

Comparative Efficacy of Pedagogical Approaches in Fostering Sustainable Entrepreneurship Among Youth Learners in Botswana

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Abstract

Research Aims: This study aimed to identify effective pedagogical strategies to foster sustainable entrepreneurship among secondary school students in Botswana, thereby addressing high youth unemployment and environmental crises.

Design/methodology/approach: A 12-week quasi-experimental mixed-methods study was conducted with 180 students from six secondary schools. Students were divided into three groups: experiential learning, problem-based learning (PBL), and traditional lecture-based teaching. Quantitative data was collected using pre- and post-intervention questionnaires to measure entrepreneurial intention, sustainability literacy, and innovation orientation. Qualitative data was gathered through classroom observations and focus groups to understand student perceptions. **Research Findings:** The findings revealed that both PBL and experiential learning significantly outperformed the lecture-based method ($p < 0.001$). Experiential learning showed the most substantial gains across all measured competencies. Qualitative results supported this, as students in the active learning groups valued the real-world relevance and collaborative activities, while the lecture group felt the material was disconnected from practice. The study also found that female and urban learners responded more positively to active learning strategies. **Theoretical Contribution/Originality:** This study provides strong evidence for the effectiveness of PBL and experiential learning in promoting sustainable entrepreneurship in a secondary school context. It highlights the need for curricular reform in Botswana to incorporate these active learning strategies and to address challenges such as teacher training and rigid assessment methods.

Keywords: Sustainable Entrepreneurship, Botswana, Experiential Learning, Pedagogy, Problem-Based Learning

JEL Classification: I21, L26, J23

1. Introduction

The increasing international focus on sustainable development has redefined how governments, institutions, and educators understand their contributions to addressing

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environmental and social challenges ([Abbas et al., 2025](#)). Sustainable entrepreneurship, defined as creating value through entrepreneurial activities that are environmentally responsible and include some degree of social equity, has emerged as a strategic response to youth unemployment, environmental degradation, and social inequality ([Y Alhassan, 2025](#); [Abbas et al., 2025](#)). It's understood that educational institutions are crucial incubators that foster learning competencies that support sustainable entrepreneurship from an early age ([Ayoungman et al., 2025](#)).

The urgency of these challenges is even more pressing in Botswana. [Darabi \(2023\)](#) highlights that, despite Botswana's relative political stability and economic success (driven by mineral resources), it faces youth unemployment, excessive dependence on natural resources, and an underdeveloped entrepreneurial orientation. Botswana's Vision 2036 ([Dept., 2018](#)) and the Revised National Policy on Education promotes a knowledge economy and provides clear guidance to diversify the economy and promote entrepreneurship ([Honde and Abraha, 2015](#)). Despite the relevant legislation, the actual policy to education about entrepreneurship in secondary schools is weak being heavily limited in creating sustainable entrepreneurship-focused thinking ([Mafela, 2009](#)).

The education system in Botswana is largely exam-focused and examination-based, which does not allow learners to interact with real-world experiential or problem-solving activities that clearly link to entrepreneurial realities ([Darabi, 2023](#)). This mismatch is especially troublesome as emerging research indicates that a lecture-based approach does not develop the necessary critical thinking, innovation, and ecological literacy that sustainable entrepreneurs need ([Rudhumbu et al., 2016b](#)). Moreover, entrepreneurship education in Botswana has traditionally focused on business creation in general, and the Sustainable Development Goals (SDGs) are often treated as an afterthought in contemporary contexts ([Ebewo et al., 2017](#)).

Pedagogical innovation, especially in the form of active learning approaches, such as experiential learning and problem-based learning (PBL) may help address the growing negative experiences of learners of entrepreneurship from Botswana ([Toit and Gaotlhobogwe, 2018](#)). Studies show active learning and experiential learning can improve student engagement, increase understanding, and allow for more application of real-world situations; all of which are important in developing learners' entrepreneurial mindsets with a sustainability focus in Botswana ([Cocu et al., 2025](#), [Derdabi and Dvouletý, 2025](#)). However, few empirical studies have investigated active and experiential learning as pedagogical strategies in the context of Botswana's unique socio-economic and educational conditions.

As such, this paper addresses a clear gap in the literature on how different teaching strategies can shape the development of sustainable entrepreneurship competencies (and/or sustainability competencies) among learners in Botswana. This paper also adds to the literature discussion on curriculum, educational reform, and sustainable development in the context of emerging economies.

1.1. Problem Statement

Botswana is at a critical juncture, with socio-economic and environmental predicaments accumulating and threatening long-term development goals. Prominent among these socioeconomic and environmental challenges are youth unemployment, high climate vulnerability, and dependence on depleting natural resources, such as diamonds ([Liaw et al., 2025](#)). Youth unemployment has reportedly reached alarming levels, estimated at over 35% in recent times, and the potential ramifications for social cohesion and economic productivity are

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dire ([Okurut and Ama, 2013](#)). At the same time, climate change and resource-intensive economic activities are compounding environmental degradation, placing further stress on Botswana's socio-ecological systems ([Musarurwa, 2021](#)).

Tackling these demands requires integrated approaches that not only articulate economic potential but do so in an economically, environmentally, and socially sustainable way. Sustainable entrepreneurship is a newly emerging paradigm that links economic innovation, environmental responsibility, and social value generation ([Fubah et al., 2025](#)). It enables young people to create value while at the same time responding to significant environmental and community-wide challenges ([Ofosu-Appiah et al., 2025](#)). Emerging economies like Botswana could potentially ignite both economic diversification and make strides towards the United Nations Sustainable Development Goals by scaling youth empowerment and capacity through sustainable entrepreneurship ([Williams and Hovorka, 2013](#)).

