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Integrating Classroom Pedagogies with Sustainable Development Goals: Fostering Skills for a Resilient Future

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Abstract:

Sustainable Development Goals (SDGs) in education emphasize the transformation of classroom pedagogies to foster a sustainable future. This review paper explores how pedagogical methods, particularly flipped learning, align with SDGs to enhance educational outcomes. High-quality professional training, based on outcome-based approaches, necessitates defining core competencies and effectively implementing teaching and learning methods. Flipped learning, which shifts direct instruction from group to individual spaces, transforms traditional classrooms into dynamic, interactive environments. This method promotes active student engagement, creativity, and immediate feedback, which are essential for achieving SDGs. The paper highlights the need for educators to rethink traditional approaches to develop practitioners who can creatively contribute to the SDGs by 2030. By focusing on flipped learning, the paper addresses challenges in integrating SDGs into education and practice, ultimately aiming to improve student learning and engagement.

Keywords: Sustainable Development Goals (SDGs), Flipped Learning, Classroom Pedagogies, Educational Transformation, Pedagogical Methods

1. INTRODUCTION

Education is universally recognized as a cornerstone for achieving the United Nations Sustainable Development Goals (SDGs) [1]. The significance of education in advancing sustainable development has been underlined continuously since the 1992 United Nations Conference on Environment and Development [2]. Numerous international projects to integrate sustainability into educational institutions have been sparked by this acknowledgment. Notably, UNESCO oversaw the United Nations Decade of Education for Sustainable Development (2005–2014), which sought to persuade governments and policymakers to give sustainability in education top priority while incorporating sustainable development into curricula across the globe. Following this initiative were the Education for Sustainable Development: Towards Achieving the SDGs framework (2020–2030) and the Global Action Programme on Education for Sustainable Development (2014–2019) [3]. With Target 4.7 requesting that all students gain the information and abilities required to advance sustainable development, Goal 4 of the 17 Sustainable Development Goals emphasizes the significance of inclusive, equitable, and high-quality education [4]. Education also plays a crucial role in accomplishing more general global goals, as evidenced by its inclusion in several other SDGs, such as SDG 3.7 (Good Health and Well-Being), SDG 5.6 (Gender Equality), SDG 8.6 (Decent Work and Economic Growth), SDG 12.8 (Responsible Consumption and Production), and SDG 13.3 (Climate Action) [4, 5]. Therefore, education for sustainable development, or ESD, is crucial for both individual and group empowerment as we move toward a sustainable future. To guarantee that every student is prepared to handle the urgent issues of unsustainable living, Target 4.7 must be met. The foundation of this is the transformational learning framework, which emphasizes the in-depth, introspective processes students go through to evaluate presumptions and embrace more sustainable worldviews. The integration of SDGs into education is examined in this review, with a focus on reevaluating and changing educational approaches to promote sustainable development. It examines the fundamental meanings and goals of education within the dominant political and economic systems, going beyond traditional and

modern educational paradigms, which are primarily driven by policy, provision, and institutional reform. Beyond 2019, the success of UNESCO's ESD will be based on three pillars: transformative action, structural changes, and technological future. While technology is important for sustainable development, especially when considering the benefits and drawbacks of technology's impact on the future economy, this entry will concentrate on the adjustments that must be made to society's power structures and deeply held beliefs to accomplish SDG 4.7 [7]. While it would have been possible to cover every SDG in length in this piece, just two were chosen to highlight how they relate to transformative education.

1.1 The Education 2030 Agenda

The 2030 Agenda for Sustainable Development is a worldwide action plan that calls on all governments, people, and countries to accomplish the 17 Sustainable Development Goals (SDGs) that the UN has set forth; as of now, none of them have been accomplished [8]. Six major changes must occur to achieve the SDGs: in smart cities; in the digital revolution; in food, biosphere, and water systems; in consumption and production; in decarbonisation and energy; and human capabilities and demography [9]. Healthcare, education, and skill development are all related to human capability and demography. Education's role is to guarantee that every country can offer its people a lifelong learning program so that we may all be creative and prepared for the uncertain and complex world that lies ahead [10].

To accomplish significant increases in population size and human potential, the fourth Sustainable Development Goal (SDG) asks all countries to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all." The 2010 Dakar Framework for Action included the Education for All Goals in addition to the Millennium Development Goals, providing a foundation for this goal of high-quality education. Reiterating and expanding upon the previous Sustainable Development Goals (SDGs), the fourth SDG expands the scope to ensure that all countries provide inclusive and fair opportunities for all people, as well as universal access to basic education. The fourth goal of the Sustainable Development Agenda is to provide learners with the information and skills they need to achieve high-quality learning outcomes at all educational levels, with a particular emphasis on informal and formal learning contexts [11]. The new Education 2030 Framework for Action lays out the steps to accomplish this goal with its seven overall goals and three strategies for attainment. 184 UNESCO members adopted this framework in May 2015 in the Incheon Declaration [12].

By 2030, every learner's curriculum should include education for sustainable development and lifestyles, human rights, gender equality, promoting a culture of peace and nonviolence, global citizenship, appreciation of cultural diversity, and the role of culture in sustainable development.

