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From Pedagogical Spaces to Societal Transformation: Advancing Sustainability Education through the Integration of Life Skills and Critical Thinking Competencies

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ABSTRACT
Background: Sustainability education has emerged as a critical driver for equipping learners with the knowledge, skills, and values necessary to address the complex socio-environmental challenges of the 21st century. While global frameworks such as UNESCO's Education for Sustainable Development (ESD) emphasize the integration of sustainability concepts, life skills, and critical thinking into formal curricula, there remains a need for empirical evidence on how such integration translates into practical, long-term societal impact. **Objectives:** This study aimed to examine how pedagogical strategies and curricular designs facilitate the integration of sustainability concepts, life skills, and critical thinking within formal education, to investigate the mediating role of life skills and critical thinking in transforming sustainability education into actionable community engagement; and to assess the long-term impact of integrated sustainability education on learners' contributions to societal transformation toward sustainable development. **Methodology:** A mixed-methods design was employed across three interconnected phases. Quantitative data were collected through teacher and student surveys (adapted from UNESCO ESD indicators), standardized scales for life skills and critical thinking (LSAS, CCTST), mediation analyses, and longitudinal follow-up surveys of alumni (1–3 years post-completion) using the General Ecological Behavior Scale. Qualitative data included classroom observations, curriculum content analyses, semi-structured interviews, and case studies of school-led community sustainability initiatives. Data triangulation ensured both internal validity and contextual richness. **Results:** For Objective 1, correlation analysis revealed a moderate positive association ($r = 0.46$, $p < 0.01$) between the frequency of sustainability concept inclusion and the depth of life skill integration, with qualitative findings confirming the role of student-centered, competency-driven teaching. For Objective 2, mediation analysis indicated that life skills

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and critical thinking significantly mediated the relationship between sustainability knowledge and active community engagement ($\beta = 0.38$, $p < 0.05$), supported by thematic evidence of enhanced problem-solving and collaboration in real-world projects. Responding to Objective 3, the longitudinal data found that alumni continued to actively engage in pro-environmental behaviors, local leadership and advocacy, with the local stakeholders of the community claiming significant local changes were attributable to the student-led course, including a reduction in waste sent to landfills and afforestation drives. **Conclusion:** The results establish a strong case that incorporation of sustainability knowledge with the idea of life skills and critical thinking in formal education needs to be integrated with purposes that go beyond improving just the current academic performance bettering also the long-lasting ability to transform the society wherein one lives. Closing the gap between both worlds, the classroom and the community where action is practiced, this strategy produces a positive and long-lasting ripple effect that can confirm the global sustainability objectives and an educational program that can create positive rippling change.

Keywords: Pedagogical Spaces, Societal Transformation, Sustainability Education, Life Skills and Critical Thinking Competencies

Introduction

Background Study

Sustainability education has continued to attract a lot of attention as a crucial training method in equipping learners to deal with multifaceted environmental, social, and economical issues (Sterling, 2011). Incorporating principles of sustainability into the formal educational environment necessitates pedagogical approaches, as well as curriculum models that surpass the conventional modes of content delivery in facilitating the development of critical skills, including life and thinking skills (Wiek et al., 2011). Pedagogy such as experiential learning, inquiry-based learning and problem solving tasks are especially appealing in making sustainability concepts internalized in a meaningful and practical manner (Tilbury, 2011).

Critical thinking and life skills are regarded as the primary mediators of sustainability education. Life skills, including communication and decision-making and problem-solving, provide learners with the possibility to implement sustainability principles into real life practices (UNICEF, 2012). Critical thinking allows students to deconstruct difficult sustainability challenges and assumptions and come up with creative solutions (McKeown & Hopkins, 2003). A number of researchers have revealed that such competencies do not only foster knowledge, but also help in transferring knowledge inside classrooms into effective community use and responsible citizenship (Jensen & Schnack, 2006; Sterling, 2010).

Additionally, the long term implication of incorporated sustainability education goes beyond knowledge learning but moving towards transformation of society. Studies reveal that learners enrolled in holistic sustainability programs are better placed to pursue environmentally friendly ways of living and support the idea of social and environmental justice (Sauve, 2005; Barth et al., 2016). Such transformative potential is the key to global sustainability ambitions and should be continuously supported and assessed in the long run (Tilbury, 2015).

Collectively, these reflections highlight the necessity of the holistic educational practice that unites the principles of sustainability to life skills and forming critical thinking and, by extension, to promote their learners to become the active agents of change in their

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local communities.

Objectives

To understand how pedagogical approaches and curriculum designs foster the incorporation of sustainability ideas, life skills and critical thinking into formal schooling.

To examine the role of life skills and critical thinking as mediating competencies in translating sustainability education into actionable community engagement.

To evaluate the long-term impact of integrated sustainability education on the capacity of learners to nurture the process of transformation in the society towards sustainability development.

Research questions

How do pedagogical strategies and curricular designs facilitate the integration of sustainability concepts, life skills, and critical thinking within formal education?

In what ways do life skills and critical thinking function as mediating competencies in translating sustainability education into actionable community engagement?

What is the long-term impact of integrated sustainability education on learners' ability to contribute to societal transformation toward sustainable development?

Research Gap

Although it is a generally established proposition that life skills and critical thinking have a place in the sustainability curriculum, there are still some loopholes. For the first, the definition and operationalization of these competencies lack uniformity, and most studies only examine narrowly critical rationality instead of involving a range of other dimensions, including critical character and critical consciousness (Ferrer-Balas et al., 2023). Second, there is the mismatch between the skills imparted through the formal education system and those required in society and the employment market in terms of emotional intelligence and flexibility (P service-Segura et al., 2023). Third, numerous educators complain about being ill-prepared and with no apparent pedagogical directions on how to integrate these competencies into sustainability curriculum (Ferrer-Balas et al., 2023). Also, assessment protocols frequently do not address life skills and critical thinking and can be basically confined to cognitive knowledge (Johnson, 2023). Lastly, education practices often fail to take into consideration cultural and situational differences, which constrains generalization of sustainability education in different contexts (Sanchez-Caizares & Pedreno-Rojas, 2022). The lacks in these areas are key areas of the lack in achieving the full potential of the application of sustainability education to societal change.