However, Botswana lacks the educational infrastructure to support this vision. The majority of Botswana's formal education system is rooted in rote learning and lecture-type pedagogy, and has been shown not to develop the more complex competencies of creativity, systems thinking, resilience, and sustainability orientation ([Okurut and Ama, 2013](#)). Even though national policy frameworks may be endorsing various approaches to entrepreneurship-type education, the fidelity of implementation can be limited, especially concerning practical and sustainability pedagogies ([Aisyah et al., 2025](#)).

In addition, the broader literature on sustainable entrepreneurship education in Sub-Saharan Africa is sparse and poorly integrated. While studies exist that look at entrepreneurship education overall ([Balhara and Singh, 2015](#), [Baliyan and Baliyan, 2018](#), [Baluku et al., 2025](#)) Very few studies in an African context isolate the pedagogical strategies and their influence on the development of sustainability-specific entrepreneurial competencies among young people. As argued by [Balhara and Singh \(2015\)](#), it is difficult to address and plan for the development of sustainability-minded entrepreneurs in developing countries when there are no contextually relevant educational models.

Consequently, there is an immediate need for empirical evidence that not only investigates the potential or capacity of entrepreneurship education but also controls for and observes the impact of experiential learning, problem-based learning (PBL), and traditional pedagogy on students' acquisition of sustainable entrepreneurial competence. Failing to consider this will pose a severe challenge for policymakers and educators in Botswana and similar contexts, as they must determine what best fits for designing and implementing education strategies that feasibly address the twin challenges of youth development and sustainable development.

2. Literature review

It is important to understand the potential impact of pedagogical approaches in contexts such as Botswana, where education is prioritized as a driver of socio-economic transformation and sustainable entrepreneurship. In this respect, the literature is reviewed here in four sections: (1) theoretical basis of entrepreneurial learning, (2) experiential learning in entrepreneurship education, (3) problem-based learning and sustainability competencies, and (4) pedagogical research from African education contexts.

2.1. Theoretical Foundations of Entrepreneurial Learning

Entrepreneurship education utilizes a variety of learning theories; however, constructivism tends to dominate the discussion: learners construct knowledge as a result of their interaction

with their environment ([Iqbal et al., 2025](#)). This notion appears in a great deal of the literature making the case for learner-centered or student-centered pedagogies in entrepreneurship. [Kolb's \(1984\)](#) experiential learning theory is a good example of the constructivist perspective because it indicates that students learn most effectively by participating in a concrete experience, followed by reflective observation, abstract conceptualization, and then active experimentation ([Nzembayie et al., 2024](#)). [Bandura's \(1986\)](#) social cognitive theory also supports a constructivist approach by emphasizing self-efficacy and observational learning, both of which are necessary components of entrepreneurial behaviour ([Iqbal et al., 2025](#)). These theories combined suggest that entrepreneurship education must do more than simply transmit inert knowledge; the learning context must dynamically engage the learner in participatory learning environments ([Prasad and Satish, 2018](#), [Rahayu et al., 2025](#), [Smail et al., 2022](#)). In the literature, it has been argued that traditional lecture-based instruction lacks the active learning required for entrepreneurs to explore, embed practical skills, and develop personal confidence and the ability to be adaptive ([Hägg, 2021](#)).

2.2. Experiential Learning in Entrepreneurship Education

Experiential learning is widely regarded as one of the most effective pedagogical strategies in entrepreneurship education. It involves engaging students in real-world activities, including starting businesses, conducting feasibility studies, and solving problems faced by the community ([Zhou and Cen, 2023](#)). Studies have found that learning by doing promotes entrepreneurial self-efficacy, opportunity recognition, and decision making under uncertainty, all of which are important characteristics of an entrepreneur ([Durão et al., 2025](#), [Ebewo et al., 2017](#), [El-Awad et al., 2025](#)).

[Kolb's \(1984\)](#) model remains fundamentally important to experiential learning as it has been tested and proved successful in many educational environments and examples. For instance, more evidence from studies in the United Kingdom and the United States demonstrates that students taking part in experiential learning on internship, simulation, and community projects have substantially greater entrepreneurial intentions than students in traditional courses ([Khetarpal et al., 2025](#)).

In addition, when experiential learning is aligned with sustainability outcomes, it contributes to students acquiring eco-awareness and developing ethical reasoning: important factors for sustainable entrepreneurship ([Ebewo et al., 2017](#)). In many developing countries, however, this alignment is largely impossible due to rigid curricular guidelines and constraints on pedagogical resources.

2.3. Problem-Based Learning and Sustainability Competencies

Problem-based learning (PBL) is another innovative pedagogic approach that has emerged recently in entrepreneurship education. PBL focuses on inquiry-based learning to investigate real-world problems and is most commonly used in group settings ([Brant and Kilar, 2025](#)). PBL can differ from experiential learning as it tends to be classroom-based, rather than task-based in the case of experiential learning; however, it is still interactive and reflective ([Choudhury and Sarkar, 2025](#)).

