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21ST-CENTURY PEDAGOGIES FOR SUSTAINABLE EDUCATION: IMPLICATIONS ON THE LEARNERS

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A B S T R A C T

The world of education has evolved significantly in the 21st-century, necessitating a shift in pedagogical approaches to promote sustainable learning outcomes. This has brought about transformative changes in education, prompting a reevaluation of pedagogical approaches to ensure sustainable learning for students. Ultimately, this emphasises the critical role of pedagogy in promoting sustainable education practices for the holistic development of learners in the digital age. This article explores the concept of pedagogy and 21st-century pedagogies, key features of 21st-century pedagogy, 21st-century teachers and skills, pedagogical approaches in education for sustainable development, types of pedagogy, sustainable education, and implications of pedagogies on learners within the framework of sustainable education and in promoting sustainable education practices for the holistic development of learners in the digital age. Understanding these implications is crucial for educators and policymakers striving to cultivate a dynamic and inclusive learning environment that empowers learners to thrive in an ever-evolving world. In conclusion, the integration of 21st-century pedagogies holds immense promise for advancing sustainable education and will benefit learners to meet up with in an ever-changing world. It was recommended that if the 21st-century pedagogies were leveraged, it would create a dynamic, inclusive, and sustainable learning environment that would empower learners to thrive academically, socially, and emotionally in an ever-changing world.

1. Introduction

The adoption of innovative pedagogical approaches has become imperative in the rapidly changing world of education, to ensure sustainable learning outcomes for learners. With a growing emphasis on equipping students with the skills and knowledge needed to thrive in an interconnected and complex world, teachers and school administrators would need to embrace innovative teaching methodologies. These 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 understanding of sustainability and global citizenship among learners.

This paper explored the implications of 21st-century pedagogies on learners within the area of sustainable education. This was done by discussing how learner-centric strategies, technology integration, and holistic development initiatives impact educational sustainability. This discussion aims to shed light on the important role of pedagogy in nurturing well-rounded and adaptable learners. As teachers go over the complexities of preparing learners for this present time and an uncertain future,

understanding these implications becomes paramount in promoting a dynamic and resilient learning environment.

2. Concepts of Pedagogy and 21st-century Pedagogies

The term "pedagogy" finds its roots in the ancient Greek word "pedagogue". In ancient Greece, a "pedagogue" was an individual responsible for educating children and the youth. This eventually gave rise to the word "pedagogy" (Kim & Jones, 2019). Pedagogy is an approach towards teaching learners, whether it is the theory or practice of educating. It defines a connection between the techniques of learning and the culture around the learners. Pedagogy aims to develop better skills and attitudes of the learners. Therefore, pedagogy is the method and practice of teaching in general, especially about academic subjects or theoretical concepts. Pedagogy can refer to all levels of teaching, from nursery and primary, all the way up to higher education. Learners need to have meaningful classroom relationships to build on prior learning.

Further, the main aim of pedagogy is to build on previous learning and work on the development of skills and attitudes of the learners. Pedagogy enables the learners to get a thorough understanding of the subject and helps them apply the learning in their daily lives outside of the classroom. However, in the contemporary world, pedagogies represent the art and science of teaching. To become a proficient teacher in the 21st century, one must master the science of teaching, a task that is no small feat, especially considering the constant evolution of technology in this era. Also, the 21st-century teacher must be an adaptor, a communicator, a leader, a learner, a visionary, a model, a collaborator and a risk taker (Chen & Smith 2021). Being a capable teacher entails not only a deep understanding of the subject matter but also a mastery of 21st-century pedagogies.

The "21st-century pedagogy" is the systematic approach to instructing concepts and ideas through the utilisation of a diverse range of advanced technological tools, all aimed at achieving specific educational goals. The 21st-century classrooms are characterised as being student-centred ubiquitous, digitally networked and connected, and learner-driven, where the students are placed in the driver's seat and are in control of their learning in team-oriented physical and virtual learning environments. This learners are expected to be self-directed learners and have innovative skills.