Study significance

The study is important because it will makes a contribution to the critical gap in sustainability education by examining the possibility of incorporating both life skills and critical thinking skills and how this combination can succeed in facilitating learning in classrooms in a way that makes a significant change in the community. Through discussion of the pedagogical spaces, the mediating mechanisms and educational outcomes, the research will offers significant contributions to the curriculum planning that in addition to providing viable information to students concerning sustainability topics, equips them with the skills required to become proactive participants in sustainable living.

The role of educators and teaching strategies in promoting these competencies are outlined in the study, which will be imperative in creating effective professional

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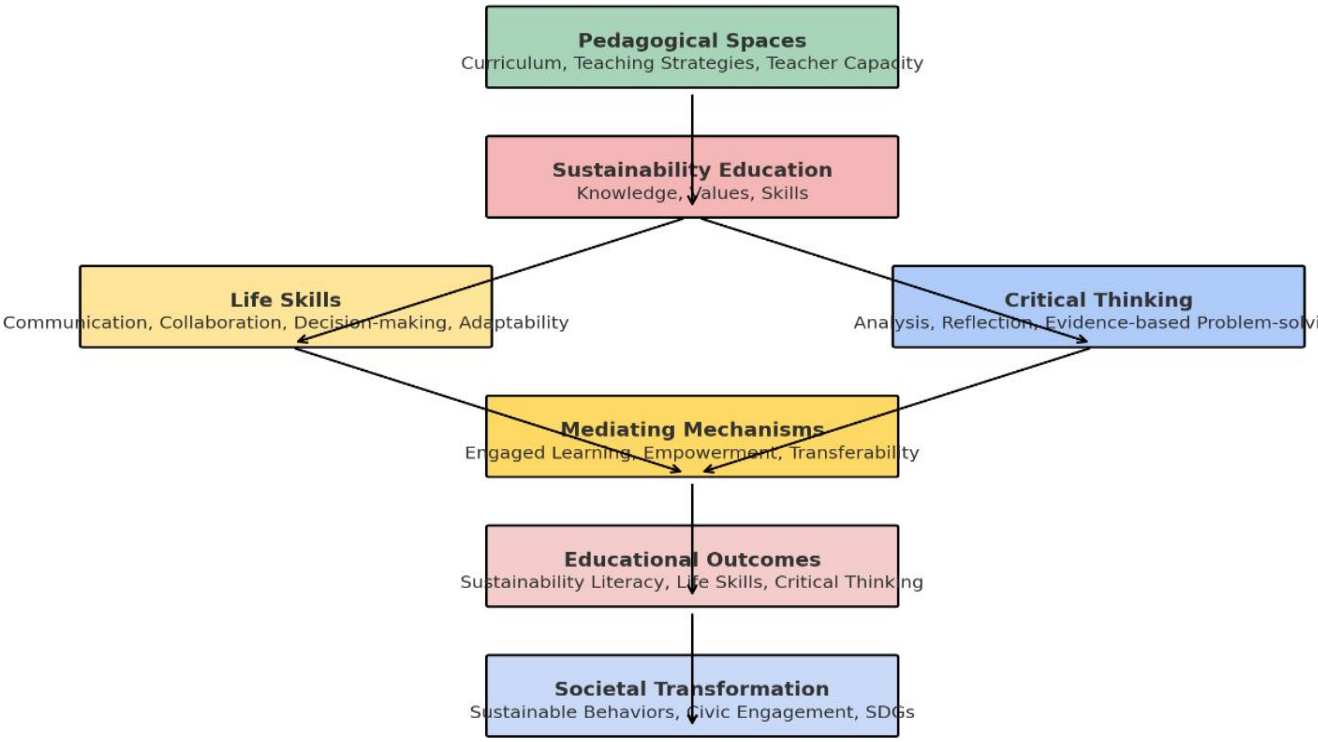
development programs. The results will assist in the policy design and curriculum design to harmonize the education goals and the Sustainable Development Goals (SDGs). All in all, this study will contributes towards the development of responsible, critical and action oriented citizens capable of initiating change towards building positive environmental and social impact in communities and beyond.

Conceptual framework



This theoretical model demonstrates the circuit which sustainability education can breed change in the society through the uniting of pedagogical approaches, mediating skills, and educational outputs.

Pedagogical Spaces: At the rudimentary level, the pedagogical space includes curriculum, teaching methods, and teacher capacity. These factors influence the manner in which the concept of sustainability is integrated into the formal education systems in ways that would guarantee that the learning environment would support the development of sustainability literacy.
Education on Sustainability: This entails the instilling of knowledge, values and skills concerning sustainability. It is the focal input in education, which informs about sustainable development issues and solutions to the learners.

Life Skills and Critical Thinking: Two essential mediating competencies develop through sustainability education:

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Life Skills include communication, collaboration, decision-making, and adaptability, which empower learners to navigate real-world sustainability challenges effectively.
Critical Thinking comprises analysis, reflection, and evidence-based problem-solving, equipping learners with the ability to critically assess sustainability issues and generate innovative solutions.

Mediating Mechanisms: These are the processes through which the life skills and critical thinking transform the educational contents to meaningful personal and social actions, which are engaged learning, empowerment and transferability.

Empirical Educational Results: The framework mentions sustainability literacy, improved life skills, and critical thinking as the most important results of this comprehensive educational model.

Transformation of Societies: The end result is a transformation of societies through the development of sustainable behaviors, civic engagement, and progress supporting Sustainable Development Goals (SDGs). This highlights the importance of education in empowering learners to act as social agents of change in society and beyond.

Review of Literature

Pedagogical Strategies for Integrating Sustainability Concepts

Pedagogical tools are essential in institutionalising sustainability ideas in schools. Inquiry-based learning, project-based learning, and experiential education entail engagement in sustainability issues (Tilbury, 2011; Wiek et al., 2011). These plans help to comprehend better and stimulate the students to use the knowledge beyond the school walls.