PBL allows students to learn interdisciplinary competencies and complex competencies such as systems analysis, critical thinking, and collaborative problem solving, all of which are skills needed in sustainability-related entrepreneurship ([Durão et al., 2025](#)). For example, students would be tasked with creating product designs or business models that address problems of

water scarcity, or access to renewable energy, etc. PBL allows students to experience the complexity and interdependence seen in real world sustainability challenges.

From studies in Europe and Asia, PBL has been shown to improve entrepreneurial intention and innovative thinking ([Chen and Ryoo, 2025](#)). However, literature claims only limited research has been conducted in the context of African education, and institutionally related problems, such as limited time and large class size, may limit PBL-based education.

2.4. Pedagogical Research in African Education Contexts

Not quite enough attention has been given to entrepreneurship education developments, and even less attention has been given specifically to how pedagogical approaches allow for sustainable entrepreneurship throughout Sub-Saharan Africa ([Darabi, 2023](#)). Research in this part of the world has largely been limited to, access to finance, regulations, and the overall entrepreneurial ecosystem, leaving less room to look at how youth people are being educated to think and act entrepreneurially ([Ebewo et al., 2017](#)). For example, there have been strategies in Botswana that prioritize major initiatives of entrepreneurship and economic diversification, such as the Education and Training Sector Strategic Plan (ETSSP) 2015-2020, and Vision 2036 ([Ghorfi and Hatimi, 2022](#)). However, there has been evidence of a significant disparity between policy aspirations and actual practice, where classroom-based practices remain lecture-driven and examination-based ([Gazi et al., 2025](#)). There have been positive findings in a few studies in this area, in which South African students exposed to active learning environments exhibited greater entrepreneurial orientation and commitment to social impact. Unfortunately, these examples are rare. There is an absence of research comparing different pedagogical responses, such as experiential and project-based learning, in terms of their ability to develop sustainability-oriented entrepreneurship competencies in an African context ([Ncube and Matlala, 2025](#)).

3. Methodology

The following section presents the methodology for comparing the impact of three pedagogical models on the development of sustainable entrepreneurship among secondary school students in Botswana. The design employed a mixed-methods approach, combining quantitative and qualitative methods, enabling measurement of a range of outcomes across affective, cognitive, and behavioural domains.

3.1 Introduction

This study employed a convergent parallel mixed-methods design, as described by [Creswell and Creswell \(2017\)](#), in which quantitative and qualitative data were collected simultaneously (in this case through surveys and interviews), with evaluation and analysis conducted concurrently to yield a fuller understanding of the research problem. A convergent parallel approach to impact study is particularly useful in educational interventions like this one because it can capture both the statistical significance of change and the process-based experiences that lie behind that change ([Creswell and Hirose, 2019](#)).

The quantitative aspect occurred before and after the series of pedagogical interventions using surveys completed by all participants to explore individual change in entrepreneurial intention, sustainability literacy, and innovation orientation. This against metric comparison across three pedagogies was very important.

As part of the study and to support the quantitative data collection, the qualitative aspect consisted of classroom observations and focus group interviews with a subgroup of participant/stakeholder students and teachers from each of the three groups. The classroom observations were designed to capture participation in terms of engagement (both student-student and teacher-student), collaboration with peers, and the teacher's style of facilitation. During the observations, the observers used a structured rubric, which was adapted from [Desky et al. \(2025\)](#). Even as a systematic rubric was developed, it was straightforward to record how well students engaged and to observe how well they engaged with one another and with their teacher as peers. During the focus groups, students discussed their reflections on their learning, the relevance of the material to their lives, and their views on sustainability and entrepreneurship at various points.

By using both methods, we were able to triangulate across methodology and help strengthen validity by reducing bias and getting a much deeper understanding of the interplay in terms of how each pedagogy was impacting learning immediately and as part of the learning of defined projects ([Halcomb and Hickman, 2015](#), Hammond and Wellington, 2020, Hammond and Wellington, 2012). We made sense of findings during the interpretation phase using a side-by-side comparison strategy so that the quantitative and qualitative datasets could converge, corroborate, and elaborate ([Cao, 2022](#)).

Just as importantly, we could answer not only what evidently changed as a result of the interventions but also how and, in part, why these changes occurred to shape findings that were statistically supported, whilst offering theoretical narratives grounded in a specific cultural and pedagogical context.

3.2. Participant (Subject) Characteristics

The study participants consisted of 180 junior secondary students evenly distributed by gender (90 male; 90 female) in the age group of 14 to 17 years, selected from the six government junior secondary schools in Botswana, three located in the capital city of Gaborone (urban), and three located in Maun, a major regional centre in the north-west (peri-urban). The selection across geographical locations was purposeful, not only to ensure a variety of learners but also to ensure diversity in the socio-economic and infrastructural contexts of learners' educational experiences within the national education system ([Barbrook-Johnson and Carrick, 2022](#)).

To achieve a representative sample, the researchers used a stratified random sampling technique, which involved stratifying students first by school location (urban versus peri-urban) and gender, then by grade (Standard 9 and Standard 10), and finally selecting participants at random within each stratum. Stratified random sampling is established as a means to enhance external validity when populations are heterogeneous (Ferrie et al., 2023). The use of equal numbers of male and female students was intentional to investigate gender differences in the pedagogical impact and entrepreneurial disposition, considered to be relevant issues in sub-Saharan Africa ([Darabi, 2023](#)).

The eligibility criteria for participation included:

1. Active enrolment in Standard 9 or Standard 10, representing the final stages of junior secondary education;
2. Proven basic English literacy, as all instructional materials and survey instruments were in English, which is Botswana's official language of instruction at this level;

3. Prior involvement or participation in at least one course in Commerce, Business Studies or Social Studies, to ensure that basic entrepreneurship concepts were present for comprehension.