Moreover, for 21st-century pedagogies to be truly effective, they should empower teachers in their mission to equip learners with a relevant set of modern and practical skill resources, often referred to as Modern and Relevant Skill Resources (MRSRs) (Chen & Smith 2021). These 21st-century skills are

critical thinking and problem solving, collaboration across networks and leading by influence, agility(liveliness) and adaptability, initiative and entrepreneurialism, effective oral and written communication, accessing and analysing information, curiosity and imagination. Ultimately, when 21st-century pedagogy is skillfully applied, the knowledge imparted resonates with learners, takes root within their minds, and becomes readily applicable in the context of the rapidly evolving modern world. Further, the concept of 21st-century pedagogy refers to new teaching methods that focus on the following aspects (Kalahaian, 2017):

- Student-centred Learning: This approach focuses on the needs and interests of students, encouraging them to take ownership of their learning and develop skills such as self-directed learning, critical thinking, and problem-solving.
- Project-based Learning: This approach encourages students to learn by working on real-world problems and projects that require critical thinking, collaboration, and creativity.
- Technology-enhanced Learning: This approach uses technology to support and enhance learning and flipped classrooms.
- Collaborative Learning: This approach encourages students to work together to achieve a common goal, promoting teamwork, communication, and problem-solving skills.
- Design Thinking: This approach encourages learners to think creatively and develop innovative solutions to real-world problems, using a five-step process: empathise, define, ideate, prototype, and test.
- Competence-based Education: This approach focuses on the development of specific skills and competencies, rather than traditional age-based grade levels.
- 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.
- Blended Learning: This approach combines traditional face-to-face learning with online learning, allowing learners to learn at their own pace and in their style.

In addition, when it comes to the fundamentals of pedagogy, the above approaches are to be considered (Chen & Smith 2021). Each of these approaches is usually placed on a spectrum from teacher-focused to learner-focused pedagogy. Teacher-focused pedagogy revolves around teachers, putting them at the centre of the learning process, while learner-focused pedagogy is centred on learners playing an active role in the learning process which is 21st-century pedagogy.

In the 21st century, pedagogical approaches have undergone a profound transformation to meet the evolving needs of learners in a rapidly changing world (Chen & Smith 2021). Traditional teaching

methods are giving way to innovative strategies that prioritise student engagement, collaboration, problem-solving and critical thinking skills. From project-based learning and personalised instruction to experiential learning and digital literacy initiatives, teachers are to embrace a diverse range of pedagogies to promote holistic development in learners. These 21st-century pedagogical approaches will not only empower learners to thrive in a knowledge-driven society but also pave the way for sustainable education practices that promote lifelong learning and adaptability (Kim & Jones, 2019).

Moreover, if one has a 21st-century classroom that is exciting to deliver powerful learning outcomes through the use of emerging technologies which is flexible, adaptable, connect, communicate, collaborate, and create on a local, national and global scale; if one is a 21st-century teacher; that is an adaptor, a communicator, a leader and a learner, a visionary and a model, a collaborator and risk taker; if the curriculum reflects the new paradigm and one has the facilities and resources that could enable 21st-century learning; how one teach must reflect how the learners learn. It must also reflect the world the learners will move into. This is a world which is rapidly changing, connecting, adapting and evolving. The style and approach to teaching must emphasise learning in the 21st century. Therefore, the key features of 21st-century Pedagogy are shown in Figure 1 and are also highlighted below:

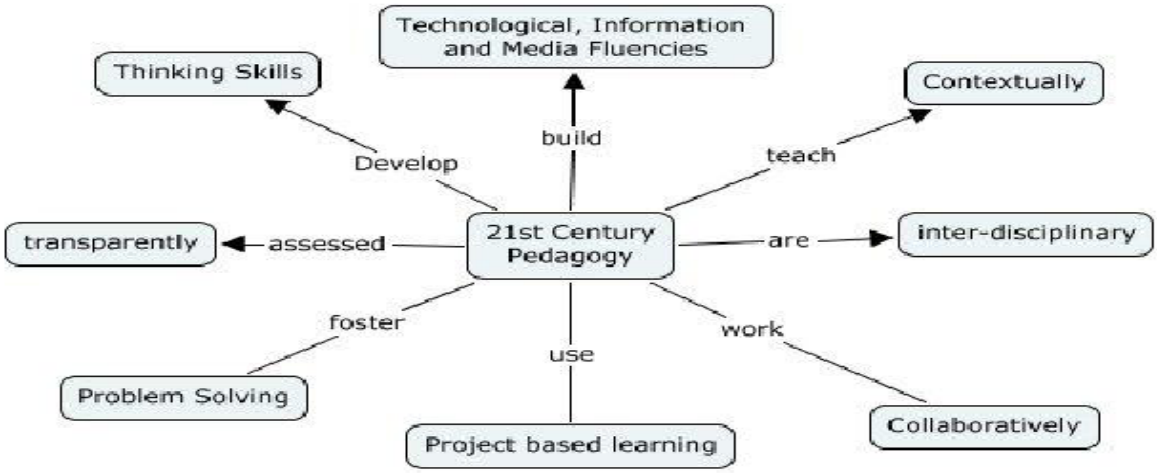

Figure 1: Key Features of 21st-Century Pedagogy

Source: Chen and Smith (2021)

The key features of the 21st-century pedagogy are highlighted below:

- building technological, information and media fluencies;
- developing thinking skills;
- making use of project-based learning;
- using problem-solving as a teaching tool;

- using 21st-century assessments with timely, appropriate and detailed feedback and reflection;
- it is collaborative and uses enabling and empowering technologies; and
- it fosters Contextual learning bridging the disciplines and curriculum areas.

Further, thinking skills are a key area. While much of the knowledge one teaches may be obsolete within a few years, the thinking skills acquired will remain with the learners for their entire lives. However, in the Industrial age education has had a focus on Lower Order Thinking Skills. The lower-order thinking skills are the remembering and understanding aspects. While 21st-century pedagogy focuses on moving learners from lower-order thinking skills to higher-order thinking skills (Chen & Smith 2021).

The 21st-century teacher scaffolds the learning of learners, building on a basis of knowledge recall and comprehension to use and apply skills; analyse and evaluate processes, outcomes and consequences, and make, create and innovate (see Figure 2). Therefore, the 21st century is an age of collaboration as well as information (Kim & Jones, 2019). The 21st-century learners can be referred to as collaborative digital natives. The growth of social networking tools, like 'bebo and Myspace' and the like is fueled by digital natives. Hence, the world, the learners are graduating into is a collaborative one.