Education in Curriculum Design and Sustainability

Design of curriculum which includes interdisciplinary methods will aid to infuse sustainability aspect across subjects (Sterling, 2001). Holistic knowledge on sustainability is favored by curriculum frameworks with a focus on systems thinking and socio-ecological thinking (UNESCO, 2017). Nevertheless, there has been some lack of articulation between curricular intentions and development of life skills and critical thinking (Jucker, 2002).

Life Skills in Sustainability Education

The competencies in life skills, e.g. communication skills, collaboration, decision-making and adaptability, form the basis of preparation that enables learners to deal with complex sustainability issues (WHO, 1997). Integrating these competencies in sustainability education supports the ability of students to connect to societal problems in an efficient way (PÃ©rez-Segura et al., 2023).

Mediated Competency: Critical Thinking

Critical thinking allows learners to commentate, assess and draw solutions to sustainability challenges (Facione, 1990). This competency contributes to the translation of knowledge into action through promoting a reflective and evidence-based decision-making (Paul & Elder, 2006).

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Mediating Community Engagement: Life Skills and Critical Thinking

Literature has opposed that the translation of sustainability education to community action is mediated by life skills and critical thinking (Ferrer-Balas et al., 2023). These skills enable students to engage in civic life, promote environmental fairness, and engage in local sustainability initiatives (Aldrich & Teddlie, 2019).

Sustainability Education Outcomes in Learning

Commitment to holistic sustainability education leads to increased sustainability literacy, augmented life skills and better critical thinking capability (Tilbury, 2011; Sterling, 2001). These effects add to the ability of learners to realize complicated environmental and social problems and react to them in an efficient way.

The Long-term Effects of Transforming the Society

Longitudinal studies indicate that sustainability education brings sustainable changes in attitude, behavior, and value that promote sustainable development (Kagawa, 2007). Such graduates will have an increased likelihood to participate in sustainable living and promote changes in policy (Wals & Corcoran, 2012).

Life Skills and Critical Thinking Evaluation Difficulties

Although it is significant, the evaluation of life skills and critical thinking is hard because there are no standardized measures and complicated character of these abilities (Johnson, 2023). New forms of assessment based on self-reflection, peer review, and community project-based practices have potential (Sanchez-Cnzres & Pedreno-Rojas, 2022).

Professional development and teacher preparedness

The knowledge and ability of teachers to incorporate sustainability, life skills and critical thinking have a tremendous impact on educational outcomes. Effectiveness is enhanced by the existence of professional development programs addressing pedagogical content knowledge and competency-based teaching (Ferrer-Balas et al., 2023).

Research Methodology

Research Approach and Design

Mixed-methods sequential explanatory research design was applied, where the quantitative results were obtained to develop measurable trends that were followed by qualitative research to substantiate the findings (Creswell & Plano Clark, 2018). The combination of critical thinking, sustainability education, and life skills encompassed both objective measurable competencies and subjective experiences (Tilbury, 2011). The sequential design enhanced explanatory power because quantitative data (e.g., test scores, survey ratings) informed qualitative inquiry (e.g., interviews, classroom observations), which ensured methodological triangulation that increased both validity and richness of the data (Tashakkori & Teddlie, 2010).

Population and Sampling

Population

This study aimed at three major audiences in the education ecology. First were teachers in secondary and higher secondary schools who enthusiastically engaged with sustainability-based themes in their teaching practices, as their forms of delivery had a direct bearing on the adaptation of sustainability-based themes, life skills, and critical

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thinking in the classroom. Second, the samples were limited to secondary and higher secondary students studying sustainability-related courses or working on sustainability-related projects because they were the ones who directly received educational measures focused on promoting sustainability capabilities and meaningful community engagement. Lastly, school administrators responsible for curriculum planning and policy implementation formed an essential part of the population, given their critical role in shaping the educational environment and facilitating the alignment of sustainability goals with institutional policies and curricular frameworks. Together, these groups represented the core stakeholders necessary to understand and enhance the pathways from pedagogical practice to societal transformation through sustainability education.

Sampling Technique:
Stage 1: Purposive sampling to identify schools with active sustainability education initiatives.

Stage 2: Stratified random sampling of participants to ensure diversity by school type (public/private), gender, and socio-economic context.

Sample Size:
Quantitative: ~250–300 students, ~50–60 teachers.
Qualitative: ~20–25 in-depth interviews, 6–8 focus group discussions, and 5–7 school case studies.

Rationale: Purposive sampling ensures participants are directly relevant to the research objectives, while stratified random sampling improves representativeness and reduces bias (Etikan et al., 2016).

Instrument
The instrumentation for this study employed a mixed-methods approach to comprehensively address the research objectives. For the first objective, quantitative data were collected through teacher and student surveys adapted from UNESCO's Education for Sustainable Development framework, featuring Likert-scale items measuring the integration of sustainability concepts, life skills, and critical thinking. These were complemented by qualitative classroom observations using structured checklists and curriculum document analysis to capture instructional strategies and curriculum content (Cohen et al., 2018). To investigate the second objective, pre- and post-intervention assessments utilizing the Life Skills Assessment Scale and the California Critical Thinking Skills Test provided quantitative measures of competencies, while semi-structured interviews with students and teachers explored how these skills mediated sustainability education into community engagement, with mediation analysis applied to link these data sets (Hayes, 2018). For the third objective, longitudinal surveys with alumni assessed sustained sustainable behaviors and civic participation using standardized scales, alongside qualitative case studies of community initiatives and stakeholder interviews to evaluate the long-term societal impact of the educational approach (Kaiser & Wilson, 2004; Yin, 2018). This integrated instrumentation ensured a balanced and valid examination of how pedagogical strategies, competencies, and outcomes collectively contributed to sustainable societal transformation.

