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Impact of Education for Sustainable Development on Undergraduate Students' Sustainability Behaviour in Nigeria

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Abstract

Study examines the impact of education for sustainable development on undergraduate students' sustainability behavior in Nigeria. The study was conducted through descriptive survey research with total population of eight hundred and seventy-five thousand (875,000) students across the 43 Federal University of Nigeria approximately as estimated in the NUC count and license. Cluster sampling of 300 students from FUG Gusau and Usmanu Danfodiyo Universities in Zamfara and Sokoto state were chosen to administered the questionnaire for completing. The finding of this reveal that, results emphasize the importance of education for sustainability in developing sustainable behaviors among university students in Nigeria. The structural model confirmed that sustainability education (including environmental concerns, cultural environment, and warning attitudes) significantly correlated with university students' sustainability behavior (specifically, reuse behavior). The study recommended that, management and policymakers should mainstream ESD across all disciplines. Capacity-University building programmes should be organized regularly for lecturers and non-academic staff.

Keywords:
Sustainability, Education, Higher education, Students, Behavior, Nigeria.

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Background to the Study

Education for Sustainable Development (ESD) has gained prominence as a transformative approach within the global educational landscape, aiming to empower learners to engage critically and constructively with the complex challenges of sustainability (UNESCO, 2020). ESD seeks to integrate principles, values, and practices of sustainable development into all aspects of education and learning, thereby fostering the competencies required to build a more just, equitable, and sustainable society (Tilbury, 2011). Within the context of higher education, universities not only function as centers of knowledge creation and dissemination but also bear the responsibility of modeling and instilling sustainable behaviors among students—future policymakers, entrepreneurs, and leaders (Sterling, 2013). Nigeria, like many other nations, faces pressing sustainability issues such as environmental degradation, resource scarcity, climate variability, and deepening social inequalities (Akinyele, 2022). In response, Nigerian universities have begun to mainstream ESD through curriculum innovation, research, campus greening initiatives, and community partnerships (Olawale & Chinedu, 2021). Despite these efforts, critical questions persist regarding the extent to which ESD initiatives are translating into tangible shifts in students' sustainability knowledge, attitudes, and—most importantly—behaviors.

The United Nations (UN) Agenda 2030 states that global transformation and universality are necessary for sustainable development. "Universality" refers to sustainable development, which calls for meeting global issues such as inequality between nations, climate change, and regional economic, social, and environmental goals. Governments and international organizations must address these complex concerns to enable necessary "transformative" changes in the way of life and environmental protection (Bastianoni et al., 2019). It has been observed that education, in all its various forms from elementary to tertiary levels, plays a distinctive and pivotal role. The global initiative for sustainable development is likely to experience significant growth due to the UN Sustainable Development Goals (Shiel et al., 2016). Education for sustainable development (ESD), also known as Education for Sustainability, is a concept aimed at comprehending and reshaping educational systems to foster sustainability within higher education institutions. Its goal is particularly centered on shaping the mindset, values, and actions of future generations (Zguir et al., 2021). The increasing number of academic programs focused on sustainability from global universities reflects the modern prominence of sustainability and environmental science (Wiek et al., 2011). Changes in behavior are necessary to achieve sustainability objectives since they have a substantial impact on humans. In this sense, people's consumption patterns—which include the need for necessities like food, fuel, water, wood, minerals, and materials—are fundamental. There is broad consensus that resource overuse and environmental degradation cause irreversible changes to our world. Home consumption contributes 50–80% of global land, material, and water usage and about 60% of greenhouse gas emissions (Ivanova et al., 2016). According to UN Food and Agriculture Organization (FAO) estimates, one-third, or around 1.5 billion tonnes, of the food produced worldwide is wasted (FAO of the United Nations, 2013). Furthermore, as population growth and resource demand

increase, it is predicted that in <15 years, the water demand will exceed the availability by 40% (Programme UNE, 2017).