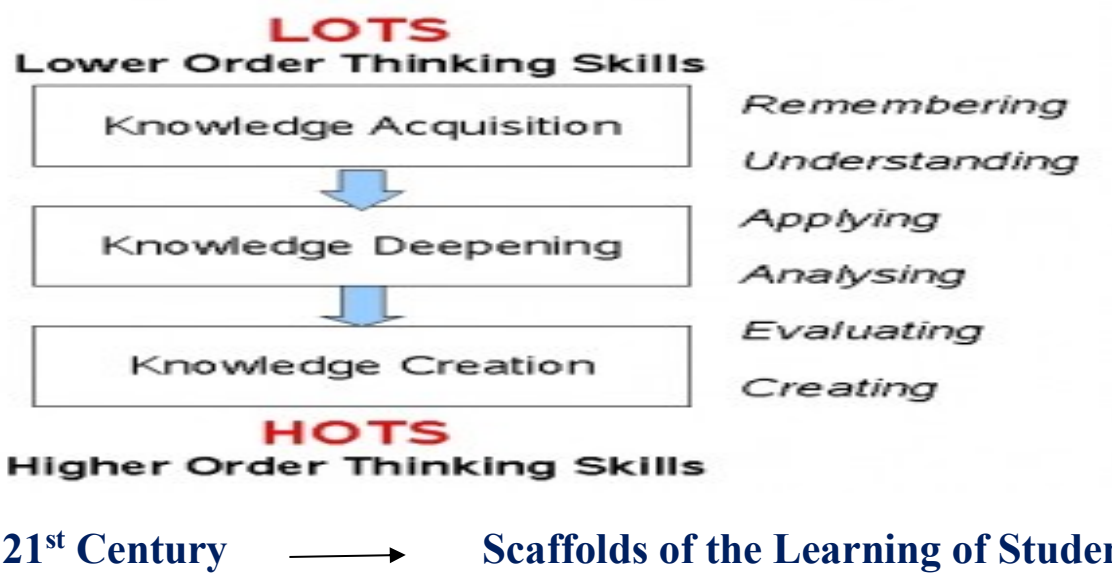

Figure 2: Focus of 21st Century Pedagogy

3. Pedagogical Approaches in Education for Sustainable Development

There is no 'absolute' or 'specific' pedagogy for sustainable education, but there is a broad consensus that it requires a shift towards active, participative, and experiential learning methods that engage the learner and make a real difference to their understanding, thinking and ability to act (Garcia & Brown,

2020). However, five pedagogic elements have been identified that cover several pedagogical approaches or methods that one might use to bring these elements into the learning environment (Sterling, 2001). They are the constructivist approach, the collaborative approach, the reflective approach, the integrative approach, and finally, the inquiry-based approach. The five pedagogical approaches identified are explained below.

a) **The Constructivist Approach:** The constructivist approach is based on the concept of constructivism. This is the belief that learners create their understanding of the world around them, and this understanding is based on experience through their everyday lives as they grow. Using specific experiences, people transform the information they have accumulated into knowledge and understanding. This approach allows learners to take a more active role in the learning process, as it encourages them to use their previous knowledge as a foundation for understanding new concepts, as opposed to passively receiving information. In this approach, the learners are allowed to be present in the process of understanding and gaining knowledge rather than just passively receiving information. This encourages critical thinking among the learners and gives a learning environment in which they can connect with what they are hearing.

b) **The Collaborative Approach:** The collaborative approach puts a big emphasis on collaborative learning, which is the idea that learners work together to gain a greater understanding of the information they have been presented with. The strength of this approach is that learners can capitalise on each other's understanding of the information, and even their unique skills and resources. This process allows learners to create an environment where people can interact with each other by sharing experiences and knowledge. Collaborative learning includes contributions from guest speakers, work-based learning, interdisciplinary/ multidisciplinary working, and collaborative learning and co-inquiry. This can be done in a variety of ways, including exchanging ideas and information, and even evaluating or monitoring somebody else's work. Here, the learners form groups of learners that learn together and work to solve a problem, build strategies, and ideas, create products or complete a task. This is a joint intellectual effort by the learners among themselves or with the help of the teachers.

c) **The Reflective Approach:** The reflective approach focuses primarily on analysing what the teacher and learners are doing in the classroom. It encourages thinking about teaching practices and figuring out ways to improve them in an attempt to make learning processes more effective for a class of learners. This can be done through processes such as self-evaluation and self-reflection, used as ways to essentially learn more about their practice, improve a certain practice (like small groups and cooperative learning) or focus on a problem learners are having. Critical reflection includes the more traditional lecture as well as newer approaches such as reflexive

accounts, learning journals, and discussion groups. Some specific forms of assessment that can be used in a reflective capacity are diary presentations and journals.

d) **The Integrative Approach:** The integrative approach differs from the other teaching approaches in the sense that it tries to provide learners with an environment where they can make connections between the current topic they are learning about and other topics they will come across at different stages of the curriculum. This means that it tends to focus on specific connections between different bits of information, rather than facts in isolation. This approach is more commonly used in higher education, but it can still be useful at other stages of education too, as it can help learners gain a broader understanding of the world around them by linking together bits of related information. Studies have shown that this kind of approach can help learners stay engaged on the topics they are learning about.