Recognising the importance of helping individual learners and communities to understand global issues and how to address them, this opens the path for revolutionary education to occur. Progression towards the 4.7 indicators has been made. However, they have also demonstrated the barriers to success, such as a lack of financing for teacher education, which reflects issues with commitment at the highest levels of government. Without political priorities, there is no possibility for revolutionary education or the essential changes to achieve sustainable development, which are two of the most important enabling factors to achieve this aim.

UNESCO identifies three competing political stances on sustainable development as influencing policy commitments: first, a view that sees it as a model for improving existing systems in favour of economic growth; second, a view that calls for larger transformations, restructuring power and society's embedded values; and third, a view that seeks major reforms to a green economy and technological innovation [14]. Modern plans of action, such as the Education 2030 Framework for Action and the Incheon Declaration, seek to enhance and disseminate the Global Action Plan's best practices in order to strengthen existing laws, regulations, and institutional structures. The fact that both the traditional and reform schools of thought in sustainable development are calling on governments to raise spending and extend existing programs demonstrates this.

2. NEW PEDAGOGICAL APPROACHES TO INDUCE SUSTAINABLE DEVELOPMENT GOALS

Teaching methods based on the classic lecture format continue to be employed in elementary, middle, and high schools, as well as some institutions. Most students believe this is an excellent technique to educate because it is something they are already familiar with and comfortable with [15]. The inverted or flipped model, which has recently emerged as a fresh teaching paradigm, offers an alternative. This strategy allows students to learn outside of class by using ICTs such

as online educational tools, screencasts, or recorded videos. In class, individuals can work on practice assignments, targeted remediation, or activities aimed at improving their higher-order cognitive abilities [16].

Some aspects of flipping are innovative, but others are not. In traditional educational contexts, students are often expected to have completed homework or read prescribed materials prior to entering class [17]. One significant difference is the great leap ahead in available ICTs for both students and teachers [18], paving the stage for the inverted classroom to emerge. Although there are numerous techniques to implementing the flipped classroom, they all share some features [19]. Students should nurture skills such as taking responsibility for their own learning, developing adaptability and flexibility, and embracing this customised approach because learning does not end in the classroom.

The ability to incorporate other cutting-edge pedagogical trends, such as cognitive technologies, is another advantage of this approach. Even if ICTs enable flipped classrooms, most teachers continue to use technology passively as a learning aid, according to academics [20]. These disheartening findings underscore the importance of educational reform that prioritises the development of students' creative talents to build an environment favorable to real-world problem-solving and acquiring higher-order cognitive abilities. Information and communication technologies (ICTs) can become useful tools, transforming into cognitive tools, if they assist students with decision-making, metacognitive processes, information organization, evaluation, and analysis; problem-solving; collaboration; and multi-modal idea communication and support [21]. Using cognitive tools requires subject matter expertise and higher-order thinking skills such as critical, logical, and deductive reasoning, making it a difficult task.

The flipped classroom style seeks to motivate pupils to study while also helping them develop their cognitive talents and topic knowledge. It draws on a wide range of teaching methodologies and, when combined with inverted classrooms, can stimulate students' interest even further. Gamification is particularly noteworthy [22, 23]. It has been effectively adopted in numerous organizational and curricular initiatives [24]. However, its usage in colleges is limited [25] since, rather than encouraging more motivation, it can induce a drop in interest if the evaluation is not fair. The flipped classroom is an innovative educational system for practitioners of sustainable development goals, serving as a potent instrument for increasing students' motivation and involvement to fulfill learning objectives. It is adaptable enough to include additional teaching strategies, such as the expert workshop [26].

3. THE ROLE OF TRANSFORMATIVE PEDAGOGY IN ACHIEVING SDGS

Pedagogical strategies for human development centre on human development and education, both conceptually and practically [27]. This community-focused approach to education is known by several names, one of which is social pedagogy, which bases its theory on a broad and complete understanding of human development. Being a member of a community, no matter how big or little, with people who have mutual responsibilities and duties, is what it means to be human.

The emphasis in social pedagogy is on holism. It asks how society may best bring out the best in each individual and how people and society should be constituted in relation to one another. It focusses on the social determinants that facilitate personal growth and draws attention to opportunities to assist individuals in assuming greater civic responsibility and engagement without compromising their pursuit of opportunities or personal interests [28]. Consequently, social pedagogy focusses on education as a whole rather than on a specific educational paradigm. There is discussion of the opportunities to positively influence society, people's well-being, and personal development.

Social pedagogy is one school of thought that aims to bring about social change. In addition to addressing fundamental issues with social order, human development, and civic education, it promotes an understanding of ourselves as moral actors and human beings (the ethical domain). However, it is equally important to acknowledge that humans are a part of nature in the Anthropocene era. Transformative pedagogies alter people's perspectives about the relationship between humans and the environment and sustainable development [29]. These three interrelated domains—people, ethics, and nature—can promote human flourishing and guarantee a sustainable future when they are addressed concurrently. Because of this, truly transformational pedagogies seek to promote significant social-ecological changes that will lead to the development of both individual and communal self-awareness [30, 31].

Martha Rogers (1994) identified five features of transformational pedagogies [32]:

a) Knowing and making sense of things are part of the cognitive dimension.

b) The affective dimension is primarily concerned with the integration of knowledge and feelings.

c) Students begin to reconsider who they are and the values they believe in on an existential level.

d) Empowerment is assuming responsibility, participating, and altering the course of your life.

e) Action means making new choices on an individual, social, and political level.