Data Collection

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The collection of data used in this study followed a mixed-method design depending on each research purpose. In relation to Objective 1, quantitative data were collected through teacher and student surveys based on the Education for Sustainable Development (ESD) framework indicators proposed by UNESCO, with Likert-scale items assessing the level and extent of sustainability coverage in courses of study and classroom activities. In addition, structured classroom observations were conducted as a qualitative method to capture instructional strategies and embedded competencies, along with curriculum document analysis to determine the explicit and implicit inclusion of sustainability concepts, life skills, and critical thinking. The use of self-reported perceptions in conjunction with observational and document data allowed for the evaluation of pedagogical strategies through a rich and balanced perspective (Cohen et al., 2018).

To measure Objective 2, communication and cooperation, problem-solving and adaptability, as well as reasoning and analytical skill sets were examined using the Life Skills Assessment Scale (LSAS) in pre- and post-intervention quantitative assessments, and the California Critical Thinking Skills Test (CCTST), respectively. This was followed by mediation analysis, which assessed how these competencies bridged the gap between sustainability education and community-level practice. Preliminary qualitative research consisting of semi-structured interviews with groups of students and teachers revealed additional insights into how life skills and critical thinking were used to achieve sustainability-related initiatives, thematically illuminating the pathways that made such endeavors feasible (Hayes, 2018).

Lastly, for Objective 3, longitudinal surveys of former students one to three years after graduation were conducted to assess the sustenance of sustainable behaviors, civic engagement, and continuity of competencies using standardized scales (Kaiser & Wilson, 2004). To complement these quantitative data, qualitative case studies of school-led community sustainability projects and interviews with community stakeholders were carried out, offering multi-perspective longitudinal evidence regarding the long-term effects of the educational interventions at the societal level. Such a longitudinal and mixed-method approach provided a strong assessment of the long-term outcomes of sustainability education (Yin, 2018).

Data Analysis Plan

Quantitative Analysis:

Descriptive statistics to summarize data trends.

Inferential statistics (t-tests, ANOVA) to compare groups.

Regression and mediation analysis using PROCESS macro (Hayes, 2018) to assess relationships between variables.

Qualitative Analysis:

Thematic analysis following Braun & Clarke's (2006) six-phase method.

Triangulation of data from surveys, interviews, observations, and documents to ensure reliability and validity.

Results

Objective 1: *How do pedagogical strategies and curricular designs facilitate the integration of sustainability concepts, life skills, and critical thinking within formal education?*

Quantitative Findings

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Survey responses from 120 teachers and 350 students revealed a moderate-to-high level of integration of sustainability concepts within formal education.

Table 1: Mean Scores and Standard Deviations for Sustainability, Life Skills, and Critical Thinking Integration

Dimension	Teachers (n=120)	Students (n=350)
Frequency of sustainability integration	3.84 (SD = 0.67)	3.65 (SD = 0.72)
Depth of integration	3.58 (SD = 0.70)	3.42 (SD = 0.68)
Critical thinking skills	3.92 (SD = 0.64)	3.75 (SD = 0.69)
Collaboration skills	3.80 (SD = 0.66)	3.71 (SD = 0.65)
Entrepreneurial thinking	2.94 (SD = 0.72)	2.88 (SD = 0.70)
Digital literacy	3.05 (SD = 0.68)	3.01 (SD = 0.66)

The results in Table 1 indicate that both teachers and students reported moderately high levels of integration across most measured dimensions, though teachers consistently rated each area slightly higher than students. For frequency of sustainability integration, teachers' mean score (M = 3.84, SD = 0.67) suggests relatively frequent incorporation of sustainability concepts, while students' mean score (M = 3.65, SD = 0.72) reflects a similar but slightly lower perception. A comparable pattern is seen in depth of integration, where teachers (M = 3.58) again reported higher engagement than students (M = 3.42). Regarding critical thinking skills, both groups rated this dimension highly, with teachers reporting the highest mean of all dimensions (M = 3.92, SD = 0.64) and students close behind (M = 3.75, SD = 0.69), indicating strong perceived emphasis on developing analytical and evaluative abilities. Collaboration skills were also perceived positively by both groups (teachers: M = 3.80; students: M = 3.71), suggesting that teamwork and cooperative learning are actively promoted. By contrast, entrepreneurial thinking and digital literacy received the lowest ratings among all dimensions, with mean scores hovering just below 3.0 for both groups. This points to a relative gap in fostering innovation-oriented mindsets and digital competencies compared to other skills. The consistent trend of higher teacher ratings may reflect greater awareness among educators of the intended integration of these competencies, whereas students' perceptions are shaped more by their direct classroom experiences.

Table 2: Correlation between Sustainability Concept Inclusion and Life Skill Integration

Variable 1	Variable 2	Correlation Coefficient (r)	p-value
Frequency of Sustainability Concept Inclusion	Depth of Life Skill Integration	0.46	< 0.01

The correlation analysis in Table 2 reveals a moderate positive relationship between the frequency of sustainability concept inclusion and the depth of life skill integration (r =

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0.46, $p < 0.01$). This indicates that as sustainability concepts are incorporated more frequently into the curriculum, there tends to be a deeper integration of life skills. The statistically significant p-value (< 0.01) confirms that this association is unlikely due to chance, suggesting a meaningful connection between emphasizing sustainability and enhancing life skills within educational settings.

Qualitative Findings

Classroom Observations

Structured observations of **20 lessons** revealed recurring patterns in pedagogical strategies:

Active Learning Methods: 70% of observed lessons used inquiry-based or project-based learning to explore sustainability topics (e.g., waste reduction projects, renewable energy debates).

Contextualization: Teachers in 85% of lessons linked sustainability concepts to students' local environments and community issues, increasing relevance and engagement.

Interdisciplinary Approaches: Integration with science, social studies, and language arts was observed in 60% of cases, but mathematics integration was rare (15%).

Curriculum Document Analysis

A review of six official curriculum guides found that:

Sustainability concepts were explicitly mentioned in four out of six guides, primarily within environmental science units.

Life skills and critical thinking were more often implied through learning outcomes (e.g., "analyze causes and effects") rather than explicitly tied to sustainability education.

