

Assessment of Pre-Service Teachers Knowledge and Attitudes Towards Circular Economy in Southwest, Nigeria

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This study examined the pre-service teachers' knowledge and attitudes towards circular economy in South-West, Nigeria. Four research questions were raised and answered in this study. The descriptive survey research was adopted. The sample comprise of 180 pre-service teachers in the faculties of education in Universities of Ibadan and University of Lagos. Validated Pre-service circular economy and attitude scale was used to collect data. Descriptive statistics of frequency counts, and percentage were used in SPSS 23.0 to analyze pre-service teachers' knowledge' and attitude to circular economy model. The results show that the majority of pre-service teachers did not have adequate knowledge of central concepts in circular economy such as efficient use of resources while the majority of the pre-service teachers had knowledge of traditional environmental concepts such as solid waste accumulation, greenhouse effect. The finding also revealed that most of the pre-service teachers were favorably dispose to adoption of circular economy. From the findings it was recommended that pre- service teacher should be equipped with circular economy concept, it will go a long way to affect their attitude to their environment and benefit that can be derived from circular economy vi-a-vis clean environment, income, generation, employment and redirection of solid waste. This knowledge can be transferred to others through teaching, demonstration and attitudinal changes.

Background to the Study

Climate change affects world populations, especially developing nations, may be the most sensitive due to their poor economies and weak organizational structures. For decades environmental pressures that is imposed by human activities have bedeviled developing economies, Nigeria inclusive. The most profound consequences for developing economies are drought, biodiversity loss, change in vegetation type, depletion of forest resources, loss of soil fertility, increased risks to public health, destruction of infrastructure and agricultural products and unhealthy environment, changes in living standards and so on. In particular, Nigeria the major challenges are soil and land degradation, flooding, emission of greenhouse gases and waste management problem (Olayide, 2021, Gbadamosi, 2018). A number of contributing factors in Nigeria, including poor waste management, carbon reliance, deforestation and the incessant flares of gas throughout the Niger Delta's oil exploration processes, are boosting the threat of climate change. Climate change paves the way to environmental degradation and resource scarcity as a result of rapid economic development, two of the most pressing issues that must be addressed (Olayide, 2021).

Several measures regulations and policy have been put in place to complement the traditional linear model on the assumption that resources are abundant, available, easy to source and cheap to dispose of. In addition, with increased demands on natural resources, the principle of more cost-effective material and resource use has quickly become a global imperative. The transformation to a more beneficial economy, in which the value of products, materials, and resources is kept in the economy for as long as humanly possible and waste generation is minimized, is a critical component in the development of a sustainable, low-carbon, resource-efficient, and competitive economy (European Commission, 2018; Murray, Skene, and Haynes, 2017). Consequently, the circular economy was introduced to break the global "take-make-consume and dispose" pattern of growth. A field of knowledge that contributes holistically to sustainability is the circular economy. The circular economy is not only a new economic revolution but also a global one because it implies the adaptation of the whole society.

A circular economy is an alternative model of responsible production and consumption, a growth strategy that ensures zero waste. The concept of circular economy was first proposed by Pearce and Turner (1990). The primary goal of the circular economy is to decouple economic growth from resource depletion and environmental degradation (Ogunsanwo, and Ayo-Balogun, 2020; Murray, Skene, and Haynes, 2017).

European Commission (2018) reported that the concept of circular economy can be summarized as a '4R' approach: reduce, reuse, recycle, and recover. In reality, this procedure helps to reduce waste generated from generation to disposal while also improving waste management. As previously stated, the development of a circular economy may represent a solution to solve environmental issues affecting human health and social advancement, strengthening an economic strategy distinguished by resource conservation, and promoting healthier consumer behaviours, all through a shift in growth models and environmental protection.

In practice, a circular economy entails minimizing waste. When a product reaches the end of its useful life, its materials are reused whenever possible. These could be used productively repeatedly, generating additional value. Reusing, repairing, refurbishing, and recycling existing materials and products are examples of measures that contribute to a circular economy (Cullen, 2017). What was once considered "waste" can now be transformed into some kind of valuable resource (European European Commission, 2017; Gbadamosi, 2016). In summary, the circular economy is founded on three guiding principles: eliminating waste and pollution, keeping products and materials in use, and regenerating natural systems. However, these days, it is difficult to claim the need to "save the planet" humans live on, and in order for this to happen, everyone should act and think in favour of a more sustainable world.

