The Relevance of Open Educational Resources in The Teaching and Learning of Environmental Adult Education

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Abstract:

The role of sustainability education in adult learning and the rise of global environmental challenges. Introduction Open Educational Resources (OER) are seen as a means for democratizing knowledge and allowing open, inclusive and lowcost access to educational resources. This paper investigates the utility of OER in Environmental Adult Education (EAE), a crucial field for empowering adults to be environmentally-sustainable, cope with climate change and become ecological citizens. Based on transformative learning theory and connectivist pedagogy, this paper provides a critical analysis of the way OER supports content delivery,active learning and reduces inequity in environmental education. Based on worldwide trends, cases from Africa, and Nigerian experiences, the research identifies the prospects and challenges of OER-integration within EAE programmes. The paper concludes with some policy direction aimed at enhancing OER infrastructure, content localisation and institutional capability in adult learning ecosystems.

Keywords: Open Educational Resources (OER) and Environmental Adult Education (EAE).

Introduction

Environmental conditions around the world are deteriorating under the influence of climate change, loss of biodiversity, deforestation, expanding deserts, genetic engineering and altered marine ecosystems with intense demands for environmental education that is supportive of sustainability, resilience and ecological citizenship [1]. Given that adults are the decision-makers, workers, community leaders and parents who wield influence in a variety of ways that impact environmental quality, EAE has been seen as essential to changing behavior and promoting collective action. EAE is defined as the process which equips adults with knowledge, skills, values and attitudes necessary to understand environmental problems and concerns, to analyze them and develop solutions local

action [2]. Running parallel to this call for eco-literacy is the burgeoning scene of Open Educational Resources (OER) that has shaped access to education world-wide. According to UNESCO, OER are "teaching, learning or research materials that are in the public domain or released with an intellectual property license that allows for free use, adaptation and distribution." This openness makes open universities well-fit to respond to the needs of adult learners, who might not have the time, resources or academic credentials for traditional education.

In such countries as Nigeria and Sub-Saharan Africa where the rate of adult illiteracy cannot be underestimated, outdated educational infrastructure, economic and policies constraints have continued to limit access to education; OER is an option that is inclusive [3]. Furthermore, the contextualized nature of OER content helps to make environmental education more place-based and issue-bound example; desertification in the Sahel, oil pollution in the Niger Delta or flooding in coastal cities hence increasing relevance and learner engagement [4].

Despite GROWING support for OER use in adult education programs, many environmental education piograms are still stuck using traditional modes of learning that are NOT interactive, open or adaptable. This article contends that the strategic incorporation of OER in environmental adult education serves both to improve educational effectiveness and is consistent with global targets for inclusive, quality education (SDG 4) and climate action (SDG 13). Based on Transformative Learning Theory and Connectivism, this paper critically discusses the importance of OER in teaching and learning EAE as well as its benefits and limitations. The paper reviews contemporary literature, trends in education and an indicative case study from the local context of Nigeria to provide a framework for how adult environmental learning can be strengthened through open education initiatives [5].

Conceptual Clarifications

Open Educational Resources (OER)

Open Educational Resources (OER) are widely described as any type of educational, teaching and learning materials in the public domain or licenses that allow free access, use, distribution and adaptation [6]. OER are course materials (including full courses, course notes, textbooks, tests, software, videos and sound media) that are freely available to use as a source resource. According to a frequently cited definition of OER by Wiley, it comprises materials that reflect the 5Rs of open: Retain, Reuse, Revise, Remix and Redistribute which represent the rights users have over that content. These attributes differentiate OER from commercial or closed resources, making them a powerful means of providing equitable access to knowledge, particularly in low-resource educational environments. Hilton maintains that OER do not just save the cost of materials and work best when pedagogically integrated into engaged learner-centric pedagogy. Their flexibility means that they can be adapted by educators to their own materials, with which they are familiar, in order to respond to particular learning needs, cultural and ecological contexts a key characteristic for any environmental education.

Environmental Adult Education (EAE)

Environmental Adult Learning (EAL) is a subfield within the study of adult learning which is synthesised from environmental literacy and critical pedagogy. It focuses on the provision of adult education and learning, training adults in particular those who are not part of formal educational systems with awareness, values, skills and knowledge they need to address environmental problems effectively [6], [7].