Transformative pedagogies' epistemic basis guarantees that their pupils acquire a holistic worldview [33]. Applying ethics, systems thinking, and a holistic perspective can help society move towards sustainability. A fundamental component of the ethical domain of transformative pedagogies is integrating all facets of social and ecological reality into the moral framework. The final objective of eco-social education is to broaden the moral circle to encompass all living things, non-living things, and humans by adopting a systemic worldview. Every daily action that people perform maintains the system to which they are linked operational.
Human liberties and duties stem from this ensuing dependence on nature and other people. The moral circle must first address environmental issues because human well-being depends on them, followed by social issues that create the framework for human rights and dignity. Only under these particular conditions can an economy be developed that is sustainable and meets the most basic needs of all people on Earth. Considering the limited resources of our planet, one may question whether ensuring future generations have the same degree of freedom as we do is the best approach to demonstrate how far our generation has gone. You must understand that human civilisation cannot exist without an ecological foundation and that it cannot live without an economy to get there. Since the economy is an ecosocial process, all human issues stem from ecological and social factors.

As a result of our collective social production, our entire perspective is what it is. Yet no social construct is ever finished. Therefore, to test each other's presumptions, worldviews, and assumptions, humans depend on one another. Through communication and innovation, people can understand the shortcomings in their worldview.

Table 2. Developing transformative pedagogy. Learning approaches, pedagogies and goals to achieve a sustainable future [34].

	Way of Learning	Goal of Learning
Cognition	Conformative pedagogy	Doing things better
Meta-cognition	Reformative pedagogy	Doing better things
Epistemic learning	Transformative pedagogy	Seeing things differently

Transformative pedagogies offer the potential for a sea change in perception and action [35]. Students who engage in epistemic learning are not expected to do better. It invites readers to reconsider their worldviews. It has the potential to permanently alter learners' perceptions and worldview. A possible shift "involves our comprehension of power relations in interconnected systems of gender, race, and class; our awareness of our bodies; our dreams of different ways of life; and our belief in the potential for societal equality, world peace, and individual happiness." Individual attitudes, behaviour, and lifestyle changes serve as the foundation for these systemic alterations. The contemplation of transformational action places a high value on community. Students identify issues that impact them personally and collectively in a community defined by geography, social media, politics, or culture. It comes to mind the concept of lifelong learning, which recognises that people learn in both formal and informal contexts. As a result, sustained transformational activities might be considered as a form of active citizenship.
Transformative pedagogies that strive for full humanity are essential for humanity in the Anthropocene epoch. People can then begin to participate in a metanarrative, a wider story about a future in which everyone can live with dignity and harmony [36]. To achieve this great goal, all courses must contain transformative pedagogies for sustainable development [37].

4. FLIPPED LEARNING: AN INNOVATIVE PEDAGOGICAL APPROACH

The flipped classroom model is a method of instruction that involves using online resources to deliver courses outside of the classroom and then using those same materials for in-class activities that promote group projects and student

participation. This style emphasises individualised lessons, effective learning, and engaged students [38]. In a flipped classroom, students can study the fundamentals at their own pace by watching lectures on video or using other online materials. The remaining class time is spent applying this knowledge through activities that involve problem-solving, projects, and teacher-led discussions [39].
Flipped learning makes radical changes to the way the educational process is organised possible since it reduces students' fear when speaking English in public [41] and increases their satisfaction with their accomplishments [40]. Students are required to use teacher-provided resources, including books, movies, and audio recordings, to explore the subject in advance of class activities as part of the flipped classroom paradigm. Consequently, the goal of classroom activities is to help students enhance their practical reading, writing, and speaking skills. In the context of flipped classes, the lecturer assumes three separate but related roles: resource, facilitator, and educator. On the other hand, the students' roles involved helping to finish the lesson as well as receiving it [42]. The fact that this paradigm is "attractive for people with different learning styles" [43] is just one of its many benefits. Students become more independent, involved, accountable, and enthusiastic as a result.
Studies and views on the flipped classroom approach are vehemently criticised, contending that it is not as effective as more traditional teaching techniques. Neither the staff nor the students were fond of the flipped classroom format. Students reported improvements in their ability to retain material and engage with one another despite their worries about flipped classrooms [44].

Several effectiveness studies have examined the effectiveness of flipped learning in EFL courses. In order to ascertain future ESL instructors' opinions of the format, Basal (2015) employed the flipped classroom approach in an English language course at a Turkish state university. For a flipped classroom to be successful, Basal (2015) contends that students must actively participate in class by raising questions, offering suggestions, and critically assessing the material in addition to receiving lectures outside of the classroom. Therefore, it offers "several benefits," like "more student-oriented learning," "more personalised learning," "a consistent connection between students and teachers," "more motivation of students," "a learning environment full of familiar tools," with "variety in lecture content attuned to different learning styles." The 45th number.

Some academics have looked into whether or not flipped classrooms are a better way to teach grammar [46, 47]. They concluded that this method is essential for raising students' grammatical proficiency and encouraging independent study after reviewing the data. Researchers Yu and Wang (2016) conducted a survey [48] among undergraduate Business majors enrolled in an introductory English writing course to learn about their opinions about flipped classrooms. Scholars have discovered that using this method helps students write better [49]. Furthermore, studies have demonstrated that "improving students' paragraph-writing skills in EFL university classrooms through the implementation of flipped classroom instruction" [50]. Additionally, when a speaking course is flipped, students perform better academically in verbal activities and become more involved in the communication process [51, 52].