Problem Statement

Despite growing efforts to integrate Education for Sustainable Development into Nigerian University education, observable sustainability behavior among undergraduate students remains relatively low. Many students are exposed to sustainability concepts through general studies courses, departmental curricula, and campus sensitization programmes, yet their everyday practices in areas such as energy use, waste disposal, water conservation, and responsible consumption often do not reflect the principles of sustainable living. This suggests a possible gap between ESD exposure and actual behavioral change. However, empirical studies that specifically examine the impact of ESD on university students' sustainability behavior in the Nigerian context are scarce. Consequently, it is not clear whether and to what extent current ESD provisions are effective in promoting sustainable behavior among undergraduates, or which aspects of ESD (content, pedagogy, campus environment, or co-curricular activities) are most influential. This study therefore investigates the impact of Education for Sustainable Development on university students' sustainability behavior, using undergraduate students in Nigeria as a case study, in order to generate evidence that can guide policy and practice in Nigerian higher education.

Research Objectives

This study is aimed to examine the Impact of Education for Sustainable Development on University Students' Sustainability Behavior: A Case Study from Undergraduate Students in Nigeria. In an attempt to achieve this objective, the following specific objectives are set to:

1. To examine the extent of integration and exposure of Education for Sustainable Development (ESD) within Nigerian university undergraduate curricula and activities.
2. To assess the level of awareness, knowledge, and attitudes of Nigerian undergraduate students towards sustainability and sustainable development.
3. To evaluate the influence of ESD on undergraduate students' actual sustainability behavior, such as resource conservation, waste management, and social responsibility.

Research Questions

The following research questions were raised to guide the study:

1. How is Education for Sustainable Development integrated into undergraduate programs in Nigerian universities?
2. What is the level of sustainability knowledge and attitude among Nigerian undergraduate students exposed to ESD?
3. To what extent does exposure to ESD influence the sustainability behavior of Nigerian university undergraduates?

Null hypothesis

Based on the research questions stated, the following null hypotheses are formulated.

1. $H0_1$: Education for Sustainable Development has no significant effect on Nigerian undergraduate students' sustainability knowledge.
2. $H0_2$: Education for Sustainable Development has no significant effect on Nigerian undergraduate students' attitudes towards sustainability.
3. $H0_3$: There is no statistically significant relationship between the level of exposure to Education for Sustainable Development and the sustainability behavior of Nigerian undergraduate students.

Concept of Education for Sustainable Development

Education for Sustainable Development (ESD) is an educational approach designed to empower individuals with the knowledge, skills, values, and attitudes necessary to contribute to a sustainable future. It integrates key sustainable development issues such as climate change, biodiversity, poverty reduction, and sustainable consumption into teaching and learning processes. ESD encourages participatory methods that motivate learners to change their behavior and take responsible action for environmental, economic, and social sustainability, aiming to improve quality of life for present and future generations. ESD fosters awareness of complex interrelationships in sustainability, encouraging reflection on conflicting goals and societal change. It plays a significant role in achieving the United Nations' Sustainable Development Goals (SDGs) by supporting sustainable and resilient communities through education. It also requires participatory teaching and learning methods that motivate and empower learners to change their behaviour and act for sustainable development. Education for Sustainable Development consequently promotes competencies like critical thinking, imagining future scenarios and making decisions in a collaborative way (UNESCO, 2020).

The Role of Higher Education for Sustainable Development (ESD)

Universities are established to carry out the tripartite roles of teaching, research, and community service thereby contributing meaningfully to the social and economic development of the nation. They are supposed to impart high-level skills to a reasonable proportion of the workforce, developing the intellectual capability of individuals and engaging in the training of competent and responsible professionals needed virtually in all aspects of human endeavor. Universities play a critical role in shaping sustainability awareness and driving transformative change towards sustainable development. As centers for knowledge creation and dissemination, universities not only educate future professionals and leaders but also serve as catalysts for societal progress. By integrating sustainability concepts into academic curricula, universities ensure that graduates possess the skills, values, and mindsets needed to address complex environmental, social, and economic challenges (Sterling, 2013).

Through Education for Sustainable Development (ESD), universities embed sustainability principles into teaching, research, and campus operations. ESD encourages interdisciplinary learning, critical thinking, problem-solving, and active participation in

sustainability initiatives (UNESCO, 2020). By fostering a holistic understanding of sustainability, ESD enables students to appreciate the interconnectedness of social equity, environmental stewardship, and economic viability, thus preparing them to make responsible decisions and act as change agents within and beyond academic settings (Lozano et al., 2015).