Informed consent was obtained through a two-stage process: students were informed of the study's objectives and procedures in age-appropriate English, and written consent forms were sent to and signed by parents/guardians. The study observed ethical requirements for research involving children and youth, including confidentiality, voluntary participation, the right to withdraw at any time without penalty ([Atkinson et al., 2020](#)). Instructors and school administrators also signed institutional agreements to acknowledge their support of the intervention.

No students were excluded on the basis of academic ability, ethnicity, or religion. All students were assigned an ID number to anonymize student data and enable longitudinal tracking, as appropriate, throughout the study.

3.3 Sampling Procedures

The study utilized a multi-stage sampling approach to enhance methodological rigor and representativeness as a sampling technique, which is widely recommended in educational research with heterogeneous samples ([Creamer and Reeping, 2020](#)). In Stage 1, six purposively sampled government-funded junior secondary schools were selected based on accessibility/administrative willingness to participate/prior involvement with pilot educational projects. This was consistent with the recommendations of Barbrook-Johnson and Carrick (2022), who argue that purposive sampling increases feasibility when specific resources are already diminished and emphasizes relevance to the local context. The purposive sampling procedure provided an equal number of urban (Gaborone) and peri-urban (Maun) schools with a clear socio-economic and infrastructural rationale since Botswana remains relatively regionally challenged, along the lines of educational resources ([Rudhumbu et al., 2016a](#), Toit and [Gaotlhogogwe, 2018](#)).

In Stage 2, a stratified random sampling procedure was used to sample students. Students were categorized by school context (urban vs. peri-urban) and gender, and by grade level (Standard 9 and Standard 10), to ensure equal representation across key demographic variables. Stratification helps alleviate selection bias and also increases external validity, particularly in instances of studying differences based on gender or place ([Creswell and Creswell, 2017](#), [Creswell and Hirose, 2019](#)). Eligible Year 2 students were required to be English literate and to have previously completed a course in Commerce, Business Studies, or Social Studies, ensuring a basic familiarity with entrepreneurship concepts. The stratification resulted in the random assignment of 180 students to three groups: Experiential Learning, Problem-Based Learning (PBL), and Lecture-Based Instruction ($n = 60$ each). Random assignment within strata reduced selection bias and increased internal validity.

3.3.1. Sample Size, Power, and Precision

The sample size needed to detect medium effect sizes (Cohen's $d = 0.5$) at a power of 0.85 ($\alpha = 0.05$) in ANOVA-based investigations was calculated a priori using GPower 3.1 ([Taherdoost, 2016](#)). The power analysis accounted for recommendations regarding the typical medium effect size for educational interventions. Medium effect sizes can be anticipated in applied educational intervention contexts due to variability in context use. We determined that a sample of 60 per group was appropriate to achieve sufficient precision, based on statistical

considerations, with high retention across all groups. The retention across sample groups was negligible (<3%); thus, statistical power was preserved, and the risk of Type II error was reduced ([Mweshi and Sakyi, 2020](#)).

3.3.2 Measures and Covariates

The quantitative element of the study employed three previously validated scales:

Entrepreneurial Intention was measured using the Entrepreneurial Intention Questionnaire (EIQ; [Krueger et al., 2000](#)), demonstrating good internal consistency (Cronbach's $\alpha = 0.89$).

Sustainability Literacy used a 12-item scale developed by [Åkerblad et al. \(2021\)](#), which included three components: knowledge of ecological systems, knowledge of social equity, and best practices for sustainable business.

Innovation Orientation used a 10-item scale that was adapted from the Innovation Behavioural Intention Inventory ([Chao, 2015](#)).

All instruments were pre-tested with a separate sample of 30 students, with very minor contextual variations in language. The pilot test also indicated, based on reliability analyses, that each instrument yielded Cronbach's alpha values exceeding 0.80, confirming good internal consistency.

3.4. Research Design

In this study, a quasi-experimental pretest/posttest control-group design was used. A quasi-experimental design can be used to evaluate educational interventions in real-life contexts where randomization is typically not feasible ([Argyres et al., 2020](#)). These types of designs differ from true experimental designs, which require randomly assigning participants and institutions into control and experimental groups. This design accommodated logistic issues associated with Botswana's schooling system, including the existence of a set timetable and resistance from administrators to randomizing at the institutional level ([Dewasiri et al., 2018](#)). Despite having randomization at the individual level by assigning students into one of three pedagogical groups (experiential learning, problem-based learning, and the traditional lecture-based), school-level randomization was not performed in order to avoid disrupting the institution's operation this is common when conducting educational research ([Dierynck et al., 2018](#)).

Additionally, the design's strength is important, as causal inferences will be drawn from the baseline and post-test groups while maintaining ecological validity. By administering the pre-tests in Week 1, it was ensured that there were no differences ($p > 0.05$) between the groups regarding their entrepreneurial intention, sustainability literacy, or innovation orientation before the interventions. It was pivotal in establishing whether the post-test differences were attributable to the pedagogical interventions rather than to baseline differences ([Creswell and Creswell, 2017](#)). The instruction on the interventions or pedagogical strategies continued for the subsequent 12-week period (interventions were scheduled for weeks 2-11; the post-test was at week 12). These were also scheduled around the typical term structure of Botswana to minimize the disruption for institutional use, as noted in recently published research into educational interventions ([Hair et al., 2019](#)). In order to better defend against threats to internal validity, such as selection bias or maturation effects, these safeguards were incorporated into the study design:

Control group: The lecture-based group provided a counterfactual to the other pedagogical conditions, allowing for isolating the effects of the traditional pedagogy condition from the other two pedagogical approaches.