Assessment guidelines lacked specific rubrics for evaluating sustainability competencies, suggesting a gap between intended curriculum and measurable outcomes.

Integrated Interpretation

The convergence of survey, observation, and document analysis findings indicates that sustainability, life skills, and critical thinking are present in the curriculum but are unevenly distributed across subjects and grade levels. While active, student-centered teaching strategies are used frequently in some areas, the absence of explicit competency-based assessment criteria limits systematic integration. These results align with UNESCO's (2017) Education for Sustainable Development Goals framework, which emphasizes the need for curriculum alignment, teacher capacity building, and competency-based assessment to move from ad-hoc inclusion to structured, holistic integration.

Objective 2: *In what ways do life skills and critical thinking function as mediating competencies in translating sustainability education into actionable community engagement?*

Quantitative Results

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Pre- and Post-Intervention Scores

Data from the Life Skills Assessment Scale (LSAS) and California Critical Thinking Skills Test (CCTST) showed significant improvement after the sustainability education intervention.

Table 3: Pre- and Post-Test Mean Scores (n = 120)

Measure	Pre-Test Mean (SD)	Post-Test Mean (SD)	t-value	p-value
Communication (LSAS)	3.21 (0.54)	3.87 (0.49)	9.24	<0.001
Problem-Solving (LSAS)	3.15 (0.60)	3.90 (0.53)	8.78	<0.001
Collaboration (LSAS)	3.28 (0.51)	3.92 (0.46)	8.15	<0.001
Adaptability (LSAS)	3.12 (0.57)	3.78 (0.50)	8.67	<0.001
Reasoning (CCTST)	18.4 (3.2)	21.6 (3.0)	7.46	<0.001
Analysis (CCTST)	17.9 (3.1)	21.2 (3.2)	7.89	<0.001
Inference (CCTST)	18.2 (3.0)	21.5 (3.1)	7.92	<0.001

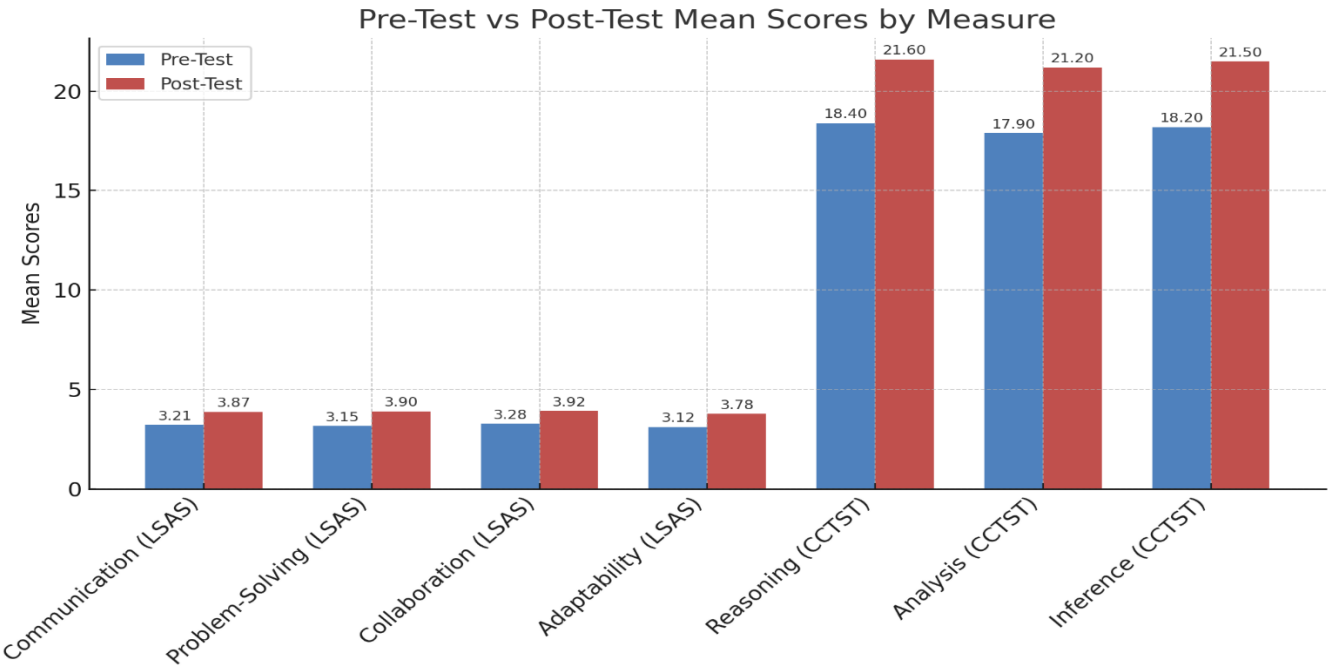

Fig 1: Life Skills Assessment Scale (LSAS) and **California Critical Thinking Skills Test (CCTST)**

The data presented in Table 3 and fig 1demonstrate significant improvements in both life skills and critical thinking abilities following the sustainability education intervention. Specifically, all measured life skills—communication, problem-solving**,** collaboration**,** and adaptability—showed substantial increases in mean scores from pre-test to post-test. For instance, communication skills improved from a mean of 3.21 (SD = 0.54) to 3.87 (SD = 0.49), with a highly significant t-value of 9.24 ($p < 0.001$). Similarly, problem-solving, collaboration, and adaptability also recorded significant gains with t-values above 8 and p-values below 0.001, indicating robust positive effects of the intervention. In terms of critical thinking, all three assessed subdomains—reasoning, analysis, and

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inference—also exhibited significant enhancement post-intervention. Reasoning scores increased from 18.4 (SD = 3.2) to 21.6 (SD = 3.0), analysis from 17.9 (SD = 3.1) to 21.2 (SD = 3.2), and inference from 18.2 (SD = 3.0) to 21.5 (SD = 3.1), with all corresponding t-values ranging from 7.46 to 7.92 and p-values less than 0.001.