Flipped learning, e-learning, blended learning, and hybrid education are growing in popularity as a result of the shortcomings of the current traditional approach [53]. Despite its seeming advantages, using the flipped learning technique in foreign language programs presents a number of obstacles for both teachers and students. Among the difficulties educators encounter are the need for thorough task and evaluation criteria preparation and the intricate nature of designing e-learning resources. The students' problems include a lack of motivation, a lack of drive, and an inability to work on their own. Clearly, there will be some adjustment required when using the flipped classroom model. Flipped classrooms are the future of educational innovation, we've decided after assessing all the benefits and drawbacks.

4.1 Flipped Classroom Model

The "Flipped Classroom Model" is an educational technique that challenges the way most classes are taught by bringing the delivery of course materials—which are frequently provided online—into the classroom through interactive, collaborative activities. The following are the guiding concepts of the Flipped Classroom Model:

1. Pre-Class Content Delivery: Students read assigned texts, watch lectures online, and interact with multimedia content prior to class. They can then take their time learning the fundamentals.

2. Active Learning in Class: During class, students collaborate with their lecturers on projects, solve problems, and participate in class discussions to apply what they've learnt. This encourages engagement and a comprehensive understanding.

3. Student-Centered Learning: Under the flipped classroom model, teachers act as mentors and coaches and let students take charge of their own learning [54].

4.2 Comparison of traditional and flipped classrooms

When comparing traditional courses versus flipped classrooms, research on flipped learning in higher education has not always shown positive outcomes. The flipped paradigm appears to be well-received by staff and students, however conclusive evidence supporting its ability to promote 21st century skills and lifetime learning in graduate and undergraduate programs is still lacking [55]. Some are concerned that the range of educational techniques in flipped classrooms may cause discomfort for certain students, despite the numerous opportunities for student-teacher cooperation and learning. Additionally, students still have difficulty transitioning to the new style of learning even in flipped classes [56].

Additionally, when they go to flipped learning, students feel as though they are not getting enough done in class and are wasting time on homework. Flipped learning appears to have been the target of many complaints because it goes against the grain of traditional thought. Students were expected to change their learning approach from what they had learnt in K–12 settings when they entered post–secondary programs, particularly for introductory courses [57, 58]. Mixed preferences were discovered among students for blended course delivery, which is a variation of the flipped classroom. Despite the fact that in-class active learning and additional project time improved their comprehension and perception, they believed that some traditional lectures should continue.

5. THE SDGS IN HIGHER EDUCATION AND TEACHER TRAINING

The 2030 Agenda for Sustainable Development, which aims to create a better world where people and the environment may coexist peacefully for present and future generations, was adopted by United Nations Member States in 2015. The Sustainable Development Goals (SDGs) recognise that in order to eradicate poverty and other forms of deprivation, action must be taken to protect the environment, battle climate change, improve inequality, and accelerate economic growth [59]. Education is essential to achieving the SDGs; in fact, SDG 4 is only focused on education, and education is inextricably linked to all other SDGs.

Having access to higher education is crucial to reaching the SDGs [60]. Two authors argue that sustainability education ought to be prioritised in all university curriculum [61, 62]. The objectives of policymakers in higher education should be reflected in sustainable practices, pedagogies, and activities—not just in the classroom, according to [63]. Researchers are currently investigating how different countries could integrate the SDGs into curricula for higher education [64]. Numerous studies—not just at universities—have examined how the SDGs are incorporated into basic teacher preparation and education programs. Before future educators can provide their students with the knowledge and abilities to support sustainable development in the classroom, they must undergo intensive sustainability training [65]. In recent years, there have been an increasing number of programs that centre around sustainability, especially when it comes to preservice teacher education. The results of [66] show that prospective primary school teachers were introduced to SDG education through a university course on the Didactics of Matter and Energy. Future educators attended a seminar that focused on sustainable development objective 12, which is sustainable food consumption. Current SDG research centres on educators, namely on the level of knowledge and responsibility that future primary school teachers will possess [67], the efficacy of educational models in assisting educators in developing sustainable competencies [68], and the attitudes of secondary school teachers towards sustainability. The aforementioned studies in preservice teacher preparation and teacher education demonstrate the growing quantity and calibre of research in this area. On the other hand, research about teacher education were either too small-scale or had insufficient theoretical underpinnings, according to the 2017 literature study [69].

6. CHALLENGES IN INTEGRATING SDGS INTO CLASSROOM PEDAGOGIES [70, 71]

When educators and institutions integrate the Sustainable Development Goals (SDGs) into classroom pedagogies, they face several challenges in creating relevant and effective learning environments that align with these global objectives.