Stratified randomization: Participants were stratified by school location, gender, and grade level to reduce confounding variables associated with socio-economic or developmental differences.

Standardized interventions: All pedagogical protocols were conducted as planned, including teacher training, teacher observation, and adherence/ fidelity check to [Kolb \(1984\)](#) and [Barrows \(1996\)](#) study guidelines.

3.5. Experimental Manipulations or Interventions

Each pedagogical intervention was carefully designed to represent different theoretical traditions that remain relevant to international best practices, while remaining mindful of Botswana's specificities.

Experiential Learning Group:

This group was constructed based on [Kolb's \(1984\)](#) experiential learning theory, which emphasizes knowledge as being constructed through a concrete experience, reflective observation, abstract conceptualization, and active experimentation. Students participated in hands-on activities, including developing micro-business plans focused on sustainable products (e.g., upcycled crafts), eco-entrepreneurship challenges (e.g., hydroponics and solar-powered irrigation systems), and community environmental projects (e.g., tree planting). The intention was to give students real-world entrepreneurial-like experiences in relation to developing skills in opportunity identification, resource mobilization, and ethical decision-making ([Ansari et al., 2020](#)). To further enhance authenticity, external mentors and local entrepreneurs, recruited through partnerships with Botswana's Entrepreneurship Hub, showcased expertise and served as facilitators, providing feedback on students' initial business models while addressing their own experiences ([Khetarpal et al., 2025](#)). Previous research indicates that this type of engagement in industry helps to bridge the classroom learning experience with the marketplace context, especially in developing economies ([Wang, 2023](#)).

Problem-Based Learning (PBL) Group:

Using [Barrows' \(1996\)](#) PBL framework, this group worked together to engage with sustainability case problems (e.g., waste management issues in the Gaborone urban market or water conservation innovations to address flooding in Maun). The PBL process was informative, with six stages: problem investigation, hypothesis generation, self-directed learning, solutions planning, student peer critique, and an iterative process of scaffolding from peer suggestions ([Graça et al., 2025](#)). Educators took the leadership role of facilitators to help students learn how to synthesize across disciplines (i.e., environmental science and economics) and use systems thinking, an important competency for sustainable entrepreneurship ([Judijanto et al., 2025](#)). We facilitated a group emphasis to simulate how entrepreneurs work on problems as a team, which was used as a strategy to improve either problem-solving or leadership skills in a similar group in Sub-Saharan Africa ([Kurniawan et al., 2024](#)).

Group 1: Lecture-Based Group (Control Condition):

This group followed the national curriculum that forced a traditional teacher-centered teaching orientation for Botswana ([Rudhumbu et al., 2020](#)). The content was restricted to theory based

on the prescribed texts on business ethics, calculating profit, and economic theory. The lesson followed a didactic lecture format with little student interaction and no practical application, a criticized method specifically for being limiting for creativity and creative thinking around the start-up or entrepreneurship process ([Toit and Gaotlhobogwe, 2018](#)). For example, the students were simply taught about "sustainable development" as a concept, but not asked to design solutions in response to the local sustainability challenges, which was out of sync with the content of the curriculum ([Adeyemi, 2009](#)). The design of this group was intentionally constructed to mimic prevailing classroom practices to provide a benchmark for pedagogical comparison.

Instructional Fidelity and Quality Assurance:

The team implemented a deliberate attempt to limit variance in the implementation processes. All instructors were provided with two days of training tailored to the pedagogical approach they were assigned. The Experiential and PBL facilitators were given modules on scaffolding student autonomy, while the lecture-based teachers were given modules on how to teach the content ([Ansari et al., 2020](#)). Fidelity checks were made through weekly classroom observations by the researchers using [Bui et al. \(2025\)](#) rubric, which outlined essential elements of how pedagogy protocols were to be adhered to (e.g., student engagement, teacher/facilitator engagement). Even the resource teachers maintain logs documenting progress on lessons, student challenges, feedback, and activities that deviate from the intervention plan. The researchers felt these measures were adequate in limiting variance between groups and controlling for a common flaw in educational trials, where implementation variance impedes outcomes ([Gianis et al., 2025](#)).

The study enforced methodological adherence of each of the interventions in relation to theoretical frameworks, as well as maintaining fidelity, which generated methodological rigor and valuable insights for education policy makers in Botswana ([Rudhumbu et al., 2020](#)).

4. Results and Discussion

4.1. Recruitment

Participants were recruited from January to February 2025, and the intervention was completed from March to May 2025.

4.2. Statistics and Data Analysis

4.2.1. Quantitative Results

Objective 1: Compare the efficacy of experiential learning, PBL and lecture-based methods to promote sustainable entrepreneurship competencies.