Global Initiatives like the UN's Decade for Education for Sustainable Development (2005–2014) and the 2030 Agenda for Sustainable Development.

The United Nations' Decade of Education for Sustainable Development (DESD, 2005–2014) and the 2030 Agenda for Sustainable Development are two major global frameworks that have strongly influenced Nigerian educational policies toward sustainability. UN Decade of Education for Sustainable Development (2005–2014): The DESD was launched to integrate sustainable development principles into education systems worldwide, including Nigeria. It emphasized building capacities at all educational levels to foster sustainable lifestyles, social responsibility, and environmental stewardship. Nigeria participated by initiating curriculum reforms, teacher training, and public awareness campaigns to promote sustainability literacy. UNESCO's support helped Nigeria address underdevelopment through education by integrating sustainability concepts more comprehensively within technical, science, and teacher education programs.

2030 Agenda for Sustainable Development: The 2030 Agenda's Sustainable Development Goals (SDGs), particularly SDG 4 on quality education and SDG 13 on climate action, have further shaped Nigerian education policies. SDG 4 mandates inclusive, equitable quality education that equips learners with knowledge and skills for sustainable development, including ESD. Nigeria's national policies aim to align education targets with the agenda by promoting universal basic education, improving access to technical and vocational education, and integrating sustainability topics within curricula. Education is recognized as pivotal for achieving economic empowerment, social equity, and environmental protection in Nigeria.

Influence on Nigerian Educational Policies

i. These global frameworks have spurred Nigeria to adopt policies that:
ii. Strengthen ESD by mainstreaming sustainability content across all education levels.
iii. Enhance teacher education to prepare educators capable of delivering ESD effectively.
iv. Utilize formal and non-formal education platforms to raise awareness and community participation in sustainable development.
v. Focus on the quality, relevance, and inclusiveness of education to reduce inequalities and empower marginalized groups.

University Students' Awareness of Sustainability Issues

Nigerian undergraduate students show a generally good level of awareness about global

and local sustainability challenges, including climate change, resource depletion, and social equity, although gaps remain in fully understanding the importance and impact of sustainability on daily life. A survey of Nigerian universities found that over 90% of students were aware of the Sustainable Development Goals (SDGs), indicating high awareness of broad sustainability issues, though many viewed sustainability as primarily a government responsibility rather than personal or institutional. The following are some of awareness among Nigerian undergraduate students.

i. Knowledge and Awareness:
ii. Curriculum Integration:
iii. Extracurricular Activities**:**

Impact of ESD on Students' Sustainability Behaviors

Education for Sustainable Development (ESD) aims to encourage specific sustainable behaviors among students, including waste reduction, energy conservation, sustainable consumption, and active engagement in community development. These behaviors align with the broader goal of fostering environmentally responsible, socially equitable, and economically viable lifestyles. Education is critical because it can change people's behavior.

Although ESD existed before the SDGs (Hjorth Warlenius, 2022), it has emerged as a pivotal instrument within the present SDG agenda to reorient learning toward a more sustainable world and tackle economic, social, and environmental challenges (Stein et al., 2022). Several universities have started implementing several principles to help administrators in higher education find and implement complex solutions for future responsible management. These principles also ensure that students receive the education necessary to support sustainable development and lifestyles (Borges et al., 2017). Higher education also helps students enhance their multidisciplinary cooperation, anticipatory skills, problem-solving ability, creative thinking, and social responsibility—all critical for accomplishing the Sustainable Development Goals (SDSN, 2020).

In the Nigeria Educational setting, it is crucial to prioritize education on sustainability. Nigeria encounters distinctive environmental obstacles such as insecurity, deforestation, desertification, and the effects of climate change that endanger the livelihoods and welfare of its people (Melesse and Obsiye, 2022). Sustainability education should be integrated more extensively than solely acquiring knowledge, entailing a transformative, participatory learning process that aligns behavior with knowledge (Hammer and Lewis, 2023). However, this research is timely and significant as it coincides with Nigeria's efforts to rebuild its higher education sector, presenting a crucial opportunity to embed sustainability principles that will influence the country's future development. Aligning Nigeria higher education institutions with international sustainability standards is essential amidst the global push for sustainable development. Education for Sustainable Development promotes behaviors based on the following:

i. Reducing waste through recycling and reusing materials.

ii. Conserving energy by adopting efficient practices and technologies.
iii. Practicing sustainable consumption by being mindful of resource use.
iv. Participating in community initiatives that improve local environmental and social conditions.
v. Advocating for and adopting environmentally friendly transportation (e.g., public transport, cycling).