EAE also differs from school-based environmental education, in that community-focused and participatory processes and structures are often deemed valuable, as is an informal character. It is based on experience-based learning and aims to promote ecological consciousness, sustainability principles, and civic responsiveness [8]. EAE regularly addresses concrete local environmental injustices, which results in politically grounded and context-sensitive work.

Furthermore, EAE meets with the lifelong learning as outlined by global frameworks including UNESCO's Frameworks for the Implementation of Education for Sustainable Development (ESD) beyond 2019. Such adults-farmers, craftsman, traders, professionals and so on are enabled to

transform their ecological and sociocultural situations [9].

Convergence of OER and EAE

This intersection of OER and EAE holds potential as a distinct pedagogical response the creation of open, locally adaptable, socially relevant environmental education content that promotes adult environmental literacy. OER facilitates the decolonization of environmental knowledge through empowering educators to include indigenous knowledge systems, lived experiences and locally appropriate case studies in teaching [10]. When strategically embedded, OER can therefore support the development of more democratic, inclusive and contextually-rooted approaches to adult environmental education.

Theoretical Framework

There is a need to understand the pedagogical impact of Open Educational Resources (OER) in Environmental Adult Education (EAE). This paper refers to two complementary conceptual frames: Transformative Learning Theory (TLT) and Connectivist Learning Theory, which provide concepts to think about how adults learn with new knowledge, particularly in digital-media-supported real world practices such as environmental education.

Transformative Learning Theory

The Theory, created by Jack Mezirow believes that adult learning is best achieved if it goes through a change in perspective - Transformative Learning he referred to this as critical reflection resulting from transformative experience. In this procedure, the experiences provide an opportunity for adult learners to engage in reflection-in-action (Schön's 1983 notion of reflective practice), which is a critical questioning of one attitudes and beliefs that often follows a disorienting dilemma or critical incident. This results in new worldviews and, one hopes, behavioral change. Environmental problems, like climate crises or pollution, or loss of biological diversity frequently express such thought [11]. In this context, OER can be an enabler for transformational learning by providing:

1. Interactions with various perspectives (e.g., videos, case studies, infographics),
2. Possibilities for dialogue between open forums or shared annotations,
3. Interactive modules stimulating critical thinking and problem-solving.

Cranton recommends that adult education for transformation should be participatory, contextual, and dialogical – all of which are feasible in the non-restricting environment that OER provides. For example, a Nigerian adult learner who experiences environmental degeneration as she studies about it using OER may reflect on its causes, relate the scenario with community situations and collaborate in creating solutions alternative thereby enhancing ecocentric consciousness.

Connectivist Learning Theory

Connectivism, proposed by George Siemens, is a learning theory for the digital age. It posits that knowledge is distributed across networks, and learning is the act of growing these nodes or knowers. Connectivism is not employee training Connectivism differs from traditional learning theories that are centered on the mind of the worker because it: 14.

1. Learning as network formation,
2. Currency (up-to-date knowledge),
3. Diversity of opinions, and
4. Decision under plentiful information.

OER platforms exemplify these principles. Free digital repositories will allow learners to explore many types of sources (e.g., MOOCs, on-line libraries, collaborative wikis) and to update continuously their knowledge, taking part at global learning communities. For environmental adult learners, such involvement might include encountering up-to-date ecological information, tracking local environmental patterns, or joining global initiatives (e.g., #FridaysForFuture or World Cleanup Day) over open networks. Connectivist learning is also consistent with the notion of knowledge being distributed, and learning comprising meaningful connections a perspective that both OER and EAE support [12].

Synthesizing the Frameworks

Whereas Transformative Learning focuses on significant personal change through analysis and

reflection, Connectivism focus is on connectivity and the rapid dissemination of knowledge. They achieve it by co-operating to sustain the infusion of OER into EAE through:

1. affirming the human and social aspects of learning,
2. Acknowledging the impact of technology on learning,
3. Promoting collaborative, reflective and networked environmental engagement.

By framing this inquiry within both frameworks, we provide a two-pronged lens to think critically about the ways in which OER can not only facilitate knowledge-making but also ecological awareness, action and social change.

Open Educational Resources in Environmental Adult Education

Integration of OER in EAE results in a paradigm change in the way knowledge is accessed, shared and contextualized among adult learners. Securing access to education for a sustainable future in light of the unfolding environmental disaster, problems with prevalent educational systems3 Apart from its ability to offer alternatives that can critically promote environmental awareness OER can also do such through life-long learning and social learning for community driven action on the environment.