- **Lack of Awareness and Understanding of SDGs among Educators:** The SDGs and their relevance to education may be foreign concepts to many teachers. Teachers may struggle to fully integrate these objectives into their lessons plans if they do not fully grasp how they connect to their pedagogical work. Because of this information vacuum, the SDGs may be oversimplified and used in a symbolic rather than substantive way, preventing students from really engaging with sustainability and global citizenship.
- **Inadequate Professional Development and Training:** A significant barrier to integrating SDGs into classroom pedagogies is the lack of adequate professional development and training for educators. Teachers need specific skills and knowledge to adapt their teaching methods to include SDG-related content effectively. However, many professional development programs do not focus on or include training related to the SDGs, leaving educators without the necessary tools and strategies to implement these goals in their teaching. This lack of preparation can hinder efforts to promote sustainability in education.
- **Resistance to Change in Traditional Educational Practices:** Many educational systems and procedures are resistant to change because of tradition and familiarity with tried-and-true methods. The new, more student-centered pedagogies—like flipped classrooms—that are required to accomplish the SDGs may encounter resistance from teachers accustomed to more traditional methods of education. A teacher's resistance to trying new things can restrict the impact of education on sustainability by impeding or even preventing the meaningful integration of the Sustainable Development Goals (SDGs) into the curriculum.
- **Limited Access to Resources and Technology:** The SDGs can only be supported by innovative teaching methods if the required resources and technology are readily available. However, many schools lack the resources—finance, technology, and infrastructure—to support these kinds of programs, particularly those located in impoverished or low-income communities. Therefore, it may be more challenging to deliver equitable education that incorporates the SDGs in underfunded schools than in schools with more resources, as the former may not be able to offer students the same level of sustainability-focused teaching.
- **Curriculum Constraints and Standardized Testing Pressures:** The testing-centric character of standardised curricula and their rigidity present a significant obstacle to the integration of SDGs into education. These restrictions provide educators less flexibility in incorporating SDG-aligned material into their teaching. The prevalence of standardised testing, which prioritises certain academic competencies over more general competencies like sustainability, critical thinking, and global awareness, may make it difficult for teachers to defend the inclusion of SDG-related activities in their lesson plans.
- **Lack of Institutional Support and Commitment:** The support of pertinent institutions is necessary in order to successfully integrate the SDGs into educational practices. If school administrators, legislators, and educational authorities do not demonstrate a strong resolve, efforts to integrate the Sustainable Development Goals (SDGs) into teaching methods may not gain the necessary support, guidance, and money. If educators choose a disconnected approach and only a handful of passionate teachers provide courses based upon the Sustainable Development Goals (SDGs), both the educational system and students may suffer.
- **Cultural and Contextual Differences in Implementing SDGs:** Diversity in schools, both culturally and contextually, may have an effect on how much the SDGs are incorporated into teaching strategies. Instructors, who frequently lack the resources necessary for success, must adapt their teaching strategies to the particular needs of their students and communities. In order to ensure that their teachings are inclusive of all pupils and meet their needs, educators need to be aware that the SDGs' cultural significance varies.
- **Assessment and Evaluation Challenges:** The success of incorporating SDGs into teaching approaches is difficult to assess. Traditional evaluation approaches may fall short of developing competencies such as critical thinking, problem solving, and teamwork through SDG-aligned pedagogies. Because instructors find it difficult to quantify the outcomes of their efforts, incorporating SDGs into education may lose part of its credibility and perceived worth.
- Integrating SDGs into education faces significant barriers such as curriculum overload, lack of teacher training, insufficient institutional support, and absence of standardized assessment tools. These challenges hinder the holistic implementation of sustainability education across disciplines. [72, 73]

7. FUTURE PERSPECTIVE

The future perspective on integrating the Sustainable Development Goals (SDGs) into education suggests an optimistic trend towards more dynamic and responsive classroom pedagogies. Education establishments are expected to emphasize

innovative teaching strategies that align with the Sustainable Development Goals (SDGs), like project-based learning and flipped classrooms, as they become increasingly conscious of the importance of sustainability and global citizenship. The increasing availability of resources and advancements in technology will make this tra nsformation even easier to implement, enabling educators to create more engaging learning environments for every student. Delivering curriculum that is focused on the SDGs requires educators to have strong institutional support and access to opportunities for professional development. If the SDGs are implemented in the classroom, they will eventually aid students in achieving their academic goals and inspire the next generation to address global issues and create a better society.

8. CONCLUSION

As a conclusion, the incorporation of the Sustainable Development Goals (SDGs) into the instructional practices of schools is absolutely necessary to foster a future that is both more sustainable and more equal. The transformative potential of educational methods such as flipped learning presents a promising route for advancement, despite the fact that hurdles such as reluctance to change, insufficient training, and lack of awareness contribute to the existence of major obstacles. The use of innovative teaching approaches and the overcoming of institutional and resource constraints are two ways in which educators can promote student engagement, creativity, and alignment with the Sustainable Development Goals (SDGs). Students will be equipped to become proactive global citizens who are dedicated to sustainability and social responsibility if we address these difficulties and provide educators with the necessary tools and training. This will not only make it easier to meet the Sustainable Development Goals (SDGs), but it will also equip students to become global citizens.