Challenges in Promoting ESD in Nigerian Universities

In Promoting Education for Sustainable Development (ESD) in Nigerian universities encounters several challenges that can be categorized under institutional barriers, cultural and socioeconomic factors, and curriculum gaps. The under listed challenges are as follow.

i. Institutional Challenges: Nigerian universities face significant institutional barriers in implementing ESD effectively. Key issues include, Lack of Funding, Insufficient Training for Educators and Inadequate Infrastructure:
ii. Cultural and Socioeconomic Factors: Cultural attitudes, Lack of Government Support and socioeconomic conditions influence students' responses to ESD.
iii. Curriculum Gaps: While there is progress integrating sustainability into Nigerian university curricula. The following gaps are as follow, Fragmented Integration, Insufficient Practical Focus and Lack of Updated Content.

Opportunities for Strengthening Education for Sustainable Development in Nigeria

Strengthening Education for Sustainable Development (ESD) in Nigeria offers significant opportunities to deepen sustainability awareness and action among university students through targeted curriculum development, collaborative partnerships, and student advocacy.

Curriculum Development: Nigerian universities can enhance ESD integration by the following. Adopting Interdisciplinary Approaches, Incorporating Experiential Learning and Promoting Community-Based Projects.

Partnerships and Collaboration: The Effective ESD requires multi-sectoral collaboration as mention below: Government Engagement, NGO and Civil Society Involvement and Private Sector Collaboration.

Student Advocacy: Empowering students as change agents is vital of the following: Encouraging Student-Led Initiatives and Highlighting Success Stories.

Literature Review

The academic focus on students' sustainability abilities progressively expanded over many years (Wu and Shen, 2016). In Spain, researchers investigated the correlation between adopting sustainable consumption and seven competencies: self-regulation, leadership, perspective, humility and modesty, kindness, and appreciation of beauty. They demonstrated that cultivating ethical competencies through education promotes

the adoption of sustainable consumption practices among students (Okubo et al., 2021). Sustainable development is mainly integrated into higher education in two ways. The first one is to include it throughout all school curricula, and the second is to train staff and students to become sustainability experts (Liu et al., 2022). Curriculum change, regional and worldwide partnerships, and sustainable campus initiatives have been organized to endorse ESD in higher education institutions (Vaughter et al., 2013). Universities have promoted sustainability initiatives in their academic programs and infrastructure (Findler et al., 2019). An increasing focus is placed on cultivating students' proficiencies in systems thinking competency, anticipatory competence, normative competence, strategic competence, and interpersonal competence (Cebrián et al., 2020; Cebrián and Junyent, 2015; Liu et al., 2022).

University students must receive education to understand and address social, environmental, and economic challenges while promoting collaboration to execute coordinated initiatives (McNall, 2011; Weber and Duderstadt, 2012). From an educational perspective, this involves establishing meaningful human connections that result in significant learning to address socio-environmental challenges during the academic journey (Núñez, 2014). Universities have a significant impact on shaping the behavior of their students, utilizing resource use competitions and sustainability programs conducted on campus (Filho, 2011). Achieving sustainable development demands more than just environmental initiatives; it requires a fundamental shift in human behavior to address today's pressing sustainability issues (Badwan et al., 2022). It also requires a profound understanding of individuals' decision-making processes, actions, thoughts, interactions, beliefs, and attitudes (United Nations, 2016).