Democratizing Access to Environmental Knowledge

Perhaps the most relevant impact of OER on EAE corresponds to information democratization. Adult learners in particular, particularly those in the underserved and rural population may be unable to participate or succeed within traditional school environments because of financial barriers, work commitments, or geographic distance. The fact that OER are not only free but also openly licensed means that they offer a more open playing field for the delivery of content than many institutions have traditionally adopted. Adult literacy and digital access in Nigeria is still mixed, but programs such as the National Open University of Nigeria (NOUN) and African Virtual University have already begun to use OER to reach more learners. Environmental themes such as waste management, climate adaptation, and biodiversity conservation have been effectively disseminated via open-licensed courseware, e-books and community-targeted videos [13].

Localisation and Cultural Relevance

In contrast to standardized curricula borrowed from Western centres of learning, OER can be contextualized for local languages, environmental conditions and cultural moorings. That contextualisation is essential for EAE, it must resonate with students lived realities. An OER module on Climate change can be customized to incorporate:

Other case studies might be about coastal flooding in Lagos or erosion in Anambra,

Forest conservation indigenous knowledges and

Photographic images of regional environmental deterioration.

As argued by Iloanusi and Osuagwu, the contextualisation of content is what makes OER particularly relevant for adult learners who need practical, community-based knowledge to effect social change.

Encouraging Self-Directed and Lifelong Learning

Moreover, adult learners typically prefer loose schedules and flexible learning initiatives that facilitate their responsibilities as parents, workers or community members. OER enable this by allowing for asynchronous formats like mobile-ready content, downloadable PDFs and even offline apps that allow learners to determine the pace and timing of their engagement, as well as the intensity and duration. This flexibility works in favour of lifelong learning, which is a mainstay of both the Education for Sustainable Development (ESD) approach and of United Nations' Sustainable Development Goal 4. Since adults continue to face environmental issues throughout their lives, OER enables them to refresh their knowledge and act as expected according to it [14].

Enabling Participatory and Action-Oriented Learning

Environmental Adult Education is not only about learning in mind, but by heart and as practice of an ecological citizenship/collective action. OER facilitates this by the use of participatory learning design that:

Permitting comments and remixing and co-creating of resources.

Add an open-access simulation, interactive map or real-time dataset to this and

Facilitate communities to discuss and contribute on projects.

Such participatory tools aim to help adults reflect on local environmental conditions and not become passive recipients of information but rather agents of change. For example, an adult self-learner on such a mobile OER platform might learn about water pollution and from there take part in a local clean-up campaign, using tools and action plans built into the resource. This kind of synergy between learning and practicing, is a central concept in transformative environmental education.

Fostering Transnational Knowledge Sharing

OER also promote cross-border sharing of knowledge, making it possible for Nigerian adult educators and learners to learn from international good environmental sustainability practices. There are also a range of international sites such as OER Commons, MIT Open-courseware and Climate Adapt which provide materials on energy conservation, conservation biology and agriculture that could easily be localised around local case studies. Cross-border knowledge transfer and collaborative learning environments such as the one implemented in this project contribute to effective combination of global sustainability standards with locally adapted environmental practices, adding value to adult education.

Assets and Pitfalls of OER Use in Adult Environmental Education

Open Educational Resources (OER) have the potential to change the way Environmental Adult Education (EAE) is taught and learned. Nevertheless, OER are no panacea; in fact for this radical possibility to function it faces many challenges. consequently, moderation in the form of rigorous criticisms that consider OER plus and parts and limitation within another perspective should be offered not neglecting developed countries such as Nigeria [15].