e) **The Inquiry-Based Approach:** The inquiry-based approach is unique in the sense that it encourages learners to engage in exploration, investigation, research and study. It begins with presenting questions, scenarios or problems that require critical thinking to solve, which is vastly different from other approaches where facts are presented simply. This approach requires more than just simply giving the correct answers to questions and encourages more thoughtful and engaged participation from learners. This makes it incredibly effective when teaching science, as many science topics are more easily learned through an understanding of processes rather than isolated facts.

4. Types of Pedagogy

The types of pedagogy are:

a. **Social Pedagogy:** It is aimed towards the social development, awareness, and well-being of the learners. The teaching must consist of values and moral education.

b. **Critical Pedagogy:** It aims towards comprehending and deconstructing several daily life problems and issues. It encourages the learner to dig deeper into things and try to understand their thoughts and beliefs on a certain topic or material of learning.

c. **Culturally Responsive Pedagogy:** It aims to address the cultural diversity among learners. It helps to comprehend cultural differences among the learners and increases awareness about cultural differences in school.

d. **Socratic Pedagogy:** It aims to encourage the learners to gain more knowledge from other sources along with what is provided to them. This will help the learners to find alternative solutions to the problems.

5. Sustainable Education

Education is fundamental to societal change. Sustainability education provides a holistic vision to deal with societal challenges by equipping learners with skills needed to improve their lives and the future of the planet (Boojh & Ishwaran, 2022). The UN Agenda 2030, with its associated Sustainable Development Goals (SDGs), particularly Goal 4 on quality education, challenges the creativity and imagination of teachers, academics and other education sector professionals and practitioners (Ayantunji, 2022).

Sustainable education is an educational approach aimed at entrenching in learners, schools, and communities the values and motivations to act for sustainability now and in the future in one's own life, in the communities, and on a worldwide platform (Garcia & Brown, 2020). Sustainable education is a type of education that focuses on finding long-lasting solutions to social, environmental, and economic issues and it is futures-oriented which aims to create a more ecologically and socially just world through informed action (Sterling, 2001).

The education for sustainability is defined as a "combination of content, learning methods, and outcomes that help learners develop a knowledge base about the environment, the economy, and society, in addition to helping them learn skills, perspectives, and values that guide and motivate them to seek sustainable livelihoods, participate in a democratic society, and live sustainably" (Boojh & Ishwaran, 2022). It empowers learners to make informed decisions and responsible actions for environmental integrity, economic viability, and a just society, for present and future generations, while respecting cultural diversity.

Further, sustainable education means finding long-lasting solutions through education, namely about social, environmental, and economic issues; which are the three pillars of sustainability (Ayantunji, 2022). It is a concept that involves active academic participation to create economic, social and environmental programmes that improve life standards, generating empowerment and respecting interdependence.

Sustainable education develops the knowledge, skills, values and world-views necessary for people to act in ways that contribute to more sustainable patterns of living (Garcia & Brown, 2020). It enables individuals and communities to reflect on ways of interpreting and engaging with the world. Sustainable education is futures-oriented, focusing on protecting environments and creating a more ecologically and socially just world through informed action that supports more sustainable patterns of living requiring consideration of environmental, social, cultural and economic systems and

their interdependence (Ayantunji, 2022).