REFERENCES

1. Nazar, R., Chaudhry, I. S., Ali, S., & Faheem, M. (2018). Role of quality education for sustainable development goals (SDGS). *International Journal of Social Sciences*, *4*(2), 486-501.
2. Garcia, J., da Silva, S. A., Carvalho, A. S., & de Andrade Guerra, J. B. S. O. (2017). Education for sustainable development and its role in the promotion of the sustainable development goals. *Curricula for sustainability in higher education*, 1-18.
3. Ferrer-Estévez, M., & Chalmeta, R. (2021). Integrating sustainable development goals in educational institutions. *The International Journal of Management Education*, *19*(2), 100494.
4. UNESCO (2018) Progress on education for sustainable development and global citizenship education. https:// unesdoc.unesco.org/ark:/48223/pf0000266176
5. UNESCO (2016b) Unpacking Sustainable Development Goal 4: Education 2030. https://unesdoc.unesco.org/ ark:/48223/pf0000246300
6. UNESCO (2019) SDG 4 - Education 2030: Part II, Education for Sustainable Development beyond 2019. https:// unesdoc.unesco.org/ark:/48223/pf0000366797
7. Messerli, P., Murniningtyas, E., Eloundou-Enyegue, P., Foli, E. G., Furman, E., Glassman, A., ... & van Ypersele, J. P. (2019). Global sustainable development report 2019: the future is now–science for achieving sustainable development.
8. Lee, B. X., Kjaerulf, F., Turner, S., Cohen, L., Donnelly, P. D., Muggah, R., ... & 3illigan, J. (2016). Transforming our world: implementing the 2030 agenda through sustainable development goal indicators. *Journal of public health policy*, *37*, 13-31.
9. Sachs, J. D., Schmidt-Traub, G., Mazzucato, M., Messner, D., Nakicenovic, N., & Rockström, J. (2019). Six transformations to achieve the sustainable development goals. *Nature sustainability*, *2*(9), 805-814.
10. Terziev, V. (2019). Lifelong learning: the new educational paradigm for sustainable development. *IJASOS-International E-journal of Advances in Social Sciences*, *5*(13).
11. Hanemann, U. (2019). Examining the application of the lifelong learning principle to the literacy target in the fourth Sustainable Development Goal (SDG 4). *International Review of Education*, *65*(2), 251-275.

12. UNESCO (2016a) Education 2030: Incheon declaration framework for action for the implementation of sustainable development goal 4: ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. http://uis.unesco.org/sites/default/files/ documents/education-2030-incheon-framework-foraction-implementation-of-sdg4-2016-en_2.pdf

13. Shulla, K., Filho, W. L., Lardjane, S., Sommer, J. H., & Borgemeister, C. (2020). Sustainable development education in the context of the 2030 Agenda for sustainable development. *International Journal of Sustainable Development & World Ecology*, *27*(5), 458-468.

14. UNESCO (2016c) Education for people and planet: creating sustainable futures for us all. Global Education Monitoring Report. http://uis.unesco.org/sites/default/ files/documents/education-for-people-and-planet-creat ing-sustainable-futures-for-all-gemr-2016-en.pdf

15. Thomasian, J. (2012). Building a science, technology, engineering and math education agenda: an update of state actions. National Governors Association Center for Best Practices.

16. Khan, S. (2012). The one world schoolhouse: Education reimagined. London: Hodder and Stoughton

17. Davies, R.S., Dean, D.L., Ball, N. (2013). "Flipping the classroom" and instructional technology integration in a college-level information systems spreadsheet course. Educational Technology Research and Development. No. 61(4), pp. 563–580.

18. Davies, R.S., West, R.E. (2014). Technology Integration in Schools. In: J.M. Spector, M.D. Merrill, J.Elen, M.J. Bishop (Eds.). Handbook of Research on Educational Communications and Technology. New York, NY: Springer New York, pp. 841–853.

19. Talbert, R. (2012). Inverted classroom. Colleagues. No. 9 (1, Article 7), pp. 1–2.

20. Wang, S.K., Hsu, H.Y., Reeves, T.C., Coster, D.C. (2014). Professional development to enhance teachers' practices in using information and communication technologies (ICTs) as cognitive tools: Lessons learned from a design-based research study. Computers and Education. No. 79, pp. 101–115.

21. Hsu, H.-Y., Wang, S.-K., Runco, L. (2013). Middle School Science Teachers' Confidence and Pedagogical Practice of New Literacies. Journal of Science Education and Technology, No. 22(3), pp. 314–324.

22. Huotari, K., Hamari, J. (2012). Defining gamification. In: Proceeding of the 16th International Academic MindTrek Conference on – MindTrek '12, p. 17.

23. Nelson, M.J. (2012). Soviet and American precursors to the gamification of work. In: Proceeding of the 16th International Academic MindTrek Conference on – MindTrek'12, p. 23.

24. Brewer, R., Anthony, L., Brown, Q., Irwin, G., Nias, J., Tate, B. (2013). Using Gamification to Motivate Children to Complete Empirical Studies in Lab Environments. In: Proceedings of the 12th International Conference on Interaction Design and Children. New York, NY, USA: ACM, pp. 388–391.

25. Iosup, A., Epema, D. (2014). An experience report on using gamification in technical higher education. In: Proceedings of the 45th ACM Technical Symposium on Computer Science Education – SIGCSE '14, (2008), pp. 27–32.

26. Pokholkov Y., Zaitseva K. (2017). Specific learning environments for fostering students' sustainability mindset. In: 45th SEFI Annual Conference 2017: Education Excellence for Sustainability: Proceedings, p. 223–228

27. Hämäläinen, J. (2012). Social Pedagogical Eyes of the Midst of Diverse Understandings, Conceptualisations and Activities. International Journal of Social Pedagogy. 1(1), 3-16.

