (Huang, Pagano & Marengo, 2024). The concept of value education could be traced back to Confucius, Aristotle in the ancient world to Abu Al Ghazali and Thomas More in the medieval world and in the modern educational theory through the works of John Dewey, Lawrence Kohlberg and Richard S. Peters. (Lovat, 2011). Value based education was developed and founded by Dr. Neil Hawkes in 2006. It underpins educational settings with universal positive human values such as respect, compassion, humility, trust and integrity to create a

transformational shift in the way that students learn. (Huang, Pagano & Marengo, 2024). The various strategies/ approaches such as Inculcation Approach, Moral Reasoning Approach, Awareness Approach, Value Clarification Approach and Evocation Approach can be used as effective and useful means of imparting value education to students. (Castro, 2024). The few key enablers for sustainability education which can be integrated within the VbESD frameworks are active engagement and social learning, democracy, student involvement and student- centred learning, purposeful deep learning, Interdisciplinarity and transdisciplinarity, affective education. (Huang, Pagano & Marengo, 2024). In this context NEP 2020 extends its vision of value- based education to higher educational institutions by encouraging universities to incorporate value education courses and emphasise the development of character and ethics in the learners. (Rai, Pallavi & Singh, 2025). The key outcome of Value based education is the development of ethical intelligence personal holistic competence (PHC). (Huang, Pagano & Marengo, 2024).

IMPLICATIONS ON THE LEARNERS -

The 21st century pedagogies have a lot of implications for learners of all ages.

- Its adoption in education heralds a transformative shift with significant implications for their sustainable learning journey. (Ayantunji, Olatoye & Ileuma, 2024).
- With the inclusion of the pedagogical approaches in the educational system students acquire other transversal competencies and skills like, learning independently, problem solving ability, collaborative learning, clearly identifying their learning objectives and time management skills. (Martín-Garin, et al., 2021).
- This transformative shift can be brought by engaging with pedagogical approaches that emphasise critical thinking, collaboration and real-world application, which would empower the learners in developing essential skills for navigating an ever-changing global world. (Ayantunji, Olatoye & Ileuma, 2024).
- By grounding innovative pedagogy in experiential learning, educators can create learning environments and opportunities that promote active reflection, application of knowledge, development of practical skills and a holistic understanding of the subject matter (Diddi & Nirappel, 2023).
- The implications and outcome of the 21st century pedagogy for sustainable development are it improves quality of teaching, encourages cooperative learning environment, eliminates monotonous learning, encourages self-paced learning, improves teacher learner communication. (Ayantunji, Olatoye & Ileuma, (2024).

CHALLENGES –

Despite its various potentials, innovative pedagogy faces systemic barriers that hinder its effectiveness in real -world applications (Lozano et al, 2017, Fillo et. al, 2018 & Awang et al., 2025) -

- Many studies have proposed different pedagogical approaches to deliver SD within courses but there has been limited research on the connection between how courses are delivered and how they may affect sustainability competencies.
- Many educators lack necessary training, digital literacy and institutional support to transition to student-centred methodology.
- Institutional and policy constraints also play a significant role in determining the success of innovative pedagogy. In Higher Educational Institutions (HEI) there is often no adequate institutional support and incentives for those academics willing to integrate SD in their activities and most of the efforts lie primarily on over committed academics.
- Many education systems still rely on standardized assessments and rigid curricula, limiting opportunities for competency based, adaptive learning models.
- Funding between urban and rural schools further aggravates educational inequalities, making it harder for underprivileged students to access high-quality learning environments.

CONCLUSION –

Education has a major role to play in dealing with the sustainable crisis, however its capacity to achieve positive outcomes has been criticized. (Kioupi & Voulvoulis, 2022). However, in the 21st century pedagogical approaches have undergone a profound transformation to meet the evolving needs of learners in a rapidly changing world. (Ayantunji, Olatoye & Ileuma, 2024). It empowers people with the knowledge, skills, values, attitudes and behaviours to live in a way that is good for the environment, economy and society and equips people with the ability to tackle issues such as climate change, biodiversity loss, overuse of resources and inequality that impact the well-being of people and the planet. (UNESCO, 2024). Transformation in learning in education for sustainability requires the commitment of faculty and academics, with their efforts, motivation, innovative ideas, change in content and methods can be materialised. (Fillo et al., 2018). Higher Education, therefore, must play a fundamental role by placing all its resources and its spirit of independence in the service of what is relevant and what is needed by the humanity and society in general. (Kumar & Mohapatra, 2021). Therefore, the adoption of transformative pedagogies is considered crucial to not only enhance academic achievement but also to empower learners to face global challenges with resilience and adaptability, promote a deep sense of social responsibility and global citizenship among learners. (Ayantunji, Olatoye & Ileuma, (2024).

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