According to the Department of the Environment, Water, Heritage and the Arts (Australia) (2009), sustainable education is based on the following seven principles:

i. **Transformation and Change:** Education for Sustainability involves equipping people with skills, capacity and motivation to plan and manage change towards sustainability within an organisation, industry or community.
ii. **Education for all and Lifelong Learning:** Education for sustainability is driven by a broad understanding of education and learning that includes people of all ages and backgrounds and at all stages of life and takes place within formal and informal learning places, in schools, workplaces, homes and communities.
iii. **Systems Thinking:** Education for sustainability aims to equip people to understand connections between environmental, economic, social and political systems.
iv. **Envisioning a Better Future:** Education for sustainability engages people in envisaging diverse, sustainable futures.
v. **Critical Thinking and Reflection:** Education for sustainability encourages individuals and groups to reflect upon personal experiences and worldviews, and challenges accepted ways of interpreting and engaging with the world.
vi. **Participation:** Education for sustainability recognises community participation as critical to the collective shift towards an environmentally sustainable society.
vii. **Partnerships for Change:** Education for sustainability focuses on partnerships to build networks and relationships, and improve communication between different sectors of the community.

Further, Sustainability Education," or education for sustainable development, is an exciting new field that blends a range of pedagogical techniques to promote an understanding of the connections between the environment, the economy and society (Kumar & Mohapatra, 2018). A still-evolving field, sustainability education has the primary goal of harnessing the power of education to advance environmental literacy and civic engagement that prepares students for jobs that contribute to a more equitable and sustainable future.

Education for Sustainable Development allows every human being to acquire the knowledge, skills, attitudes and values necessary to shape a sustainable future which means including key sustainable development issues in teaching and learning; for example, climate change, disaster risk reduction,

biodiversity, poverty reduction, and sustainable consumption (UNESCO, 2014). It also requires participatory teaching and learning methods that motivate and empower learners to change their behaviour and take action for sustainable development. Education for Sustainable Development consequently promotes competencies like critical thinking, imagining future scenarios and collaboratively making decisions (Kumar & Mohapatra, 2018). Education for Sustainable Development requires far-reaching changes in the way education is often practised today.

Sustainable Development Education is about the learning needed to maintain and improve the quality of life of people now and for generations to come; which will enable people to develop the knowledge, values and skills to participate in decisions about the way they do things individually and collectively, both locally and globally, that will improve the quality of life now without damaging the planet for the future (Khan, 2002).

Therefore, sustainable education in the 21st century encompasses a holistic approach that not only imparts knowledge but also nurtures critical skills and values essential for lifelong learning and success. This educational paradigm emphasises environmental consciousness, social responsibility, and economic viability, equipping students with the tools to address complex global challenges (Jones & Patel, 2019). By integrating sustainability principles into curricula, fostering a culture of innovation and problem-solving, and promoting ethical decision-making, teachers can empower learners to become responsible global citizens. Sustainable education goes beyond the classroom, inspiring individuals to make informed choices that contribute to a more equitable, resilient, and environmentally conscious society.

6. Implications of the 21st-century Pedagogies on the Learners

The 21st-century pedagogies have a lot of implications for learners of all ages. Embracing pedagogical shifts such as personalised learning, competency-based education, and interdisciplinary approaches requires educational administrators to cultivate a supportive environment that encourages experimentation and professional development among teachers (Chen & Smith 2021). This can be done by fostering a culture of collaboration, continuous learning, and adaptability, educational administrators can empower their faculty to effectively implement transformative pedagogies, thereby preparing learners for success in a rapidly evolving world (Marouli, 2021).

For the learners, the adoption of 21st-century pedagogies in education heralds a transformative shift with significant implications for their sustainable learning journey. This can be done by engaging with

pedagogical approaches that emphasise critical thinking, collaboration, and real-world application, learners would be empowered to develop essential skills for navigating an ever-changing global world (Jones & Patel, 2019). Through inquiry-based learning, project-based assignments, and technology integration, learners would not only acquire knowledge but also cultivate creativity, problem-solving abilities, and a deep sense of environmental and social responsibility (Marouli, 2021). These pedagogies would not only prepare learners for academic success but also equip them to become active agents of positive change in the world.