28. Hämäläinen, J. (2015). Defining Social Pedagogy: Historical, Theoretical and Practical Considerations. British Journal of Social Work 45(3), 1022-1038

29. Laininen, E. (2018). Transforming Our Worldview Towards a Sustainable Future. In: Justin W. Cook (Ed.) Sustainability, Human Well-Being and the Future of Education. Basingstoke: Palgrave Macmillan.

30. Salonen, A. & Bardy, M. (2015). Ekososiaalinen sivistys herättää luottamusta tulevaisuuteen. Aikuiskasvatus 35(1), 4-15.

31. Salonen, A. & Konkka, J. (2015). An Ecosocial Approach to Well-Being: A Solution to the Wicked Problems in the Era of Anthropocene. Foro de Educación 13(19), 19-34.

32. Rogers, M. (1994) Learning about Global Futures: an exploration of learning processes and changes in adults, DEd Thesis. Toronto: University of Toronto.

33. Lange, E. A. (2018). Transforming transformative education through ontologies of relationality. *Journal of transformative education*, *16*(4), 280-301.

34. Sterling S. (2011). Transformative Learning and Sustainability: sketching the conceptual ground, Learning and Teaching in Higher Education 5, 17-33

35. Lotz-Sisitka, H., Wals, A. E., Kronlid, D., & McGarry, D. (2015). Transformative, transgressive social learning: Rethinking higher education pedagogy in times of systemic global dysfunction. *Current opinion in environmental sustainability*, *16*, 73-80.

36. Siirilä, J, Salonen, A., Laininen, E., Pantsar, T. & Tikkanen, J. (2018). Transformatiivinen oppiminen antroposeenin ajassa. Ammattikasvatuksen aikakauskirja 20(5)

37. Stough, T., Ceulemans, K., Lambrechts, W., & Cappuyns, V. (2017). Assessing sustainability in higher education curricula: A critical reflection on validity issues. Journal of Cleaner Production 172, 4456-4466

38. Bergmann, J., & Sams, A. (2012). Flip your classroom: Reach every student in every class every day. International Society for Technology in Education.

39. Abeysekera, L., & Dawson, P. (2015). Motivation and cognitive load in the flipped classroom: Definition, rationale, and a call for research. Higher Education Research & Development, 34(1), 1-14.

40. Abdullah, M. Y., Hussin, S., & Kemboja, I. (2021). Does Flipped Classroom Model Affect EFL Learners' Anxiety in English Speaking Performance? *International Journal of Emerging Technologies in Learning*, 16(1), 94-108. http:/doi.org/10.3991/ijet.v16i01.16955

41. Thoo, A. C., Hang, S. P., Lee, Y. L., & Tan, L. C. (2021). Students' Satisfaction Using ELearning as a Supplementary Tool. *International Journal of Emerging Technologies in Learning*, 16(15), 16-31. https://doi.org/10.3991/ijet.v16i15.23925

42. Mahalli, Nurkamto J., Mujiyanto, J. & Yuliasri, I. (2019). The Implementation of Station Rotation and Flipped Classroom Models of Blended Learning in EFL. *Learning. English Language Teaching*, 12(12), 23-29. DOI:10.5539/elt.v12n12p23

43. Hamdani, M. (2019). Effectiveness of Flipped Classroom (FC) Method on the Development of English language learning of the high School Students in Ahwaz. *International Journal of Applied Linguistics & English Literature*, 8(2), 12-20.

44. Santikarn, B., & Wichadee, S., (2018). Flipping the Classroom for English Language Learners: A Study of Learning Performance and Perceptions. iJET. 13(9), 123-135.

45. Basal, A. (2015). The Implementation of a Flipped Classroom in Foreign Language Teaching. *Turkish Education Online Journal of Distance* -TOJDE, 16(4), 28-37. https://doi.org/10.17718/tojde.72185

46. Bezzazi, R. (2019). Learning English Grammar through Flipped Learning. *The Asian Journal of Applied Linguistics*, 6, 170-184.

47. Thaichay, T., & Sitthitikul, P. (2016). Effects of the flipped classroom instruction on language accuracy and learning environment: A case study of Thai EFL upper-secondary school students. *Rangsit Journal of Educational Studies*, 3(2), 35-64.

48. Yu, Z. & Wang, G. (2016). Academic Achievements and Satisfaction of the Clicker-Aided Flipped Business English Writing Class. *Educational Technology & Society*, 19(2), 298- 312.

49. Afrilyasanti, R., Cahyono, B. Y., & Astuti, U. P. (2017). Indonesian EFL students' perceptions on the implementation of flipped classroom model. *Journal of Language Teaching and Research*, 8(3), 476. https://doi.org/10.17507/jltr.0803.05

50. Chatta, B. S., & Haque, M. I. (2020). Improving Paragraph Writing Skills of Saudi EFL University Students Using Flipped Classroom Instruction. *Arab World English Journal (AWEJ)*. Special Issue on CALL, 6, 228- 247. https://dx.doi.org/10.24093/awej/call6.15

51. Qader, R.O., & Arslan, F.Y. (2019). The Effect of Flipped Classroom Instruction in Writing: A Case Study with Iraqi EFL Learners. *Teaching English with Technology*, 19(1), 36-55.