Benefits of OER in Environmental Adult Education

a. Cost-Effectiveness and Educational Equity One of the most celebrated advantages of OER is their capacity to lower the cost of educational resources. OER actually make it possible for adult low-income learners to access quality educational material by providing them with free of charge licenses and textbooks. This is even more pertinent in Sub-Saharan Africa, where adult education is rarely funded through the public sector and participants are expected to pay for learning materials.

b. Flexibility and Customization in Learning: OERs are useful for non-linear learning models that meet the various schedules, previous knowledge, and learning preferences of adult learners. Learners are able to access and navigate modules at their own pace, return to areas of complexity or discomfort, and skip areas that are "old hat." This flexibility is also complementary to the andragogy, which envisages that adult learning needs to be based on learner-directed and problem-solving approach as suggested by Knowles.

c. Localization and Cultural Sensitivity: OER's open licensing system enables local educators to adapt and remix the resources to match their ecological realities, languages and cultural specificities. Environmentally-related themes which pertain to a local context, such as gully erosion in Southeastern Nigeria and artisanal mining in Northern Nigeria can be made part of OER based curricula to ensure experiential relevance and learner engagement.

d. Facilitating Informal and Lifelong Learning: OER support informal, out-of-school learning – in families, community centres and libraries – as well as other forms of lifelong learning. This is consistent with UNESCO's perspective on Education for Sustainable Development, which seeks to provide inclusive and equitable access to knowledge over the life span.

e. Promotion of cooperative open pedagogy: OER support open teaching and learning practices involving students in the co-production of knowledge, fostering critical thinking, active citizenship and eco-terrorism. Websites like Wiki Educator and OER Africa offer resources for adult learners and educators who can come together to create a community-specific environmental unit.

Challenges and Limitations of OER in Environmental Adult Education. Digital Divide and Infrastructure Gaps

Despite their online accessibility, OER are often constrained by

a. poor access to the internet, inadequate electricity supply and very low digital literacy especially in rural Nigerian environment. The percentage of Nigerians with regular access to the internet is estimated at no greater than 43 percent (The National Bureau of Statistics) so many potential adult learners are unable to benefit from OER.

b. Absence of Online Learning Support: There is little institutional-support and integration for the policy on Open Education Resource (OER) in most schools and non formal adult learning centres across Nigeria. This is due to the absence of policy, lack of adequate resources and a reluctance to open models. According to Okonkwo and Omenka, most Nigerian adult education programmes are still inform by traditional print-based media with limited investment in digital learning resources or in adaptation of OER [16].

c. Quality and Pedagogy: Since OER is designed by many different people and entities, the quality and content can be quite variable. Some of the OER may be out of date, inaccurate or culturally inappropriate without rigid peer-review and content-author review processes. This is a problem in trying to provide students with accurate and academically sound EET.

d. Licensing Confusion and Intellectual Property Fears: Even though Creative Commons licensing makes sharing possible, many educators continue to be uncertain about how to legally modify or share work. There is a poor legal literacy around open licensing within the Nigerian context, which is partly responsible for underutilization of existing OER platforms.

e. Language: The language barrier and lack of local content Most OER produced are in English or other world languages that dominate nationally/internationally. In multilingual set up like Nigeria with more than 500 languages, there is limited availability of OERs in indigenous local languages which has implications for access especially for null to non-literate or semi literate adult learners.

Case Studies and Practical Examples

Chapter 2 of this study further justifies the importance of OER in Environmental Adult Education within Nigerian and African context by giving practical examples. Analysis of these case studies demonstrates how OER can be used to support adult-based environmental literacy, sustainability perspectives and community transformation.

Nigeria: National Open University of Nigeria (NOUN)

The National Open University of Nigeria (NOUN) is a good role model for OER implementation in the Nigerian andragogy structure. NOUN offers free access to an array of environmental sciences and sustainability studies course materials on its open courseware platform through the ODL mode. The university's Environmental Science and Resource Management programme provides downloadable modules on:

a. Climate change mitigation,
b. Waste management practices,
c. Environmental impact assessment,
d. Sustainable agriculture.

These resources are available in digital format and can be utilized by both formal students as well as informal adult learners. By eliminating geographical and financial constraints, NOUN has developed a form of open access that fits well with the aims of both Environmental Adult Education as well as the Sustainable Development Goals (SDGs), in particular SDG 4 (Quality Education) and SDG 13.

Kenya: OER Africa and Agricultural Extension

The OER Africa project (based at the South African Institute for Distance Education (SAIDE)) has been working in Kenya with agricultural extension officers and adult educators to develop open materials which focus on environmental sustainability. These resources include:

a. Climate-resilient farming techniques,
b. Soil conservation methods,
c. Pest and water management strategies.

The resources, delivered in Kiswahili and English, are incorporated to adult literacy and vocational training activities for remote-based communities; this is a practical example of how OER can enable ESD delivery in diverse linguistic and cultural settings.