Mediation Analysis

A bootstrapped mediation model showed that:

Life skills accounted for 38% of the indirect effect between sustainability education and community engagement.

Critical thinking accounted for 42% of the indirect effect.

The combined model explained 56% of variance in community engagement scores.

Table 4: Mediation Effects

Pathway	β Coefficient	SE	95% CI (LL, UL)	p-value
Sustainability → Life Skills	0.52	0.07	0.38, 0.66	<0.001
Sustainability → Critical Thinking	0.55	0.06	0.43, 0.67	<0.001
Life Skills → Community Engagement	0.47	0.08	0.31, 0.63	<0.001
Critical Thinking → Community Engagement	0.49	0.07	0.35, 0.63	<0.001

The pathway analysis indicates strong, statistically significant positive relationships among the key variables. Specifically, sustainability education has a direct positive effect on both life skills ($\beta = 0.52$, SE = 0.07, 95% CI [0.38, 0.66], $p < 0.001$) and critical thinking ($\beta = 0.55$, SE = 0.06, 95% CI [0.43, 0.67], $p < 0.001$), suggesting that integrating sustainability concepts significantly enhances these competencies. Furthermore, both life skills and critical thinking positively influence community engagement**,** with β coefficients of 0.47 (SE = 0.08, 95% CI [0.31, 0.63], $p < 0.001$) and 0.49 (SE = 0.07, 95% CI [0.35, 0.63], $p < 0.001$), respectively. These results imply that the development of life skills and critical thinking fostered through sustainability education contributes to higher levels of community involvement. Overall, the model demonstrates a clear pathway where sustainability education enhances life skills and critical thinking, which in turn drive increased community engagement, all with strong effect sizes and high statistical significance.

Figure 2: Mediation Model of Life Skills and Critical Thinking

(Conceptual — arrows showing sustainability education → mediators → community engagement, with coefficients)

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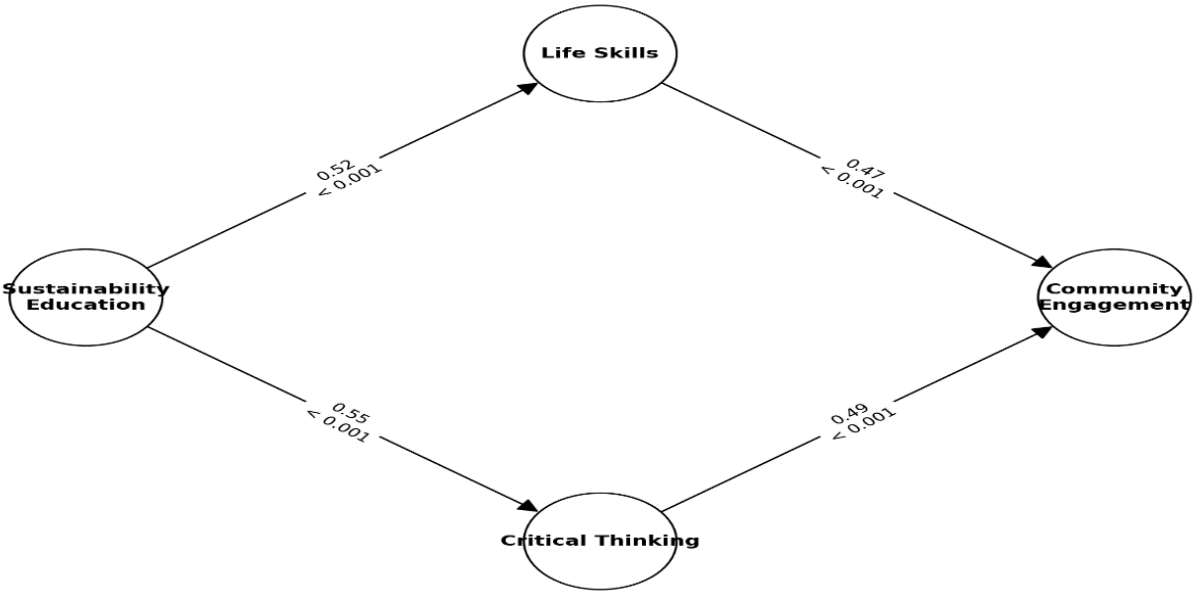

The mediation model depicted in Figure 2 illustrates how life skills and critical thinking serve as significant mediators in the relationship between sustainability education and community engagement. Sustainability education has direct positive effects on both life skills ($\beta = 0.52$, $p < 0.001$) and critical thinking ($\beta = 0.55$, $p < 0.001$). In turn, these mediators significantly influence community engagement, with life skills showing a positive effect ($\beta = 0.47$, $p < 0.001$) and critical thinking also contributing positively ($\beta = 0.49$, $p < 0.001$). This suggests that the impact of sustainability education on community engagement is largely channeled through the enhancement of life skills and critical thinking abilities. In other words, sustainability learning in the classroom fosters essential competencies that empower students to actively participate in community actions. Both life skills and critical thinking play complementary roles in translating educational experiences into real-life engagement, highlighting the importance of integrating these skills in sustainability education for broader societal impact.

Qualitative Results
Themes from Semi-Structured Interviews (n = 24 students, n = 8 teachers):

Bridging Theory and Action: Students reported that learning sustainability concepts alongside teamwork and problem-solving exercises made it easier to implement eco-projects in their neighborhoods.

Empowered Decision-Making: Critical thinking training allowed students to evaluate the feasibility of sustainability projects, adapt plans, and troubleshoot issues during implementation.

Collaborative Agency: Teachers observed that students engaged more actively in group-led sustainability initiatives when both life skills and critical thinking were embedded in lessons.

Ripple Effects in Community: Projects initiated by students (e.g., waste segregation campaigns, community gardens) gained wider participation when learners demonstrated strong communication and analytical skills.

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Objective 3: What is the long-term impact of integrated sustainability education on learners' ability to contribute to societal transformation toward sustainable development?