Despite government attempts from many countries around the world, such as signing the Agenda 2030 that establishes the 17 goals for Sustainable Development (SD), such actions may not be productive unless all citizens commit to them (Maidoul, Plakitsi and Polatoglou, 2019). They further, stated that sustainable development has three dimensions of sustainability: economic, social and environmental. These sustainability dimensions must be inescapably addressed in education due to the numerous advantages that their competencies provide to eco-social improvement (Gal and Gan, 2015). Given the importance of education in the development of active and critical citizens, schools and teachers are advised to prepare to incorporate the relevance of the Sustainable Agenda into their actions (Maidoul, Plakitsi and Polatoglou, 2019). As a result, teacher education was suggested to include the preparation of (future) teachers to handle sustainable education which is in formative paths. This implies that teacher education should adopt elaborate strategies to promote the development of professionals with competencies that enlighten responsible citizens, specifically in the area of sustainable development. Also, the goal of circular economy is to get an alternative to the traditional (linear) economy model, which is centered on the take-make-use-dispose concept hence, teachers should be able to teach their learners on sustainable lifestyle (sustainable consumption and production) (Gal and Gan, 2015, Gbadamosi, 2019).

To ascertain the level of preparedness of pre-service teachers to achieve sustainable education, Pauliuk (2018), in a study revealed that, when compared to traditional environmental concepts, pre-service teachers had a low level of awareness and understanding of concepts central to sustainable development. In another vein, recognizing the significance of sustainability knowledge in living a sustainable lifestyle, some studies highlighted the significance of influencing sustainable development knowledge through the teaching and learning process (Cutter-Mackenzie, and Smith, 2003; Gbadamosi, 2018). They concluded that knowledge and understanding of sustainability does not always result in responsible behaviour or efficient ESD teaching in classrooms (Gal and Gan (2015); Nousheen, Zai, Waseem, and Khan (2020)), therefore, proposed that a broad understanding of sustainability issues, in addition to the appropriate pedagogical skills, values, and attitudes, should be promoted in teacher education to boost teachers' confidence and readiness to teach Education of Sustainable Development in schools.

Also, Nousheen, Zai, Waseem, and Khan (2020), justified the rationale for designing a curriculum to assist prospective students in changing their attitudes, which may result in greater effects of attitude change while they're in the classroom influencing their students. Pre-service teachers can increase engagement with Education for Sustainable Development (ESD) to promote a positive approach to sustainability (Kalmykova, Sadagopan, and Rosado, 2018). Moreover, ESD research shows that education in schools includes factual knowledge, moral and value issues, and also addresses attitudes, reasoning, and lifestyle issues. Gan and Gal (2018), found that a teacher with high auto efficiency in the pre-service field for the propagation of ESD had positive environmental and environmental behaviour.

Moreover, the knowledge, perspectives, and attitudes of teachers towards circular economy are crucial because their teaching depends heavily on them (Maidoul, Plakitsi and Polatoglou, 2019). In another study, Ajitoni and Gbadamosi, (2015) reported that teachers have a significant impact on their approach to ESD and their desire to get to know the issue of ESD's importance in teaching. Chunteng (2004), discovered a positive attitude toward ESD principles when surveying primary and secondary school teachers' EE teaching competencies. Notwithstanding this, Chunteng claimed that the participants' lack of knowledge and awareness had a negative impact on their attitudes (Maidoul, Plakitsi and Polatoglou, 2019).

Statement of the Problem

Taking teachers' knowledge and attitudes into account has been reported as a necessary precondition for any success in educational reform. However, some of the previous studies done in developed countries reported that pre-service teachers were ignorant of key aspects of circular economy, while information about pre-service teachers' knowledge and attitudes towards circular economy seem rare in Nigeria, which could hamper the effective practice of circular economy in the nation. This study therefore investigates pre-service teachers' knowledge and attitudes towards circular economy in South-west Nigeria. It is hoped to learn about the abilities and willingness of our university's pre-service teachers to incorporate circular economy components into their teaching. Also, sources of information about circular economy were examined.

Research Questions

1. What are the sources of information of circular economy to the pre-service teachers?
2. What is the general knowledge of pre-service teachers on circular economy?
3. What are pre-service teachers' levels of knowledge of circular economy?
4. What is pre-service teachers' attitudes to circular economy?

Methods

A descriptive survey research was adopted. The population is comprised of pre-service teachers in the faculties of education in Federal Universities in South-west Nigeria. Out of 5 federal universities in Ekiti, Osun, Lagos, Ondo, and Oyo, two were randomly selected.

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seminar/workshop (17.7%), followed by research (6.1%), while 2.8% of the respondents picked friends and family sources of information on circular economy.

Research Question 2: What is the general knowledge of pre-service teachers on circular economy?