Methodology

The study is basically descriptive survey research captures the perspectives of a diverse population, allowing researcher to quantify and analyze variables such as Sustainability behavior, Sustainability attitudes and Socio-demographic factors. The population of this study comprises the students of Federal University of Nigeria. There are 43 Federal University in Nigeria across the 36 State and FCT. The total population for the study was eight hundred and seventy-five thousand (875,000) students across the 43 Federal University of Nigeria approximately as estimated in the NUC count and license. The sample size was determined using the Bin Ahmad and Binti Halim (2017) formula, where an additional 5% of the sample size was added to account for potentially incomplete questionnaires. A total of 300 self-administered questionnaires were disseminated via Google Forms among undergraduate students across Faculties of social sciences at Udusok and FUG, Gusau. We received 276 responses out of the 300 we targeted. The selection process for the study population involved cluster sampling, whereby faculty officer would provide information regarding the total number of students enrolled in each faculty. Participation in the study was entirely voluntary, and the criteria for inclusion required that participants be currently enrolled undergraduate students in the Faculty of Social Sciences at either Udusok or FUG Gusau respectively. Students were approached in the classroom to complete the questionnaire fully. The questionnaire of

this study contains five sections addressing concerns about the environment (CE), the culture of the environment (CUE), warning (W), reuse (R), and a section intended for respondents' demographic background. These sections draw upon items adapted, revised, and added from previous studies of (Ahamad and Ariffin, 2018; Boca and Saraçli, 2019). The chosen objects correspond to four components of ESD: enhancing quality of life, ensuring environmental protection, resource efficiency, and addressing the demands of future generations (Ahamad and Ariffin, 2018). These four components are aimed to ensure that the questionnaire is inclusive. There are 15 items in the independent variables (CE, CUE, W) and five in the dependent variable, namely student behavior (R). The total number of items was adjusted to 20 accordingly after subsequent validity and reliability tests were taken. Before distributing the questionnaires to the sample population, the questionnaire was content-validated and tested for reliability. Item content validity was assessed using the item content validity index (I-CVI). This process involves of experts from university indicating the relevance of items contained in a questionnaire. Therefore, the questionnaire was distributed to four academicians with expertise in or relevant to ESD. They were requested to rate, comment, and suggest item improvements. Then a pilot test involving 20 respondents was undertaken to confirm the reliability of the questionnaire. The internal reliability and consistency of questions were tested using Cronbach's alpha. Cronbach's alpha values for all four sections have acceptable internal consistency (CE, CUE, and W) and (R). The research was conducted at Usmanu Danfodiyo University, Sokoto and Federal University Gusau, Zamfara State, Nigeria, involving undergraduate students from the Faculties of Social Sciences. These faculties were chosen due to their focus on areas related to sustainability, including resource management, environmental economics, and corporate social responsibility. As of the 2024/2025 academic year, there is a total student population of 850 across both faculties.

Data Analysis and Results

The study utilized structural equation modeling with SmartPLS4 to assess both the measurement and structural model (Henseler et al., 2015). The researchers of this study investigated the proposed paths and confirmed the findings. Structural equation modeling using SmartPLS4 encompasses a range of statistical techniques for examining potential relationships between independent and dependent variables (Lee et al., 2011). It is characterized by two sets of linear equations: the structural model, which elucidates the connections between constructs, and the measurement model, which illustrates the interactions between a construct and its observable indicators. The researcher selected SmartPLS for two primary reasons: firstly, PLS is a more suitable approach for our investigation as it is exploratory in nature. Secondly, it has gained significant recognition across scientific disciplines recently (Sarstedt and Cheah, 2019). Utilizing hypotheses testing in research to uncover causal relationships was commonly considered appropriate (Restuputri et al., 2021).

Research Model

The diagram in Figure 1 describes a research model that is developed based on the study's objectives, hypotheses, and existing literature. This model encompasses various

important variables including environmental concerns (CE1, CE2, CE3, and CE4), cultural environment (CUE1, CUE2, and CUE3), attitudes toward environmental warnings (W1, W2, and W3) as well as the practice of "reuse" with its three components (R1, R2, and R3). The research employs Structural Equation Modeling to examine the eco-friendly behaviors of university students and explore the causal connections between their environmental attitudes and their real actions. The SEM framework integrates both behavioral aspects along with attitudinal ones.