With advancements in technology and teaching methods, learners can benefit from more personalised, interactive, and engaging learning experiences. These may include online courses, educational apps, virtual reality simulations, and lifelong learning opportunities. This implies that the learners may use virtual reality to explore historical events firsthand, participate in online discussion forums to engage with peers globally, or access personalised learning paths tailored to their interests and pace (Marouli, 2021). The learners could also benefit from interactive simulations to enhance critical thinking skills, AI tutors for individualised support, and collaborative projects to foster social connections (Jones & Patel, 2019).

Further, embracing technology and innovative teaching methods can truly revolutionise how learners learn, stay mentally active, and connect with the world around them. It is inspiring to see how lifelong learning opportunities continue to evolve and empower learners of all ages.

The following are other identified implications of the 21st-century pedagogy for sustainable Education:

i. **Improves Quality of Teaching:** If a well-thought pedagogy is implemented in the teaching, the quality of learning can show a drastic improvement. This will benefit the learners by helping them to thoroughly understand the material, thereby improving the learning outcomes.

ii. **Encouraging Cooperative Learning Environment:** The implementation of pedagogy in teaching will encourage the learners to work together towards completing a task and learning together. This will increase their perceptions by understanding and taking views from the other learners which will improve their learning process in the future.

iii. **Eliminates Monotonous Learning:** Pedagogy and development work hand in hand. It helps the learners to think in different ways and move beyond the traditional methods of memorisation and comprehension for learning. It invokes complex processes of learning among the learners such as analysing, creative thinking, and evaluation. Further, it will make the

learners to be more receptive to what the facilitator is teaching.

iv. **Learner can follow their Ways of Learning:** A well-thought pedagogy can help the learners to grasp materials in various ways. It will cater to the learning abilities of different learners. Learners will be able to follow their preferred ways of learning and stick to them. In this way, the learners will develop a better understanding of the subject, which eventually improves their skills and learning outcomes.

v. **Convenient Learning Approach for All:** The implementation of a suitable pedagogical approach will help the learners to learn better and encourage them in the learning process.

vi. **Improves Teacher-Learner Communication**: The teacher will understand the learner in a better way which will help them to focus on the learner's weaknesses and guide in the learning process.

7. Conclusion

In conclusion, the integration of 21st-century pedagogies holds immense promise for advancing sustainable education in an ever-changing world. Through, innovative teaching methodologies that prioritise critical thinking, problem-solving, collaboration, technology integration, and real-world application, teachers will be able to empower learners to go over complex global challenges with resilience and adaptability. As one strives to develop a culture of lifelong learning and environmental stewardship, it is crucial to continue to promote the adoption of transformative pedagogies that would not only enhance academic achievement but also promote a deep sense of social responsibility and global citizenship among learners. Through sustained commitment to these principles, one can collectively work towards building a more sustainable and inclusive future for generations to come.

8. Recommendations

Based on the above, the following are recommended on the 21st-century pedagogies for sustainable education and the implications on the learners:

i. Pedagogical strategies should meet the diverse needs and learning styles of the learners, promoting active engagement, autonomy, and self-directed learning.
ii. Harness the power of digital tools and resources to enhance learning experiences, promote digital literacy, and prepare learners for the demands of a technology-driven world.
iii. Encourage collaboration across subjects to cultivate critical thinking, problem-solving skills, and a holistic understanding of complex real-world issues.
iv. Incorporate socio-emotional learning initiatives to nurture empathy, resilience, and interpersonal skills essential for personal growth and success in an interconnected society.

v. Infuse environmental education into the curriculum to instil a sense of environmental stewardship, sustainability, and eco-conscious practices in learners.
vi. Create opportunities for the learners to explore, experiment, and innovate, promoting a culture of creativity, curiosity, and lifelong learning.
vii. Continuously assess the effectiveness of pedagogical strategies, solicit feedback from learners, and make adjustments to ensure meaningful and sustainable educational outcomes.

Therefore, if the above recommendations are implemented, teachers and educational administrators will be able to leverage 21st-century pedagogies to create a dynamic, inclusive, and sustainable learning environment that will empower learners to thrive academically, socially, and emotionally in an ever-changing world.

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