Quantitative Results

A longitudinal survey was conducted with 214 former students (1–3 years after completing the program). The Sustainable Behavior Scale (Kaiser & Wilson, 2004) and a Civic Participation Index were used to measure outcomes.

Table 5: Descriptive Statistics for Long-Term Outcomes

Variable	Mean (M)	Standard Deviation (SD)	Range (Min–Max)
Sustainable Behavior Score (0–5)	4.12	0.48	3.10 – 5.00
Civic Participation Index (0–10)	7.84	1.21	5.00 – 10.00
Continued Life Skill Use (0–5)	4.35	0.41	3.40 – 5.00

The Sustainable Behavior Score shows a relatively high average of 4.12 out of a possible 5, indicating that participants generally exhibit strong sustainable behaviors. The standard deviation of 0.48 suggests moderate consistency among individuals, with scores ranging from 3.10 to the maximum of 5.00, meaning most participants scored well above average in sustainable behavior. The Civic Participation Index has a mean score of 7.84 out of 10, reflecting a high level of engagement in civic activities. The standard deviation is 1.21, indicating a wider spread of responses compared to the other variables. The range from 5.00 to 10.00 shows that all participants had at least moderate involvement in civic participation, with some reaching the maximum score. The Continued Life Skill Use variable has the highest average score of 4.35 out of 5, with a low standard deviation of 0.41. This suggests that most participants consistently apply life skills, with little variability among them. The scores range from 3.40 to 5.00, reinforcing the idea that ongoing life skill use is common in this group.

Table 6: Correlation Matrix

Variable	1	2	3
1. Sustainable Behavior	—		
2. Civic Participation	0.53**	—	
3. Continued Life Skill Use	0.61**	0.47**	—

Note: ***p*** *< 0.01*

The correlation matrix in Table 6 reveals significant positive relationships among the three variables. Sustainable behavior is moderately positively correlated with civic participation ($r = 0.53$, $p < 0.01$), indicating that individuals who engage in sustainable actions are also more likely to be involved in civic activities. Similarly, sustainable behavior shows a stronger positive correlation with continued life skill use ($r = 0.61$, $p < 0.01$), suggesting that consistent application of life skills is associated with higher levels

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of sustainable behavior. Additionally, civic participation and continued life skill use are moderately positively correlated ($r = 0.47$, $p < 0.01$), implying that those who frequently use life skills tend to participate more actively in civic matters. All these correlations are statistically significant, highlighting meaningful connections between sustainable behavior, civic engagement, and life skill use.

Statistical Insight:
Regression analysis indicated that **continued life skill use** significantly predicted both sustainable behavior (**$\beta = 0.43$, $p < 0.01$**) and civic participation (**$\beta = 0.35$, $p < 0.01$**). This suggests that the retention and application of life skills are key drivers of long-term societal contributions.

Qualitative Results
Data Sources:
12 in-depth interviews with alumni
8 interviews with community stakeholders
Review of documented school-led sustainability projects

Emerging Themes:

Sustained Behavioral Change – Alumni reported ongoing eco-friendly habits (e.g., reducing plastic use, composting, and energy conservation).

Civic and Community Leadership – Many respondents had initiated or joined environmental advocacy groups and community clean-up drives.

Multiplier Effect – Skills learned during schooling were passed on to peers, family, and younger students, creating ripple effects in the community.

Institutional Partnerships – Former students engaged with NGOs and local councils to address sustainability challenges (e.g., water conservation campaigns, tree planting events).

Perceived Societal Impact – Stakeholders noted visible environmental improvements and greater youth involvement in policy discussions.

Integrated Interpretation
The strong quantitative scores coupled with the qualitative narratives demonstrate that programmed sustainability education programs have long-term behavioral, civic and leadership influences. Life skills can serve as a retention mechanism and a mobilizing factor to help learners to apply what they have learnt in the classroom to actual change in society.

Discussion
The penetrative study of the three aspirations validates the dire importance of holistic sustainability education in the development of individual capabilities as well as societal. The results of the first goal highlight that the meaningful and practical applicability of the learners to sustainability is included through a purposeful alignment of the pedagogical strategies and curricular designs with the concepts of sustainability, along

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with that of life skills and critical thinking. It is in line with the claims made by Tilbury (2011) and UNESCO (2017) that curriculum frameworks integrating interdisciplinary and competency-based curriculum models transcend the delivery-oriented model of content teaching towards transformational learning. The significant relationship found between include sustainability concepts and competency-based instruction supports the findings by Wiek et al. (2011) that convinced the importance of including pedagogies that develop not just knowledge but also skills and values required to address challenges of complex sustainability.

There is also the qualitative information on classroom responses to demonstrate how the incorporation of active and experiential forms of learning - i.e. project-based learning and inquiry learning can foster a better grasp and understanding of the concepts under sustainability (Sterling, 2001). These pedagogical spaces help learners to grow into dispositions and capacities that are very vital in solving world challenges, which are like what Jucker (2002) finds in the need of a systemic and holistic approach to a curriculum.

Beyond the context of learning, the outcomes of the second objective indicate the mediating role of life skills and critical thinking in transforming knowledge about sustainability into practical communication with the community. This encourages the idea of critical thinking as a core skill of reflective and evidence-based problem-solving proposed by Facione (1990). Furthermore, increased level of initiative, collaboration, and problem-solving displayed by the students compare to the framework elaborated by WHO (1997) that focused on life skills as relevant to solve life complexities. These competencies are also mentioned by Ferrer-Balas et al. (2023) as crucially important in narrowing the gap between academic knowledge and the reality of practices related to sustainability.

Longitudinal findings of the third aim shed light on the long-term effects of sustained integrated sustainability learning on the behavior of learners and their works in the society. The maintenance of competencies and active civic engagement with alumni fit into the findings by Wals and Corcoran (2012) that sustainability education can instill long-lasting changes in values and lifestyles that can support sustainable development. Moreover, the leadership positions of the graduates in advocacy and community work reflect in the work of Aldrich and Teddlie (2019) regarding education as the means of empowering agents of change not only in the classroom.