Table 1: ANCOVA Results for Post-Test Scores (Controlling for Pre-Test)

Outcome Measure	Pedagogical Group	Adjusted Mean (SE)	F-value	p-value	Partial η^2
Entrepreneurial Intention	Experiential	4.52 (0.08)	18.74	<0.001	0.21
	PBL	4.18 (0.07)			
	Lecture	3.39 (0.09)			
Sustainability Literacy	Experiential	4.71 (0.06)	22.15	<0.001	0.25

	PBL	4.47 (0.07)			
	Lecture	3.58 (0.08)			
Innovation Orientation	Experiential	4.33 (0.07)	15.89	<0.001	0.18
	PBL	4.09 (0.06)			
	Lecture	3.51 (0.08)			

The statistical analysis revealed that experiential learning was significantly more effective than both problem-based learning (PBL) and traditional lecture methodologies across all measures of entrepreneurial intention, sustainability literacy, and innovation orientation ($p < 0.001$). With moderate to large effect sizes (partial η^2 between 0.18 and 0.25). This statistical significance strongly suggests that the differences are highly unlikely to be due to chance. Therefore, experiential learning led to greater competency development than either of the other two pedagogies.

Table 2: Pairwise Comparisons (Bonferroni-Adjusted)

Outcome Measure	Comparison	Mean Difference	SE	p-value	95% CI
Entrepreneurial Intention	Experiential vs. PBL	0.34	0.09	0.002	[0.12, 0.56]
	Experiential vs. Lecture	1.13	0.11	<0.001	[0.85, 1.41]
	PBL vs. Lecture	0.79	0.10	<0.001	[0.54, 1.04]
Sustainability Literacy	Experiential vs. PBL	0.24	0.07	0.012	[0.08, 0.40]
	Experiential vs. Lecture	1.13	0.09	<0.001	[0.89, 1.37]
	PBL vs. Lecture	0.89	0.08	<0.001	[0.68, 1.10]

The results clearly showed that experiential learning produced statistically greater improvements in sustainable entrepreneurship competencies than both problem-based learning (PBL) ($p < 0.05$) and lecture-based instruction ($p < 0.001$). Beyond the statistically significant benefits of experiential learning, the results also have practical significance, given moderate to large effect sizes (partial $\eta^2 = 0.18$ –0.25).

Objective 2: Assess gender-based differences in pedagogical impact.

Table 3: Independent t-Tests (Post-Test Scores by Gender)

Outcome Measure	Gender	Experiential (M $\pm$ SD)	PBL (M $\pm$ SD)	Lecture (M $\pm$ SD)	t-value	p-value
Entrepreneurial Intention	Male	4.40 $\pm$ 0.62	4.05 $\pm$ 0.68	3.30 $\pm$ 0.79	2.45	0.016
	Female	4.65 $\pm$ 0.58	4.35 $\pm$ 0.71	3.50 $\pm$ 0.81	3.12	0.002
Sustainability Literacy	Male	4.60 $\pm$ 0.51	4.30 $\pm$ 0.59	3.45 $\pm$ 0.85	2.78	0.006
	Female	4.82 $\pm$ 0.49	4.60 $\pm$ 0.61	3.70 $\pm$ 0.92	3.45	<0.001

The analysis showed that female students had a significantly higher post-intervention score in both experiential learning and problem-based learning (PBL) groups than male students ($p < 0.05$), indicating a significant gender-responsive nature of active pedagogies.

Objective 3: Evaluate regional disparities (urban vs. peri-urban schools).

Table 4: Two-Way ANOVA (Pedagogy $\times$ Location)

Outcome Measure	Source	F-value	p-value	Partial η^2
Entrepreneurial Intention	Pedagogy	17.92	<0.001	0.19
	Location	4.56	0.034	0.05
	Pedagogy $\times$ Location	1.23	0.294	0.02
Sustainability Literacy	Pedagogy	20.15	<0.001	0.22
	Location	6.78	0.010	0.07
	Pedagogy $\times$ Location	0.89	0.412	0.01

Table 4 also indicates that urban schools had slightly higher post-intervention scores than peri-urban schools ($p < 0.05$), suggesting contextual advantages associated with specific asset characteristics in urban schools (e.g., infrastructure, industry mentor support, pre-educational engagement with entrepreneurial concepts). Importantly, the lack of significant interaction effects between pedagogical type (experiential learning, PBL, lectured) and school context suggests that the methods are generally effective across urban and peri-urban environments. This indicates that active approaches such as experiential and problem-based learning are effective for developing sustainable entrepreneurship competencies in environments lacking geographic and resource advantages.

Qualitative Results (Thematic Analysis)

Objective 4: Explore learners' perceptions of pedagogical relevance and engagement.

Table 5: Themes from Focus Group Interviews

Theme	Subtheme	Quote	Frequency (%)
Experiential Learning	Real-world application	"By creating a business plan for recycling, I learned how to look at this problem realistically."	85%
	Industry mentorship value	"The entrepreneur commented on my project, so I was optimistic that my idea could be a real thing."	78%
PBL	Collaborative problem-solving	"It was interesting to see the vision shared in a group for the cause of water conservation."	72%
	Complexity of sustainability issues	"I didn't take note of all the moving pieces that go along with waste previously."	68%
Lecture-Based	Disconnect from practice	"We learned theories, but didn't learn how to start a business."	90%
	Passive engagement	"I found it challenging to plug in during the lecture lectures,"	82%

particularly since they were all the same."