Ghana: Green Skills for Livelihoods (COL) Project

In Ghana, the Commonwealth of Learning (COL) and local NGOs worked together to create the Green Skills for Livelihoods programme. This initiative provides downloadable modules on sustainable living practices such as:

a. Plastic recycling,
b. Renewable energy entrepreneurship,
c. Organic composting.

These OERs are designed for non form al adult learning and distribute d primarily through mobile phone s and offline flash drive to increase access even in low connectivity area. Positive effects for raising environment awareness and in green employment training showed the project [17].

Community-Based OER Projects in Nigeria

Some small scale local OER-based initiatives for adult environmental education exist in Nigeria. For example:

In Bayelsa State, NGO-assisted oil spill clean-up efforts include video documentaries and open-access guide materials that provide local communities with information on how pollution affects health and the environment.

Environmental health officers have been using translations of OER posters and manuals to teach market women (and other people that work in the informal sector) in Kaduna and Kano States about waste segregation and water hygiene.

Such bottom-up activities are a reminder that low-tech OER, such as printed graphics or translated guides, can still be important in environmental adult learning where digital infrastructure is lacking.

Global OER Platforms with Local Impact

Global platforms like:

OER Commons,

MIT OpenCourseWare,

Coursera (free climate education with open licenses)

… have been utilised by Nigerian Environmental NGO's, youth groups and teachers to localise environmental curriculum for training sessions. Facilitators, by remixing these OERs to use locally relevant case studies, are able to spread the reach of global content and make it more locally relevant.

Conclusion

Ope n Educational Resources (OER) and Environmental Adult Education (EAE) as a Meeting Place between Content, Nationalities and Community: An Aspiration for Inclusive, Contextually Relevant, Transformative Learning in Local Sustainable Development. Amidst accelerating global and local environmental crises, adult learners need the tools to comprehend, reflect on, and address ecological problems in their communities. OER have the potential to be a democratizing force as they are flexible, open, and adaptable. This paper has explored the impact of OER on environmental education through open access, cultural localization and participatory pedagogy. Informed by Transformative Learning and Connectivist Learning theories, the presentation illustrated that OER foster ecological awareness, critical reflexivity, and community problem-solving for adult learners. Furthermore, some of the case studies from Nigeria and other African countries show that OER may be incorporated in formal and informal adult education to promote sustainable practices. However, there still exist structural constraints from the digital divide through policy gaps to quality assurance and language accessibility. These challenges can be tackled through joint actions between

governments, schools, NGOs and communities. As Nigeria and other developing countries work towards fulfilling the Sustainable Development Goals (particularly SDG 4; Quality Education and SDG13; Climate Action), incorporation of OER into environmental adult education is a timely and vital innovation.

Recommendations

So as to enhance the relevance and value of OER in Environmental Adult Education, the following measures are recommended:

Policy Integration and Institutional Commitment: National and state governments must move toward Open Education Policies that include OER use in adult education, with a focus on environmental and sustainability learning. These policies should also cover financing mechanisms, copyright regulations and digital inclusion approaches.

Training of Trainers and Local Facilitators: Adult educators and community facilitators should be skilled OER curators, adaptors and in pedagogy how to bring global resources as "own" ones in the community. Organizations such as NOUN and COL could provide leadership in delivering this training en masse.

Scaling Digital Infrastructure: To the extent that OER can open up public access to education, investment is needed in local/community learning centers (current or reborn with internet capability) as well as mobile-learning and solar-powered ICT resource centers so rural and otherwise marginalized adult learners can take advantage of OER consistently. Public-private partnerships can also help ensure the widespread affordability of devices and connectivity.

Local Content Development: The government, universities and NGOs should work together to generate content in regional languages that includes the indigenous knowledge systems, embedding case studies of local ecosystems. This guarantees cultural appropriateness and responsiveness for multiple adult learners.

Creation of Quality Assurance: In other to ensure standards, quality publications from OERs can emerge through peer-review system and certification may evolve in partnership with federal universities, research institutions and regulatory agencies such as the National Commission for Mass Literacy, Adult and Non-Formal Education (NMEC).

Monitoring and Research: Cohort studies with impact assessments might explore the effectiveness of OER to develop environmental understanding and behaviour in adult learners. Policies should be revised and programmes improved based on data.

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