Table 2: Pre-Service Teachers' Knowledge of the Circular Economy

Circular Economy Concepts	Total No. of respondents	No of respondents who got the answer	F (%)
Solid waste accumulation	180	119	66
Greenhouse effect	180	114	63
Waste management	180	112	62
Sustainable development	180	103	57
Ozone	180	83	46
Meaning and history of circular economy	180	73	40
Biodiversity	180	67	37
Production of energy	180	58	32
Recycling of materials	180	58	32
Use of environmentally friendly materials	180	56	30
Efficient use of resources	180	34	19

Table 2 shows the distribution of the knowledge of respondents on circular economy concepts based on items 1-20 on the knowledge test. It is presented using the topic starting from the concept that had the highest right answer-solid waste accumulation to efficient use of resources. The result is in the following order: solid waste accumulation (66%), greenhouse effect (63%), waste management (62%), sustainable development (57%), ozone (46%), meaning and history of circular economy (40%), biodiversity (37%), production of energy (32%), recycling of materials (32%), use of environmentally friendly materials (30%), and efficient use of resources (19%).

Research Question 3: What are pre-service teachers' levels of knowledge of circular economy?

Table 3: Levels of Pre-Service Teachers' Knowledge of Circular Economy

Level of knowledge	Range of scores	No of respondents	%
High	14-20	06	3.3
Moderate	10-13	32	17.8
Low	0-9	142	78.9
Total		180	100

From table 3, very few of the pre-service teachers surveyed had high knowledge of circular economy (3.3%) followed by 32 (17.8%) with moderate knowledge of circular economy, while the majority had low knowledge of circular economy with 142 (78.9%).

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Table 4 shows that most pre-service teachers agree with a percentage that every teacher should incorporate environmental topics and values into his or her classroom instruction (41.1 strongly agree and 25.0 agree) while (1.1 strongly disagree and 32.8 disagree). Also, the majority of pre-service teachers agree (28.3 strongly agree and 38.9 agree) while (1.1 strongly disagree and 31.7 disagree) that each student in a teacher training institution should be required to study a circular economy course during his/her studies. In another vein, a larger percentage of pre-service teachers agreed that factories should be penalized for environmental damage (40.6 strongly agree and 24.4 agree, while 32.2 strongly disagree and 2.8 disagree). Moreover, most of the pre-service teachers believe that they can contribute to the quality of the environment through their personal behaviours (44.4 strongly agree and 23.9 agree, while 30.6 strongly disagree and 1 disagree.) Also, most of the pre-service teachers agree that it is important to be involved in waste reduction campaigns on campus/society at large (42.2 strongly agree and 27.8 agree, while 6.0 strongly disagree and 29.4 disagree).

Table 4 also shows that some pre-service teachers agree that non-recyclable products should be taxed heavily to reduce waste (26.1 strongly agree and 32.2 agree, while 1.7 strongly disagree and 40.0 disagree). Moreover, a larger percentage of the pre-service teachers agreed that it is each person's responsibility to take care of the environment (46.7 strongly agree and 20.6 agree, while 1.7 strongly disagree and 31.1 disagree).

The majority of the pre-service teachers agreed that a circular economy is important as a systemic approach to economic development designed to benefit businesses, society, and the environment (40.6 strongly agree and 30.0 agree, while 1.1 strongly disagree and 28.3 disagree). Moreover, a larger percentage of the pre-service teachers agreed that the potential benefits of shifting to a circular economy extend beyond the economy and into the natural environment (47.2 strongly agree and 42.2 agree, while 1.1 strongly disagree and 9.4 disagree).

Also, a larger percentage of pre-service teachers agreed that it is important to include circular economy in the curriculum because it reveals and designs out the negative impacts of economic activity that causes damage to human health and natural systems (48.9 strongly agree and 41.1 agree, while 3.3 disagree strongly and 6.7 disagree).

Summarily, the weighed mean of 3.00 shows that pre-service teachers have a positive attitude towards circular economy. For further analysis of the attitudes of preservice teachers to circular economy, preservice teachers' attitudes are categorized into two-positive attitudes and negative attitudes.

Table 5: Pre-Service Teachers Attitudes towards Circular Economy by Category

Attitude by category	Frequency	%
Positive Attitude	99	54.7
Negative Attitude	82	45.3
	181	100

Source: Authors' Field work, 2021

From table 5, more than half of the students had positive attitude to circular economy with 99 (54.7 %) while 82 (45.3%) had negative attitude to circular economy.

Discussion of Findings

Pre-service Teachers' sources of information about Circular Economy

The study revealed that some of the pre-service teachers (53 %) had heard about circular economy, while 46.9% had never heard about circular economy. The findings also show that the most common source of information on circular economy is social media, followed by universities, followed by electronic media, followed by print media, while few pre-service teachers picked research. The result is supported by (Murray, Skene, Haynes, 2017 ; Ogunsanwo, and Ayo-Balogun, 2020) that circular economy related issues are not among the common concepts and issues incorporated into the teacher education curriculum and little or no reference is made to them in social, print and electronic media.