Table 6: Classroom Observation Rubric Scores

Pedagogical Group	Student Engagement (1–5)	Peer Collaboration (1–5)	Teacher Facilitation (1–5)
Experiential	4.6 ± 0.3	4.4 ± 0.4	4.2 ± 0.5
PBL	4.2 ± 0.4	4.5 ± 0.3	4.0 ± 0.6
Lecture-Based	2.8 ± 0.6	1.9 ± 0.7	3.5 ± 0.4

The qualitative findings that experiential learning and problem-based learning (PBL) students exhibited higher levels of engagement and collaborated more were significantly supported by the quantitative findings, illustrating the interrelationship between participation and competency development. Students in experiential learning engaged in hands-on projects, such as micro-business plans, and in community-based environmental activities, which required them to collaborate, reflect critically, and solve problems through iterative cycles. These activities demonstrated Kolb's (1984) model of learning, in which students participated in the cyclical process of experience and active experimentation, thereby stimulating intrinsic motivation and a new level of cognitive engagement.

Participatory learning, for example, in PBL groups required collaboration on specific peer-learning tasks related to sustainability issues (e.g., waste management solutions), which relied on peer-to-peer dialogue, role differentiation, and consensus-building. As [Gazi et al. \(2025\)](#) defined, collaborative participation in learning enhances teamwork skills, whereas social learning reinforces conceptual learning in collaborative group tasks. Classroom observations showed that experiential and PBL groups scored significantly higher than lecture-based groups for engagement (4.6 ± 0.3 vs. 4.2 ± 0.4) and collaboration (4.4 ± 0.4 vs. 4.5 ± 0.3) (Table 6). Higher levels of engagement in these groups are directly associated with higher overall student outcomes. For example, experiential learning students' entrepreneurial intention scores (adjusted M = 4.52) and sustainability literacy (M = 4.71) scores were better than the lecture-based students (M = 3.39 and 3.58, respectively) (Table 1), which would indicate that working on real-world tasks improved their skills and confidence. The collaborative nature of these pedagogies could also allow students to experience more engagement than in a traditional classroom as students in Botswana, on the whole, are very passive and often only repeat or recite the taught content ([Widodo et al., 2025](#)). Focus group participants from experiential/PBL groups describe how the opportunities of mentorship and peer feedback in these approaches made a difference. One student mentioned, "Working on a real business plan made me feel like I mattered." This perception was not reported by students who were taught in lecture-based groups.

Integration of Results

The triangulation of the quantitative and qualitative data revealed strong multi-dimensional evidence that experiential learning and problem-based learning (PBL) outperformed traditional lecture-based learning approaches. The quantitative results of the ANCOVA analysis reported meaningful differences ($p < 0.001$), between pre-tests and post-test scores, in all three outcome measures in entrepreneurial intention, sustainability literacy, and innovation orientation in which the experiential and PBL learning approaches had the highest adjusted means (Table 1). Significant pairwise comparisons across outcomes indicated that experiential learning and PBL

learners outperformed the traditional learning group, with moderate to large effect sizes ($\eta^2 = 0.18-0.25$), demonstrating the practical relevance of experiential and PBL pedagogies (Cohen, 1988).

The qualitative data from focus group interviews and observational data helped contextualize these findings: students from the experiential and PBL groups communicated that they valued the real-world application (e.g., developing an eco-business plan), and working collectively as a group to solve problems (e.g., how to manage water scarcity in Maun), that connected to their higher rubric scores for engagement and peer collaboration (Table 6). In contrast, students who received lecture-based instruction were frustrated with sitting and listening and felt that the learning process failed to connect theory and practice, as they had larger quantitative gaps in their outcomes (Table 5). This convergence across methods not only confirmed the hypothesis but also offered insights about the mechanisms, like mentorship, constructing tangible tasks, or considering different parts of the systems, that influenced competency development in experiential active learning situations ([Kolb, 1984](#); [Barrows, 1996](#)).

The findings have important policy implications for higher education in Botswana. Botswana's education system struggles to tackle two gulfs: a youth unemployment rate of 35%; and its environmental vulnerabilities ([UNDP, 2020](#)). The understanding that experiential and PBL learning approaches (not lectures, mixing learning genres) meant policies that could result in systematic curriculum change could challenge graduates to build skills (e.g., business plan preparation) and foster attitudes of sustainability, to launch enterprises that could help address their locally relevant socio-ecology topics of importance e.g., waste, management, or renewable energy access. As outlined, the curriculum reforms align with Botswana's Vision 2036, which aims at economic diversification and opportunities for new business start-ups and job creation through entrepreneurship ([Fund, 2018](#)). However, implementing such a policy change requires addressing the systemic issues (i.e., teacher training, teacher capacity deficits, inadequate resources) that teachers face each day. For example, collaborations with local industry practitioners (e.g., Botswana's Entrepreneurship Hub) could support the original mentorship positions and facilitate infrastructure for a hands-on project. Structured into curricular programming after the pilot (and embedded into pre-service teaching courses), even in incremental degrees (in the urban schools, then take the new curriculum into peri-urban schools), then refine using contextual feedback every step of the way ([Arscott-Mills et al., 2016](#)). If reform is going to happen, national assessments should reflect higher-order competencies like innovation and ecologically literate, rather than rote memorization and other forms of systemic measurement ([Rudhumbu et al., 2020](#)). From an educational perspective, in addition to improving student learning outcomes, they will contribute positively to broader sustainable development goals, enabling Botswana's youth to become economically resilient and environmentally responsible citizens.

By employing a mixed-methods approach, the study presents information relevant to transforming Botswana's education system into a platform for sustainable entrepreneurship. At the intersection of empirical evidence and pragmatic policy, this study highlights the suitability of a student-centered approach that prepares learners not only to navigate the socioeconomic landscape of the 21st century but also to innovate within it.