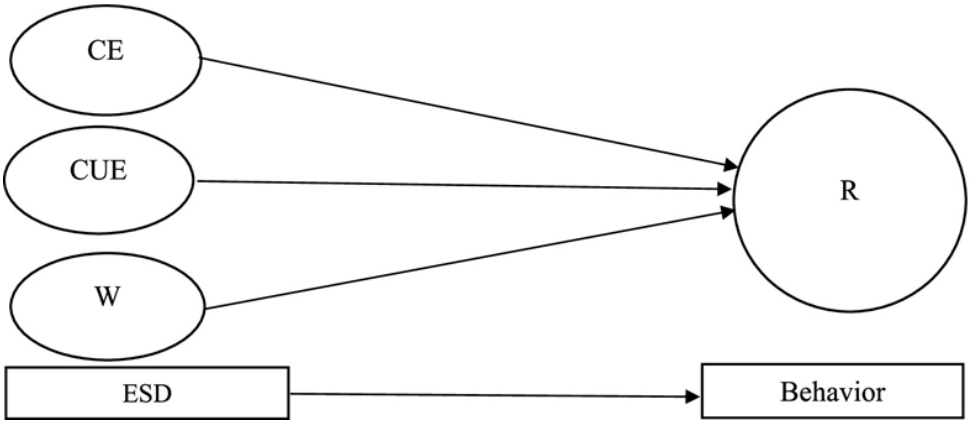

Figure 1: Research model. Source: by author.

Findings of the study on Demographic Information

Based on the demographic information provided by the participants, it can be observed that 54.2% of the sampled respondents identify as male, while 45.8% identify as female. Concerning age groups, 86% of the sample consists of participants aged 18–22. Concurrently, 14% of the respondents were between the ages of 22 and 25. All participants in our study were undergraduate students who had recently completed secondary education, and none were older than 25. Regarding marital status, the study's sample was predominantly composed of single respondents, at 96%. Married respondents constituted a mere 4% of the total. As indicated in Table 1, most research participants (70% of all respondents) were in the third and last years of their bachelor's degree, while 30% were in the first years of their bachelor's degree.

Table1: Demographic characteristics of respondents (N = 251).

Character	Frequency	Percent
Gender: Male	156	54.2%
Gender: Female	115	45.8%
Age 18–22 years	216	86%
Age 22–25 years	35	14%
Single	241	96%
Married	10	4%
Education: Level I	75	30%
Education: Level III & IV	176	70%

Discussion

This study investigated how ESD affects the behavior of university students in Nigeria. The study's results emphasize the importance of education for sustainability in developing sustainable behaviors among university students in Nigeria. The structural model confirmed that sustainability education (including environmental concerns, cultural environment, and warning attitudes) significantly correlated with university students' sustainability behavior (specifically, reuse behavior). Higher education institutions are crucial in advancing sustainable development through significant in-campus activities that positively impact the environment and society (Badea et al., 2020). The involvement of students in sustainable practices promotes their attachment to the campus community, extends their desire to participate in campus initiatives, and facilitates a significant change through their behavior (Krasny and Delia, 2015).

Conclusion

The study examined the impact of Education for Sustainable Development (ESD) on the sustainability behavior of Nigerian university undergraduates, focusing on environmental concern, cultural environment, warning attitudes, and reuse behavior as core constructs. The findings demonstrate that ESD-related factors are significantly associated with students' sustainability behavior, indicating that exposure to sustainability concepts within curricula and campus activities can positively influence practical actions such as reuse and resource conservation. This confirms that higher education institutions are strategic platforms for cultivating sustainability-oriented values, attitudes, and behaviors among future decision-makers in Nigeria. Despite growing awareness and evolving curriculum initiatives, the study also highlights persistent gaps between students' sustainability knowledge/attitudes and their everyday practices, as well as institutional, cultural, and socioeconomic challenges that constrain the full realization of ESD objectives. Limited funding, inadequate staff

training, fragmented curriculum integration, and contextual barriers such as poverty and entrenched norms reduce the translation of ESD exposure into consistent sustainable lifestyles on campus and beyond. The study therefore concludes that while ESD already contributes meaningfully to shaping sustainability behavior, a more systemic, practice-oriented and context-sensitive implementation is required to achieve deeper and more enduring behavior change among Nigerian undergraduates.

Recommendations

1. Management and policymakers should mainstream ESD across all disciplines.
2. Capacity- University building programmes should be organized regularly for lecturers and non-academic staff.
3. Universities should invest in supportive campus infrastructure and policies.
4. Partnerships with government agencies, NGOs, and the private sector.
5. Student-led clubs and advocacy platforms should be encouraged and supported as key drivers of peer influence

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