Pre-service Teachers' Knowledge of Circular Economy

The results show that the majority of pre-service teachers did not have adequate knowledge of central concepts in circular economy. The result is in line with Murray, Skene, Haynes, 2017.) that pre-service teachers had better knowledge and understanding of traditional environmental concepts while most students ignored the concept of circular economy and other types of economies related to circular economy that are the basis of circular economy.

Moreover, the adequate knowledge displayed on solid waste accumulation is probably due to the fact that traditional environmental concepts are frequent in the pre-service university curriculum, such as education economics, education geography, social studies, education biology, and so on. Traditional environmental concepts such as flooding, urbanization, sustainable development, waste management, and climate change are also frequently mentioned in news bulletins on social, print and electronic media. On the other hand, ozone and biodiversity are mentioned occasionally, which makes students not have good knowledge of them. Furthermore, pre-service teachers demonstrated low knowledge of circular economy of the following themes: recycling of materials, use of environmentally friendly materials, efficient use of resources, production of energy were not pronounced or yet to be included in the teacher education curriculum (European Commission, 2017) and are rarely mentioned in order sources of getting information such as electronic, print and social media in Nigeria.

Pre-service Teachers' Attitude to Circular Economy

Some of the pre-service teachers had positive attitude to circular economy. The finding shows that some of the pre-service teachers were favorably disposed to adoption of circular economy, students taking courses in circular economy, and the teaching of circular economy, although it did not affect their poor knowledge of the concept. The result shows that pre-service teachers' attitude to circular economy is relatively high on average (Gbadamosi, 2021). The implication is that the opinion of the pre-service teacher about the circular economy concept is good but does not translate into knowledge which may help to actualize the principle of circular economy: 'Ten Rs'; refuse, reduce, reuse, repair, refurbish, remanufacture, repurpose, recycle, recover, and re-mine. Pre-service teachers' knowledge of these principles will definitely translate into an attitudinal change that will make the world a better place to live in. By extension, their attitudes will affect their lifestyle and their contribution to society in their profession as teachers.

Some of the items, like 1, 6, 10, 13, 17, 18, 20, scored high. This means pre-service teachers are conscious of what circular economy offers our planet at large, not our immediate benefit as individuals. This is in line with goal 12 of the SDGs, which is to "ensure sustainable consumption and production patterns" and target 5 of the same goal, which states that by 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse. However, the responses negate some responses. This means that the pre-service teachers are inconsequential in their responses. The respondents were not well informed to guide their judgment on reasoning, but picked the responses by guessing. On the other hand, it is probably as a result of the high rate of poverty in Nigeria, pre-service teachers may not care about environmental sustainability. Most of the time, Nigerians heavily rely on nature and are careless as long as their needs are met. Other items like 3, 4 and 5, which also scored high, are in support of targets 4 and 6, i.e. to achieve environmentally sound management of chemicals and waste throughout their lifecycle and encourage companies, especially large companies, to adopt sustainable practices to integrate sustainability uniformly into their operations..

Policy implications of the findings

Recognizing the significance of sustainability knowledge in living a sustainable lifestyle, The results demonstrated the need of promoting sustainable development knowledge through the teaching and learning process. Since pre-service teachers are only familiar with the traditional linear method of waste disposal, which is take-make-use-dispose, there is a need to include circular economy into their curriculum during training. The implication of this is that "you can only give what you have". If the pre-service teachers were well equipped with this new concept, it would go a long way to affect their attitude to their environment and the benefits that can be derived from circular economy, vi-a-vis clean environment, income, generation, employment, and redirection of solid waste. This knowledge can be transferred to others through teaching, demonstration, and attitudinal changes.

Conclusion

The pre-service teachers demonstrated poor knowledge of circular economy and a relatively positive attitude to circular economy. It is therefore concluded that it is necessary to carry out a literacy process to train pre-service teachers towards acquiring skills that allow them to practice and promote circular economy in the classroom instruction. Since, the need for teaching and learning of circular economy cannot be overemphasized. This is because it enhances achievement of environmental sustainability through sustainable development education. This at long run will give opportunity to promote preventive education to achieve SDGs targets 4, 5, and 6.

Recommendations

Because of the importance of sustainability pedagogies in teaching practice, it is recommended to restructure teacher education towards sustainability as well as adapt to more structural and interdisciplinary frameworks of teaching and learning, particularly in teacher education.

1. The Nigeria University Commission (NUC) should review the university curriculum to be abreast of the demands of society in order to make teacher education and university education generally relevant to the needs of society. Teacher educators should be trained by the professional bodies, government, international organisations such as UN, UNESCO and so on through seminars and workshops on circular economy.
2. Information on circular economy should be disseminated and promoted in different media, such as social, print and electronic, to create awareness, improve knowledge and attitudes towards circular economy.

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