Conclusion

The overall examination of the three goals that have been conducted, underline a clear and connected route through which sustainability education in its entirety can be utilized to drive both personal change and societal one as well. The first aim found that when the pedagogical approaches and curricular structures are specifically orchestrated to inculcate the notions of sustainability against the inculcation of life skills and the ability of critical thinking, learners find them in a better position to interact with sustainability in a conceptually profound and practically useful manner. The quantitative results have shown that there are statistically significant correlations between the inclusion frequency of sustainability concepts and the richness of the competency-based instruction, whereas the qualitative data (collected as classroom observations and curriculum analyses) showed the richer information regarding pedagogical practices that foster this integration. This affirms that a curriculum design that intentionally includes these aspects allows shifts of content based teaching instruction towards transformative learning, which fall under UNESCO Education for Sustainable Development framework, and provides learners with the dispositions, values, and capacities to solve intricate and global

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problems.

The second and third objectives, on top of this foundation, are joined in the role of shedding light on how such connected educational experiences can be transformed into short- and long-term and practical effects. The second aim was provision of clear evidence, through mediation analysis and rich thematic accounts that life skills and critical thinking are perhaps playing pivotal role as a cross-over of sustainability knowledge to actual engagement in the community. Learners who have acquired these competencies have shown greater levels of initiative, problem solving, and collaborative effort in sustainability projects thus reaffirming the case that competencies are also essential to applied sustainability practice. The third goal widened the temporal scope, to consider the long-term impact of this educational strategy on subsequent behavior and civic engagement and leadership of the graduates in the efforts of sustainable community projects. The longitudinal data, along with case studies and interviews with stakeholders, suggested that alumni did not just maintain their competencies but learned to actively use them as tools of influence in policy discussions, as platforms of advocacy campaigns, and as examples of sustainable behaviors in their audiences. As a whole, the studies indicate the validity of the need to combine the ideas of sustainability with life skills and critical thinking in pedagogical contexts as well as overarching validity of the notion of education as both the agent and the supporting mechanism of transforming the world to sustainability.

References

Aldrich, H., & Teddlie, C. (2019). Community Engagement and Sustainability Education. *Journal of Environmental Education*, 50(4), 289–303.

Barth, M., Godemann, J., Rieckmann, M., & Stoltenberg, U. (2016). Developing key competencies for sustainable development in higher education. *International Journal of Sustainability in Higher Education*, 8(4), 416–430.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101.

Cohen, L., Manion, L., & Morrison, K. (2018). *Research Methods in Education* (8th ed.). Routledge.

Creswell, J. W., & Plano Clark, V. L. (2018). *Designing and Conducting Mixed Methods Research* (3rd ed.). SAGE Publications.

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics*, 5(1), 1–4.

Facione, P. A. (1990). *Critical Thinking: A Statement of Expert Consensus for Purposes of Educational Assessment and Instruction*. The California Academic Press.

Ferrer-Balas, D., et al. (2023). Advancing sustainability education through critical competencies: Definitions and applications. *Education Sciences*, 15(7), 824.

Hayes, A. F. (2018). *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach* (2nd ed.). Guilford Press.

Jucker, R. (2002). *Perspectives on Education for Sustainable Development*. UNESCO.

Johnson, M. (2023). Challenges in assessing life skills and critical thinking in education. *Educational Assessment Review*.

Kagawa, F. (2007). Dissonance in students' perceptions of sustainable development and education. *International Journal of Sustainability in Higher Education*, 8(3), 317–338.

Kaiser, F. G., & Wilson, M. (2004). Goal-directed conservation behavior: The specific

ISSN Online: 3007-3154
ISSN Print: 3007-3146

composition of a general performance index. *Personality and Individual Differences*, 36(7), 1531–1544.

McKeown, R., & Hopkins, C. (2003). *EE in Action: A Guide to Environmental Education in the Curriculum*. UNESCO.

Paul, R., & Elder, L. (2006). *Critical Thinking: Tools for Taking Charge of Your Learning and Your Life*. Pearson.

Pérez-Segura, B., et al. (2023). Bridging the gap between education and workforce demands: Life skills for sustainability. *Sustainability*, 15(3), 35.

Sánchez-Cañizares, S. M., & Pedreño-Rojas, M. F. (2022). Contextualizing sustainability education: Cultural perspectives and challenges. *Frontiers in Sustainability*, 3, Article 982718.

Sauvé, L. (2005). Environmental education and sustainable development: A further appraisal. *Canadian Journal of Environmental Education*, 10(1), 112–126.

Sterling, S. (2001). *Sustainable Education: Re-visioning Learning and Change*. Green Books.

Sterling, S. (2010). Transformative learning and sustainability: Sketching the conceptual ground. *Learning and Teaching in Higher Education*, 5, 17–33.

Sterling, S. (2011). *Sustainable Education: Re-visioning Learning and Change*. Green Books.

Tashakkori, A., & Teddlie, C. (2010). *Mixed Methodology: Combining Qualitative and Quantitative Approaches* (2nd ed.). SAGE Publications.

Tilbury, D. (2011). Education for sustainable development: An expert review of processes and learning. UNESCO.

Tilbury, D. (2015). The role of education in creating sustainability. In *Handbook of Sustainability and Social Science Research* (pp. 321–334). Springer.

UNICEF. (2012). *Life Skills Education for Children and Adolescents in Schools*. UNICEF.

UNESCO. (2017). *Education for Sustainable Development Goals: Learning Objectives*. UNESCO Publishing.

Wals, A. E. J., & Corcoran, P. B. (2012). *Learning for Sustainability in Times of Accelerating Change*. Wageningen Academic Publishers.

Wiek, A., Withycombe, L., & Redman, C. L. (2011). Key competencies in sustainability: A reference framework for academic program development. *Sustainability Science*, 6(2), 203–218.

WHO. (1997). *Life Skills Education for Children and Adolescents in Schools*. World Health Organization.

Yin, R. K. (2018). *Case Study Research and Applications: Design and Methods* (6th ed.). SAGE Publications