52. Abdullah, M. Y., Hussin, S., & Ismail, K. (2019). Implementation of flipped classroom model and its effectiveness on English speaking performance. *International Journal of Emerging Technologies in Learning (IJET)*, 14(09), 130. https://doi.org/10.3991/ijet.v14i09.10348

53. Konoplianyk, L., & Melnykova, K. (2019). Application of the "flipped classroom" technology when teaching a professional foreign language. *Bulletin of the National Aviation University. Series: Pedagogy. Psychology*, 2(15), 38-45.

54. Bishop, J. L., & Verleger, M. A. (2013). The flipped classroom: A survey of the research. Proceedings of the ASEE National Conference, Atlanta, GA.

55. Marcey, D., & Fletcher, J. (2014). The lecture hall as an arena of inquiry: Using cinematic lectures and inverted classes (CLIC) to flip an introductory biology lecture course. Retrieved January 16, 2016, from http://www. academiccommons.org/2014/07/22/the-lecture-hall-as-an-arena-of- inquiry-using-cinematic-lectures-and-inverted-classes-clic-to-flip-an- introductory-biology-lecture-course/

56. Strayer, J. (2012). How learning in an inverted classroom influences cooperation, innovation and task orientation. Learning Environments, 15(2), 171–193.

57. Lape, N., Levy, R., Yong, D. H., Haushalter, K. A., Eddy, R., & Hankel, N. (2014). Probing the inverted classroom: A controlled study of teaching and learning outcomes in undergraduate engineering and mathematics. Presented at the Presented at the 121st ASEE Annual Conference and Exposition. Indianapolis, IN.

58. Yong, D. H., Levy, R., & Lape, N. (2015). Why no difference? A controlled flipped classroom study for an introductory differential equations course. Primus, 25(9–10), 907–921.

59. United Nations Organization. Transforming Our World: The 2030 Agenda for Sustainable Development; UN: New York, NY, USA, 2015; Available online: https://sustainabledevelopment.un.org/content/documents/ 21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf (accessed on 12 November 2020).

60. Owens, T.L. Higher education in the sustainable development goals framework. Eur. J. Educ. 2017, 52, 414–420.

61. Leal Filho, W.; Shiel, C.; Paço, A.; Mifsud, M.; Ávila, L.V.; Brandli, L.L.; Molthan-Hill, P.; Pace, P.; Azeiteiro, U.M.; Vargas, V.R.; et al. Sustainable Development Goals and sustainability teaching at universities: Falling behind or getting ahead of the pack? J. Clean. Prod. 2019, 232, 285–294.

62. SDSN Australia/Pacific. Getting Started with SDGs in Universities: A Guide for Universities, Higher Education Institutions, and the Academic Sector; Australia, New Zealand and Pacific Edition Sustainable Development Solutions Network: Melbourne, Australia, 2017; Available online: http://ap-unsdsn.org/wp-content/uploads/ University-SDG-Guide_web.pdf (accessed on 12 November 2020).

63. Evans, N. Teacher Education and education for sustainability. In Learning to Embed Sustainability in Teacher Education. SpringerBriefs in Education; Springer: Singapore, 2019; pp. 7–21.

64. Albareda-Tiana, S.; Vidal-Raméntol, S.; Fernández-Morilla, M. Implementing the sustainable development goals at University level. Int. J. Sustain. High Educ. 2018, 19, 473–497.

65. Albareda-Tiana, S.; Vidal-Raméntol, S.; Pujol-Valls, M.; Fernández-Morilla, M. Holistic approaches to develop sustainability and research competencies in pre-service teacher training. Sustainability 2018, 10, 3698.

66. Zamora-Polo, F.; Sánchez-Martín, J. Teaching for a better world. sustainability and sustainable development goals in the construction of a change-maker university. Sustainability 2019, 11, 4224.

67. Vernia-Carrasco, A.; Pastor-Fuentes, V.; López-Navarro, M. Preliminary Study on the Awareness of the SDGs in Future Primary School Teachers; Editorial Universitat Politècnica de València: Valencia, Spain, 2020.

68. Agirreazkuenaga, L. Embedding sustainable development goals in education. teachers' perspective about education for sustainability in the basque autonomous community. Sustainability 2019, 11, 1496.

69. Evans, N.; Stevenson, R.B.; Lasen, M.; Ferreira, J.; Davis, J. Approaches to embedding sustainability in teacher education: A synthesis of the literature. Teach. Teach. Educ. 2017, 63, 405–417.

70. Hamwy, N., Bruder, J., Sellami, A., & Romanowski, M. H. (2023). Challenges to Teachers Implementing Sustainable Development Goals Frameworks in Qatar. *Sustainability*, *15*(15), 11479.

71. Khadim, M., Qureshi, N., & Khan, A. M. (2022). Challenges of Implementing Education for Sustainable Development: University Teachers' Perspectives. *PJE*, *39*(1).

72. Tassawar, K., Akhtar, N., Mehmood, T., & Elahi, A. (2025). Sustainable Development Goals (SDG's) in Education: A Framework for Teaching and Learning. Journal of Religion & Society (JR&S), 3(1), 733–747.

73. Sohaee, N., & Farsad, R. (2025). Innovative pedagogies for sustainability education. In Proceedings of the 2025 Education for Sustainability Conference (pp. 1–16).