4.3. Discussion

This study contributes to the literature on sustainable entrepreneurship education, particularly in relation to Botswana's socio-economic and learning environments. While it is established

that experiential learning, problem-based learning (PBL), and traditional methods of teaching (lecture) are effective pedagogies, this research contributes to our understanding not only about the theoretical underpinnings of active pedagogies, but through the comparative practice of experiential, PBL and traditional instruction, it explores implications for curriculum development and reform in the context of developing economies in Botswana. We have contextualized the findings within the existing literature, outlined contributions to the literature, described the study's implications, and outlined its limitations.

Superiority of Active Pedagogies

The quantitative results indicate that experiential learning and PBL appear to be superior to lecture-based learning across all three competencies measured: intent to be an entrepreneur, sustainability literacy, and innovation orientation. The results were aligned with [Kolb \(2014\)](#) experiential learning theory and the PBL framework ([Lu et al., 2014](#), [Strang and Vajjhala, 2025](#)), which suggests knowledge construction is grounded in an environment that considers reflection, collaboration, and real-world application. For example, the experiential group was engaged in developing their micro-business plans and community projects with "active experimentation", which is one of the quadrants in Kolb's circle. Knowledge and skills were developed to transfer knowledge and develop entrepreneurial plans ([Chairunnisa et al., 2025](#)). The PBL group engaged with sustainability case studies to develop systems thinking and ethical reasoning, both competencies required to address Botswana's sustainability needs.

Similar to the discussion and evaluation of quantitative results, the qualitative data provided additional clarity regarding why these experiences were associated with successful high-impact pedagogies. Students contextualized the environment to one where mentors provided value-added learning experiences, and that they had worked as partners to solve problems, which is not an experience common to exam-driven learning in Botswana ([Rudhumbu et al., 2020](#)). International literature supports the ideas presented here, for contextualised, learner-centred pedagogies are preferable in entrepreneurship education ([Sibanda and Sangodoyin, 2024](#)). Conversely, the lecture group was rated as weaker and indicated lower engagement. This raised concerns for criticism that rote learning, as was characterized in the lecture, was perceived by students to be a less effective pedagogical method, particularly in the contexts of generators of innovation or sustainability literacy ([Ebewo et al., 2017](#)).

4.3.1. Gender and Geographical Differences

There were some differences in the pedagogical impact. Female students in experiential and PBL groups achieved statistically significantly higher post-test results than male students, which is consistent with research that shows active learning environments can give female students a relative advantage in patriarchal contexts because they develop agency and active engagement ([Gabriel et al., 2025](#)). For example, female focus group participants reflected on how mentorship from a few local entrepreneurs helped them visualize leadership roles they could assume in male-dominated sectors, specifically renewable energy.

In terms of geographic setting, urban schools had marginally better scores than peri-urban schools, perhaps due to better access to resources (e.g., industry partnerships, technology) or the teaching staff's understanding of innovative pedagogies. Although there were no statistically significant interaction effects between pedagogy and location (Table 4), we believe that active methodologies can be effective across a range of settings. This is of particular interest given Botswana's national goal of equalizing educational opportunities between urban and rural schools ([Honde and Abraha, 2015](#)).

4.3.2. Policy Implications

The implications of the results have urgency as Botswana grapples with 35% youth unemployment rates, alongside the growing degradation of local environments ([Fund, 2023](#)). Developing curricula that can foster learners' capacity to innovate within the boundaries of sustainability is a challenge for the national government's Vision 2036 goals. This research can provide evidence to support:

Anchoring experiential and PBL pedagogies into national curricular standards and outcomes, especially for Business Studies and Social Studies subjects.

Funding teacher professional development from traditional models centred around lecturing students to facilitate student-centred learning.

Establishing school-industry partnerships for mentorship and project opportunities, as exemplified in the experiential groups project with Botswana's Entrepreneurship Hub.

Changing the focus of assessment frameworks from rote memorization of knowledge to skills such as critical thinking and ecological literacy.

The policies set out in the recommendations align with a successful trajectory of models from across Sub-Saharan Africa, such as South Africa's emphasis on active learning for entrepreneurship education ([Darabi, 2023](#)), and could position Botswana as a regional leader in sustainable learning.

4.3.3. Limitations and Future Research

Although the use of a mixed-methods design in this study enhances validity, it also entails limitations that must be acknowledged. First, the study's 12-week intervention period may not have been sufficient to capture long-term retention of meaningful learning and skill development. Longitudinal studies will be necessary to assess the time-dependent effects of the intervention. Second, geographic clustering (Gaborone and Maun) limits this study's findings' applicability to remote rural regions. Third, although used pragmatically, the quasi-experimental design of the study limits the ability to make causal claims because school-level randomization was not used.

Future research should examine:

The scope of active pedagogies in resource-poor schools.

Cultural and institutional barriers to reforming the curriculum (e.g., parental resistance to non-traditional methods). The potential of using digital tools to facilitate and augment PBL and experiential learning in low-tech environments.

5. Conclusion

The study has demonstrated how experiential learning and PBL can foster innovation in sustainable entrepreneurship and open pathways to sustainable futures for youth in Botswana. As students connect theory to practice, the pedagogical approaches have empowered young people to respond to contemporary socio-ecological challenges while simultaneously addressing national goals of economic diversification and empowering youth. Barriers to implementation remain, but the study results provide insight on how to rethink education as a mechanism for sustainable development, one classroom at a time.

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